Climate change means extreme fire seasons in Canada are here to stay

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Main findings

- Indigenous communities and wildland firefighters face heightened physical and mental health impacts from wildfires. Indigenous communities are overrepresented in wildfire areas, while remote locations and limited transportation routes have made evacuations more difficult. Successive wildfires have made long-term recovery between disasters more difficult. Beyond physical impacts, repeated evacuations and displacement can disrupt access to hunting grounds, traditional foods and cultural practices.
- The large numbers of simultaneous fires across Canada and their rapid growth under extreme fire weather conditions are stretching available personnel and firefighting resources (e.g. aircraft, equipment) and resulting in extensive impacts to property and public health.
- The impacts of wildfires reach far beyond the location of the fire itself. Smoke from the fires affected millions of people over hundreds of kilometers. Wildfires can cause severe and often delayed health impacts ranging from difficulty breathing to cardiac arrest. Compounding vulnerabilities (e.g. preexisting conditions, socioeconomics) and concurrent extreme weather events can increase the likelihood of negative health outcomes.
- In the Northwest Territories, DSR7x as observed in July 2026 had a return period of 2 years, but DSR30x is of more relevance to the sustained fire activity seen in the region and had a return period of 6 years. In observations, these events would have been much rarer in a 1.4°C cooler climate with return periods of 50 and 100 years for this year’s 7-day and 30-day event.
- In Ontario, very rapid spread and establishment of the fires means that DSR7x is of greater relevance, with a 15 year return period in today’s climate, made a factor of about 3.5 more likely with 1.4°C of global warming. DSR30x had a return period of 6 years, and is observed to have increased in likelihood by a factor of about eight.
- To assess the role of human-induced climate change we combine the observation-based assessments with climate models. In both regions and for both event definitions the climate models show a much smaller increase in likelihood and intensity. Combining models and observations gives an increase in likelihood of about a factor of 5 in the Northwest Territories for DSR7 and a factor 2 for DSR30 and in Ontario of about 2 for both event definitions.
- In addition to the weather conditions at the time of the outbreak, we also analyse effective precipitation for the 2-year period preceding the fires. In observations we find the change in intensity of effective precipitation compared to a 1.4°C cooler counterfactual climate is small and very uncertain in both regions. There is also no evident trend in the climate models, thus we cannot attribute a change in 24-month dry conditions to human-induced climate change. This lack of trend in long term drought does not necessarily apply to the rapid onset of drought at shorter timescales, which is included as a factor in the drought code component of the DSR.
- Canada's forests are highly susceptible to wildfire because of their natural fuel characteristics and climate conditions. As wildfires become more frequent, larger, and more intense, fuel reduction measures become less effective and fires become increasingly difficult to control.
- Sustaining an effective response through the remainder of the fire season will require continued interagency coordination, flexible deployment of personnel and equipment across jurisdictions, and sufficient surge capacity to respond to new large fires without compromising ongoing operations. Adaptation to increasing wildfire risk requires an integrated risk management approach and can include incorporating future fire risk into timber harvest allocations, improving forest resilience after fires occur by diversifying with

less flammable tree species, as well as strengthening early warning systems and implementing multi-risk zoning for land use and development planning that can have multiple benefits. Integrating First Nation's knowledge and experience strengthens risk assessment, preparedness and response.

- The last three fire seasons in Canada have been exceptionally severe, with record-breaking burned area and emissions recorded across multiple regions. In 2023, WWA found that the severe start to the fire season in Quebec was made seven times more likely due to human-caused climate change. Since then, a growing body of peer-reviewed research has established that climate change is driving the increasing severity of extreme Canadian fire seasons.

1 Introduction

The 2026 wildfire season began with lower than average activity in the spring, but has quickly intensified to dangerous levels through July, prompting a level 4 national preparedness response (GoC, 2026, ciffc). The multiple occurrences of hot, dry weather since the end of June combined with significant lightning activity led to a dramatic increase in wildfire activity across Canada (CBC, 2026). More than 4,000 fires have been recorded and 3.8 Mha have burned in 2026 as of August 3rd 2026, (CWFIS, 2026) which is already above the annual 30-year average from 1994-2023 of 2.7 million hectares (CWFIS, 2026).

At the time of writing, more than 800 wildfires are active across the country (CIFFC, 2026 The Guardian, 2026b). Many of these fires remain out of control, with the provinces of Ontario, British Columbia, Québec, and the Northwest Territories having been the most severely affected thus far into the season. The scale and persistence of the fires have resulted in widespread evacuations, disruption to transport and infrastructure, significant pressure on emergency response services, and major degradation of air quality in many regions including major cities like Toronto (The Guardian, 2026b, CBC, 2026).

What was particularly remarkable this year was the exceptionally rapid rate at which burned area accumulated over a very short period of time. Indeed, hotspot-derived estimates indicate that approximately 94% of the total area burned occurred during the final five weeks between the end of June and end of July (CWFIS, 2026). As an example, on July 13, a peak in lightning activity in northwestern Ontario ignited multiple wildfires along a ~500-km cold front producing the highest annual total carbon emissions for the province on record (Copernicus, 2026). These ignitions occurred against a backdrop of exceptionally high temperatures, low humidity, and critically dry vegetation, allowing numerous new fires to develop rapidly while existing fires continued to expand (Reuters, 2026). The fire activity was highly concentrated in a short period, with approximately 604,000 ha burning between 13 and 17 July, including daily burned areas exceeding 250,000 ha on both 14 and 15 July. This rapid expansion coincided with an exceptional combination of the lightning activity with highly fire-conducive conditions, record-breaking atmospheric dryness and temperature and short-term drought conditions.

Elsewhere in the country, numerous large wildfires, mostly initiated by lightning strikes (BMJ, 2026; Gosselin et al., 2022), emerged at the end of June in Quebec and the Northwest Territories while in the second half of July, several fires of importance ignited and rapidly spread in southern British

Columbia. Wildfires in these latter two regions occurred while they were experiencing severe multi-year drought conditions. In NWT, fires were recorded at a level of intensity (per GSAT fire radiative power) comparable to that of 2014 and 2023 (Copernicus, 2026). In many areas, strong winds also contributed to rapid fire spread and made suppression efforts more challenging. So far wildfire activity is lower than record levels seen in 2023 and 2025, but forecasts suggest that weather conditions conducive for wildfires will remain above or well-above average in the remainder of the fire season for much of the country (GoC, 2026, CWFIS 2026).

Figure 1 shows the sequence of daily geopotential height and wind evolution of the large-scale circulation that favoured both the development of wildfire conditions in Canada and the subsequent long-range transport of smoke into the northeastern United States. From 1st to 7th July, a persistent upper-level ridge dominated the eastern United States and extended into Ontario. These same weather systems were associated with hot conditions in the United States (WWA, 2026). These conditions dried vegetation across parts of Ontario and neighbouring regions, increasing fire danger. From 8 to 12 July, the ridge gradually weakened as a trough developed over eastern Canada. The wind field became increasingly zonal over southern Canada, with stronger westerly to north-westerly flow emerging on the northern flank of the retreating ridge. This transition set the stage for more efficient transport of smoke away from the fire source regions.

The development of a high-pressure ridge over the central U.S. on July 14 and deep low pressure over eastern/northwest Canada on July 15 produced a strong pressure gradient. This positioned the jet stream and created a persistent north-westerly flow allowing transport of smoke away from the fires in western Ontario to the Great Lakes, the northeastern United States and the Atlantic Ocean (NASA, 2026). As a result, Toronto and wider southern Ontario experienced record-poor air quality (Guardian, 2026; CBC, 2026), skies were dark over Quebec (La Presse, 2026), and over 120 million people in the Midwest and Northeast U.S. were affected by dangerous air quality, with alerts stretching from Minnesota to New Hampshire (CNN, 2026).

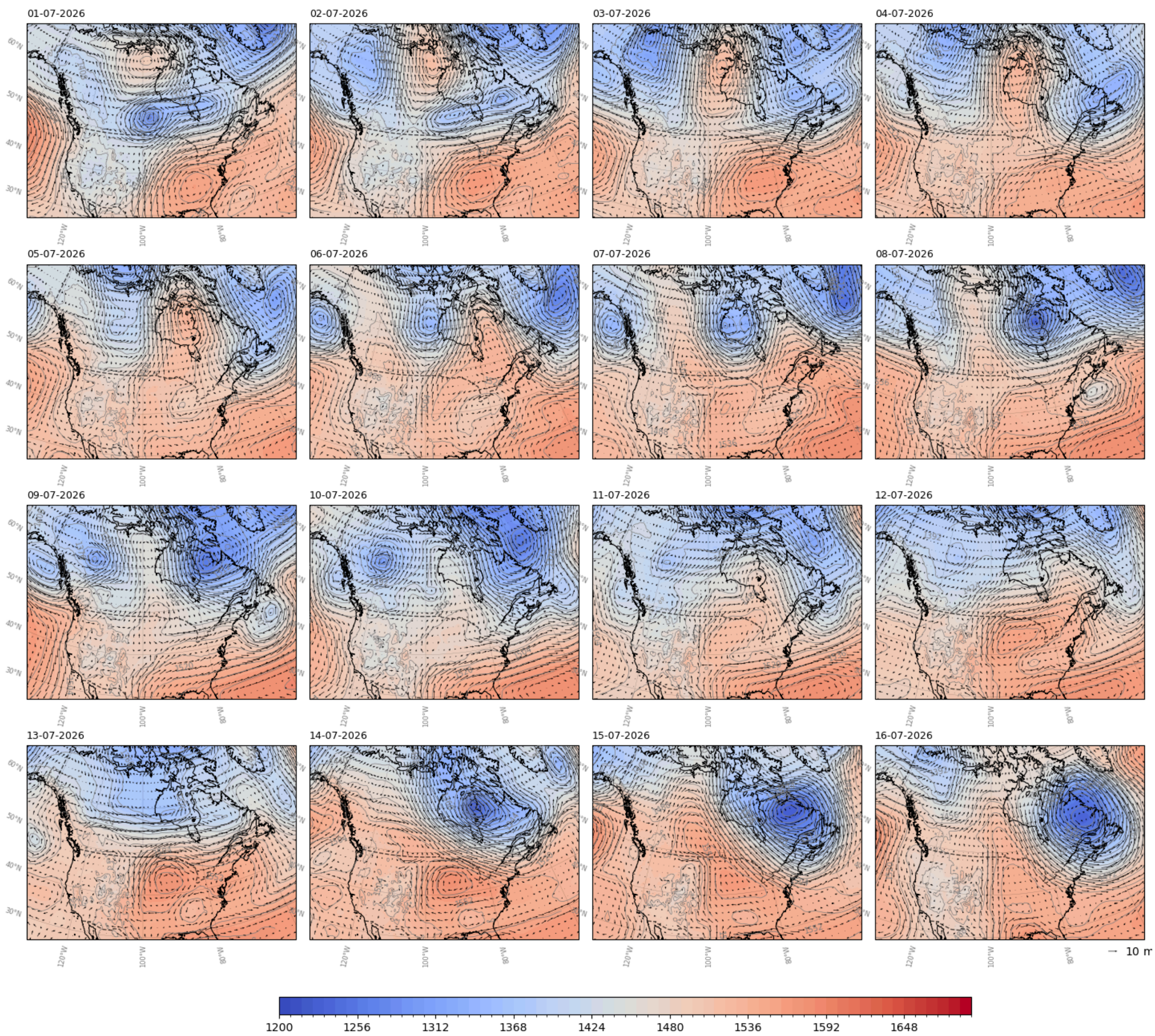

Figure 1.1: *Geopotential height (m) and winds (m/s) at 850 hPa. Data ERA5*

1.1 Impacts

Exposure to elevated concentrations of wildfire smoke has been associated with increased emergency healthcare utilisation, particularly for respiratory and cardiovascular conditions, as well as increases in all-cause mortality (AJMC, 2026), while also prompting public health warnings, large-scale evacuations, disruption to transport and economic activity, and considerable pressure on firefighting resources (Medical Daily, 2026). In particular, many remote and Indigenous communities have been displaced, with some communities suffering extensive damage or destruction as fires spread rapidly under extreme weather conditions. These impacts compound over successive fire seasons, with first nations communities disproportionately impacted (Christianson et al., 2024).

The 2026 wildfire season began with lower than average activity in the spring, but has quickly intensified through July, prompting a level 4 national preparedness response (GoC, 2026, ciffc). Wildfires have significant implications for physical, mental and cultural wellbeing, environmental destruction, and financial strain (PSC, 2024). The smoke from fires in northwestern Ontario have reached north central and northeastern US regions, resulting in hazardous air quality across Canada and the US, and into the Arctic (Reuters, 2026; Copernicus, 2026). Evacuation orders have been given in several regions, disproportionately affecting First Nations communities (Guardian, 2026). The full extent of the impacts of this season's wildfires are yet to be determined. Previous wildfire seasons have led to significant health impacts, for example, smoke from the 2023 wildfires are estimated to have caused over 80,000 premature deaths globally (Zhang et al., 2025). The fires can also be expected to be linked to negative mental health outcomes, leading to post-traumatic stress disorder, depression, anxiety and suicidal thoughts (Hayes et al., 2022). Wildfires have particular impacts on First Nations people, often bringing financial hardship and emotional distress, including a deep sense of loss tied to environmental destruction and cultural disconnection (Hohban et al., 2026). Nationally, financial costs of fighting wildfires regularly exceed $1 billion per year, and can be expected to this season as well (GoC, 2026).

1.2 Overview of burned area event

Attribution analyses of hot extremes in the Northwest Territories and Ontario which occurred between the end of June and early July was carried out by Environment and Climate Change Canada (ECCC) rapid event attribution system (Extreme weather event attribution - Canada.ca) following an approach based on Malinina and Gillett (2024). Attribution analyses were triggered for heat events that exceeded the median TXx for 1991-2020 for the individual pre-defined regions used in the system. Heatwave events were identified in Ft. Smith, NWT, June 23-July 7; Inuvik, NWT July 8-10; Western Ontario, July 11-14; and Eastern Ontario, July 12-14. All these events were found to have a probability ratio with a lower bound between 2 and 10 putting them in the "much more likely because of human influence on climate" category for the current climate.

In the broader context, the 2026 Canadian fire season was initially characterized by below-average burned area and emissions and an absence of early-season (May/June) events which drove the 2023 and 2025 wildfire seasons (Figures 1.2.1, 1.2.2). Two regional events in the Northwest Territories and Ontario rapidly altered the seasonal trajectory. Over 500,000 ha burned in Ontario in two days (July 14-15) following a regional heat dome event (Figure 1.1). Over one million hectares burned in around 20 days in the Northwest Territories. Yet the some of the events that have occurred in both Ontario and Northwest Territories account for over 50% of burned area and emissions Canada-wide to date, pushing the season from average to near the tails of the historical (2003 – 2023) distribution of burned area and emissions (Figure 1.2.1, 1.2.2). This temporal trajectory, driven by a small number of localized high-intensity events, contrasts with Canada's 2023 wildfire season, which saw nationwide fire activity beginning in May, particularly in western Canada and Quebec (Jain 2024; e.g. Figure 1). Notably, in Ontario, despite lower overall fire activity, 2026 has to date seen by far the highest burned area and emissions activity, of particular importance given that this is Canada's most populous province.

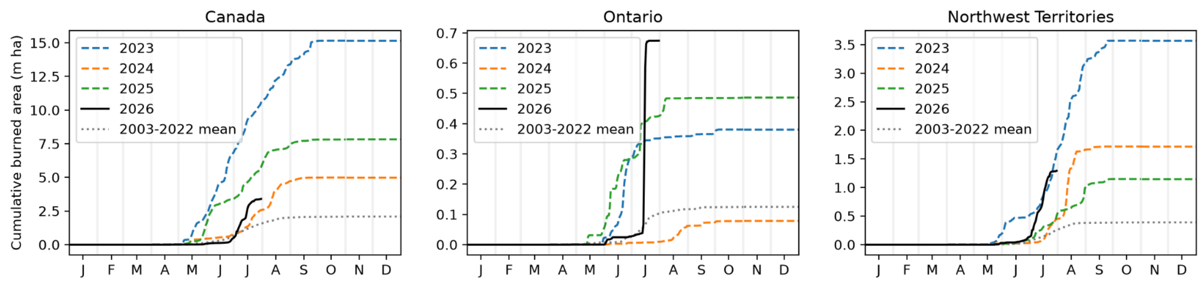

Figure 1.2.1: Cumulative burned area for 2026 and the previous three fire year, over (left) all of Canada, (centre) the Ontario study region, (right) the NWT study region. Data source: Fire M3.

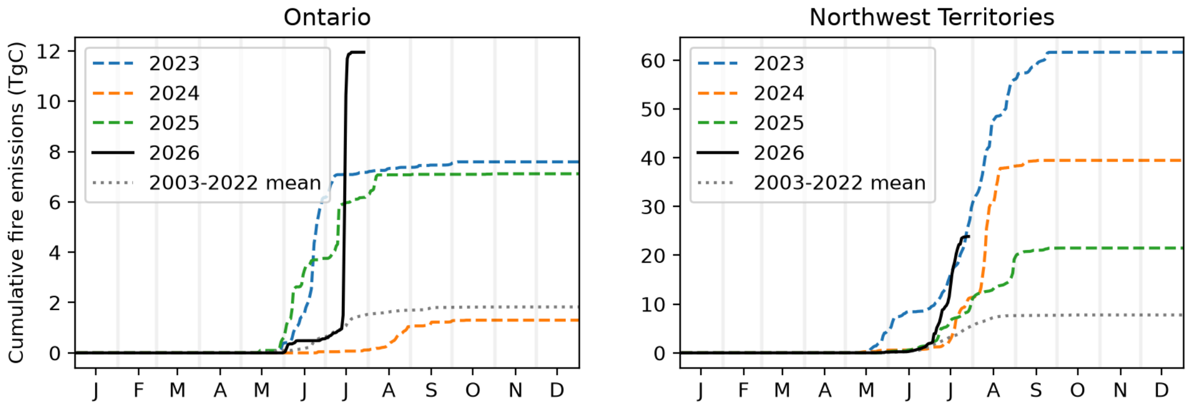

Figure 1.2.2: Cumulative emissions in Tg carbon for 2026 and the previous three fire years, over (left) the Ontario study region, (right) the NWT study region. Data source: Fire M3.

1.3 Event definition

In this report, we study the influence of anthropogenic climate change by comparing the likelihood and intensity of similar fire weather and drought extremes at present with those in a 1.4°C cooler climate without human-caused warming (based on Forster et al., 2026). We also extend this analysis into the future by assessing the influence of a further 1.4°C of global warming from present. This is in line with the latest Emissions Gap Report from the United Nations Environment Programme, which shows that the world is on track for at least 2.8°C temperature rise by end-of-century given currently implemented policies (UNEP, 2025).

We analyse compound fire weather, using the Daily Severity Rating (DSR) rescaling of the Canadian Fire Weather index (FWI). The FWI is predictive of the potential intensity of forest fire (Van Wagner, 1987), and whilst adopted globally – is of especially appropriate use in the Canadian ecosystems for which it was developed (Jones et al., 2022). DSR is a rescaling of the FWI, that allows for aggregation over a relatively ecologically homogeneous landscape and over multiple days – giving greater weighting to the larger values that drive in extreme fire spread days and difficult to suppress fire should a wildfire catch. As illustrated in Figure 1.3.1, DSR is well correlated to fire activity (represented here by fire radiative power, FRP), and it is also well-correlated with area burned over most of Canada (Kirchmeier-Young et al., 2024). High fire weather conditions do not always correspond to extreme fire activity – as seen in mid June in the Northwest Territories – due to (1) the random nature of wildfire occurrence meaning that fires are of increasing likelihood to have occurred as the favourable window persists, and (2) the accumulative drying effect on the landscape in hot, dry and windy weather to increase the susceptibility of vegetation to fire.

We look at two regions that experienced high fire activity, situated mostly in the Northwest Territories (NWT) and western Ontario (Figure 1.2.1) and bounded by the boxes (61-67°N & 125-115°W) and (48-52°N & 93-87°W) respectively. For simplicity we hereafter refer to the study regions as the NWT and Ontario regions. To assess both the role of shorter term extremes in fire weather conditions driving rapid blow-ups in fire activity (as seen in Ontario) and longer term conditions resulting in widespread fire (as seen in NWT) we assess the effect of climate change on the maximum 7-day and 30-day accumulations of DSR – labelled DSR7x and DSR30x respectively throughout this report.

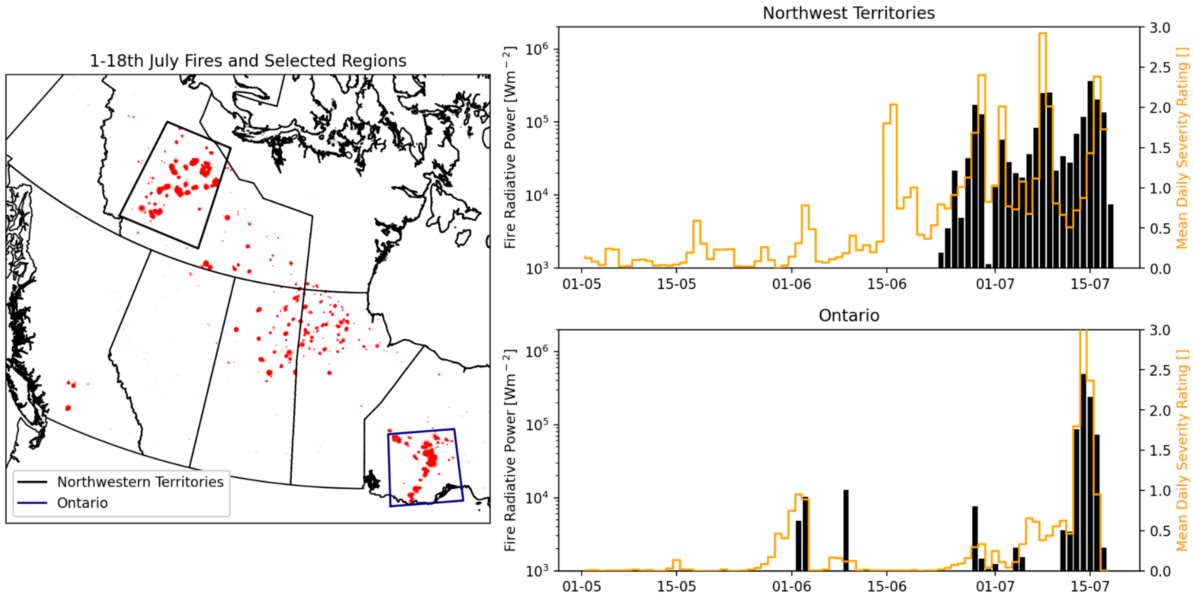

Figure 1.3.1: *left, detected FRP activity (VIIRS) for July (data availability up to 18th) with the event study regions overlaid. Right, fire activity characterised in black bars (FRP) and the spatially averaged daily severity rating in orange lines (DSR) for the Northwest Territories (top) and Ontario (bottom) regions. FRP data source: FIRMS.*

In addition to fire weather, we also assess multi-year drought conditions, which led to greater vulnerability of forests in Northwest Territories. Looking at the same regions, we assessed this using the 24-month effective precipitation, defined as precipitation minus the potential evapotranspiration estimated according to Hargreaves formula (Hargreaves et al., 1985)

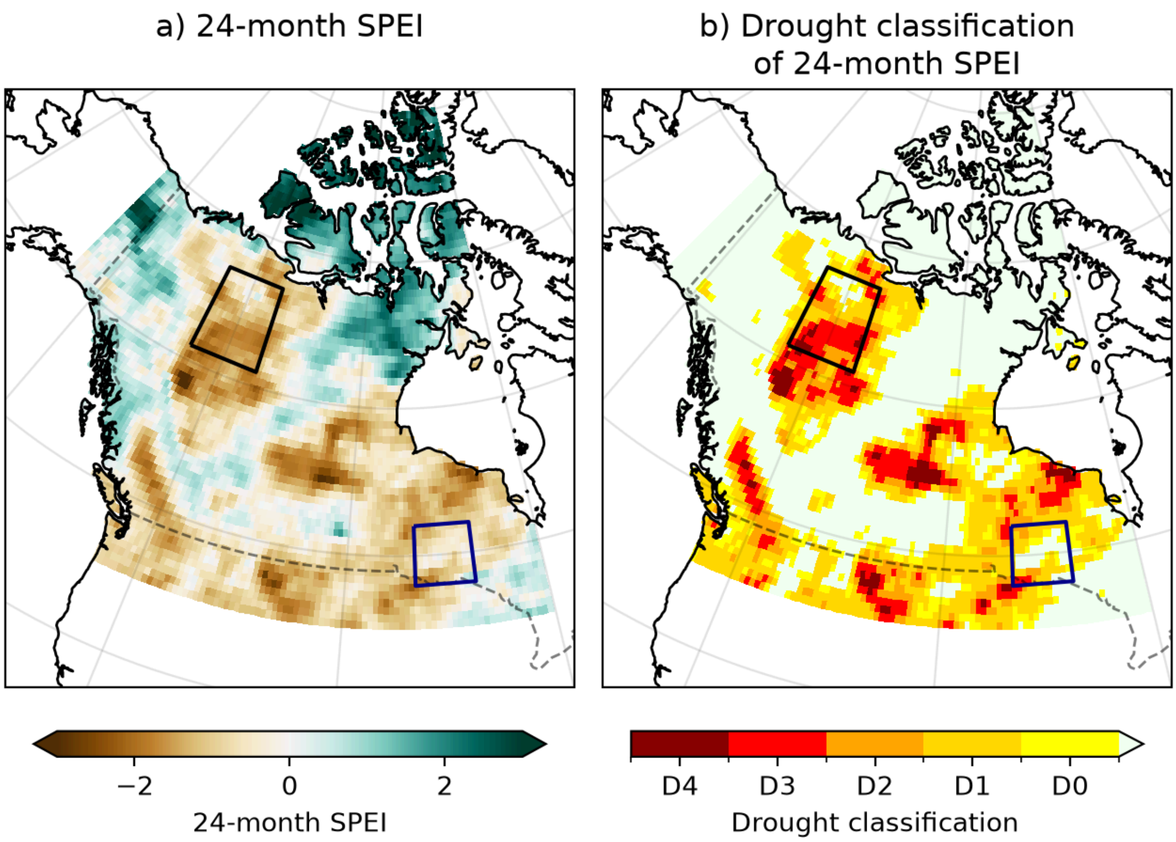

Figure 1.3.2: *Maps of (a) 24-month SPEI and (b) drought classification of the 24-month SPEI. Drought classifications in decreasing order of severity are D0: abnormally dry; D1 moderate drought; D2 severe drought; D3 extreme drought; D4 exceptional drought. Boxes indicate the two study regions, with the NWT region outlined in black and the Ontario region in dark blue. Data from ERA5.*

2 Observed trends

2.1 Trends in gridded data

2.1.1 Trends in fire weather

The return periods of the observed events are included in Table 2.1.1.1, for the 7-day maximum period of the DSR averaged over each region (DSR7x). In the remainder of this report, the Canadian calculation of the FWI is taken for analysis – but to assess the return period most appropriate for this study the CEMS calculation was included as a point of comparison, showing similar return periods of the event except for the NWT DSR30x event. The 30-day events for both regions were similar, so a 6 year return period event was examined for best comparability of attribution between these events. The 7-day events had markedly different rarities, with the nearest integer to the central estimates taken as the function return period to be investigated: a 15-year event in the Ontario region and 2-year event in the NWT region.

We note that the choice of return period affects the estimated probability ratios but that the estimated changes in intensity are independent of this. The results for the observational datasets evaluated at these fixed return period are shown in Table 2.1.1.3.

Table 2.1.1.1: Magnitudes and estimated return period of maximum accumulated fire severity ending for 2026 (up to 18th July) over a 7-day and 30-day period in the Ontario and NWT regions.

Dataset	Ontario DSR7x		Ontario DSR30x		NWT DSR7x		NWT DSR30x	
	Magnitude	Return period (95% C.I.)	Magnitude	Return period (95% C.I.)	Magnitude	Return period (95% C.I.)	Magnitude	Return period (95% C.I.)
ERA5 (CEMS)	*8.34*	*18.6 (7.05, 105)*	*3.43*	*7.51 (3.35, 34.5)*	*9.93*	*5.34 (2.66, 17.3)*	*7.64*	*19.1 (6.11, 245)*
ERA5 (ECCC)	8.10	14.9 (6.17, 55.1)	3.44	6.17 (2.89, 20.8)	7.43	2.02 (1.49, 3.31)	6.49	6.85 (3.32, 24.1)

Table 2.1.1.2: The selected return periods for analysis – taken from return periods as characterised by the ECCC calculation of the FWI, which are taken to be more reliable over Canada.

	Ontario DSR7x	Ontario DSR30x	NWT DSR7x	NWT DSR30x
Return Period	15 years	6 years	2 years	6 years

The model fits for the Ontario region are shown in Figure 2.1.1.1 below. The models were fitted according to a GEV distribution scaling with GMST, showing an increasing relationship with global temperatures. There is a striking multidecadal wave in the LOESS smoothed trend (dashed green line) which is not captured in the model fit. There is a possibility that this natural variability in the midcentury is driven by multidecadal modes of variability such as the PDO or AMV. Examination indicates that it does correspond to the strongest recent negative period of the AMO (NOAA, 2026), which has been found to be correlated with increased fire activity in the region (Skinner et al., 2006; Cardil et al., 2023). However, due to the very short sample window compared to the period of the oscillation; uncertainty about the causal relationship between the AMV and fire activity; and the question as to whether the AMV is in fact externally forced and therefore meaningful to use as a covariate for natural variability (Liang et al., in review) – we opt not to include this as a covariate. Despite this variability, there is an observable, moderate increase in the likelihood of this event.

The NWT equivalents (Figure 2.1.1.2) do not show similar variability, despite having been proposed to be subject to a similar relationship (Skinner et al., 2006) – giving another region not to include the climate mode as a covariate on the basis of a single realisation. There is a very clear increasing trend in fire weather with GMST at both accumulations.

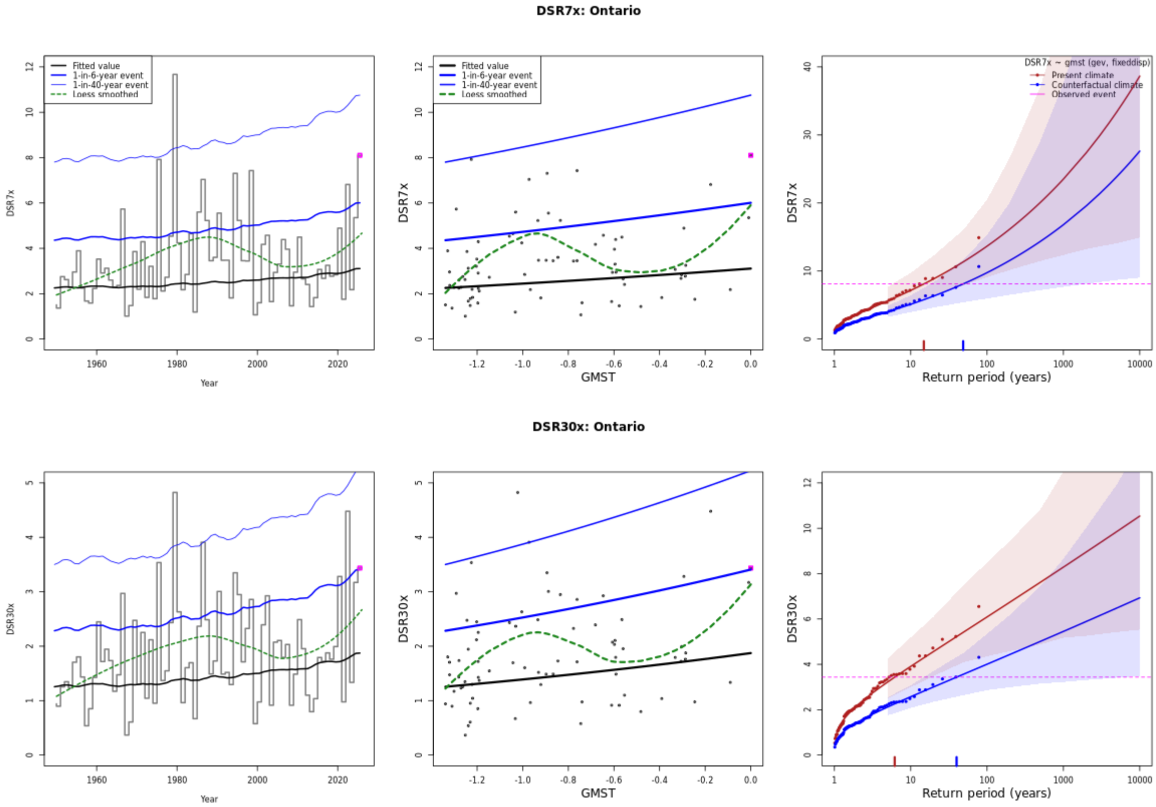

Figure 2.1.1.1: *Trend fitting for the Ontario 7-day (top) and 30-day (bottom) fire weather events from ERA5 data. Left shows the annual timeseries of the event (grey line), and middle the variation of annual values (black dots) with 4-year smoothed GSAT. The event is shown with the pink box. The loess-smoothed trend is shown with the green dashed line and the fitted statistical model that varies with GMST is shown with the black and blue lines, showing the event (black line), and the 1-in-6 (bold blue) and 1-in-40-year (lighter blue) return period event magnitudes. To the right, the statistical fits are shown. The probability curve for the current climate is shown in red, and for the past 1.4°C cooler climate in blue, with the shaded band showing the 95% confidence interval. The magnitude of the studied event is highlighted with a horizontal pink line. Red and blue markers on the return-period axis (log) mark the return period for an event of the 2026 magnitude in the current and past climate respectively.*

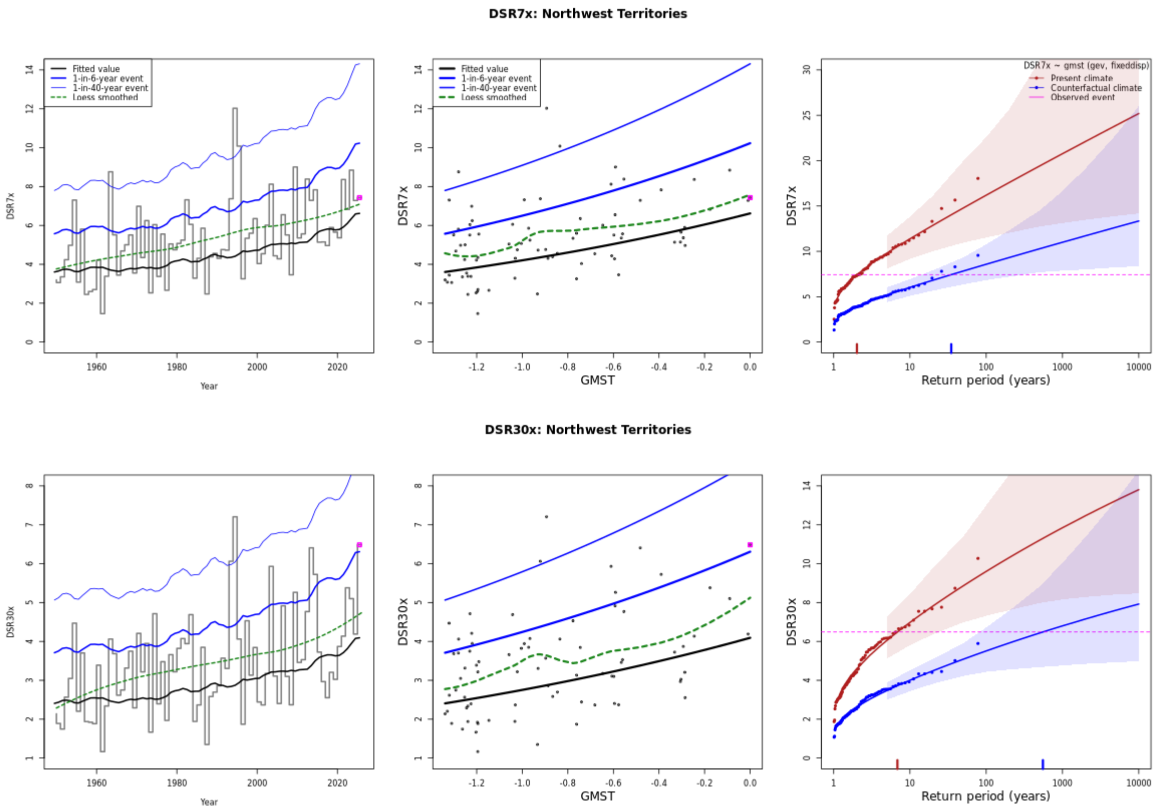

Figure 2.1.1.2: *Trend fitting for NWT 7-day (top) and 30-day (bottom) fire weather events from ERA5 data. Left shows the annual timeseries (grey line) of the event, and middle the variation of annual values (black dots) with 4-year smoothed GSAT. The event is shown with the pink box. The loess-smoothed trend is shown with the green dashed line and the fitted statistical model that varies with GMST is shown with the black and blue lines, showing the event (black line), and the 1-in-6 (bold blue) and 1-in-40-year (lighter blue) return period event magnitudes. To the right, the statistical fits are shown. The probability curve for the current climate is shown in red, and for the past 1.4°C cooler climate in blue, with the shaded band showing the 95% confidence interval. The magnitude of the studied event is highlighted with a horizontal pink line. Red and blue markers on the return-period axis (log) mark the return period for an event of the 2026 magnitude in the current and past climate respectively.*

		DSR7x		DSR30x	
		Probability ratio (95% CI)	**Intensity change (-) (95% CI)**	**Probability ratio (95% CI)**	**Intensity change (-) (95% CI)**
ERA5 (overwintering included ECCC)	**Ontario**	3.49 (0.946, 52.4)	2.38 (-0.145, 5.44)	**7.74 (1.28, 412)**	**1.26 (0.173, 2.37)**
	NWT	**27.2 (6.96, 425)**	**3.84 (2.47, 5.23)**	**16.3 (3.98, 1330)**	**2.12 (1.21, 3.19)**

Table 2.1.1.3: *Probability ratio and change in magnitude for fire weather at both timescales and in both regions, according to the event return periods in Table 2.1.1.2.*

2.1.2 Trends in effective precipitation

To characterise drought conditions, we use effective precipitation, defined as precipitation minus potential evapotranspiration (P-PET). PET represents the atmospheric demand for moisture under the assumption of unlimited water availability. This metric therefore captures both precipitation deficits and increase in atmospheric evaporative demand (AED), making it a reliable metric for assessing drought severity. While the multi-year nature of the droughts was not spatially uniform over Canada, we use a 24-month definition because the impacts of the seasonal precipitation deficits are implicitly represented in the Fire Weather Index (FWI). Our focus is therefore on the longer-term effects of drought in driving vegetation stress and build-up of dry fuels. Over the NWT region, the drought has persisted for the last ~24 months, but meteorological droughts over Ontario have been variable in time, with an end to a 2-year cumulated dry rainfall period earlier this year (Figure 2.1.2.1). Nevertheless, we apply the same 24-month definition for both study regions, to capture the long-term influence of accumulated precipitation deficits and warming on vegetation stress and fire weather conditions.

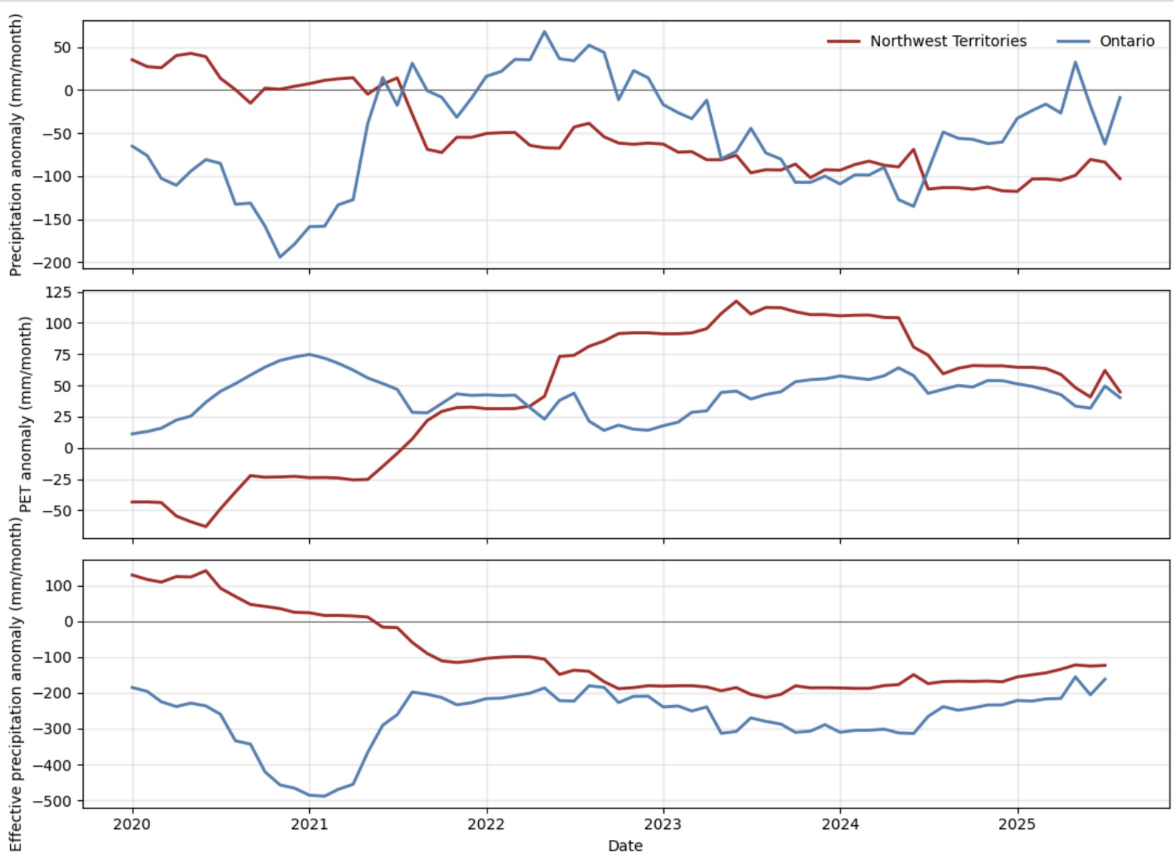

Figure 2.1.2.1: *Two-year rolling averages for precipitation, potential evaporation and effective precipitation for the Ontario and NWT regions.*

The return period estimates in five observation-based datasets are shown in Figure X1. At the time of carrying out this study, two datasets (ERA5 and CPC) had the event (data till end of June 2026, needed for defining the event). The other estimates which came from ERA5 and ERA5-Land, but using model generated potential evaporation estimates were downloaded directly from the CDS run only till April 2025, and therefore do not contain the event (see Appendix Section A.1.1 for data availability).

From the two datasets that contain the event (CPC and ERA5), the best estimated return period of the low effective precipitation during the 24 month period from July 2024- June 2026 area-averaged over the NWT is 11 years in ERA5 and 7 years in CPC with high uncertainty around them. Over the Ontario region, the return periods in both these datasets are close to 4 years. Therefore, for the other datasets, as well as for the attribution analysis, we define the event as a 1-in-10 year event over NWT, and as a 1-in-4 year event for the Ontario region. The results for the observational datasets evaluated at this return period are also shown in Table 2.1.2.1 for ERA5 and ERA5-Land based 24- month effective precipitation time series, both using potential evaporation available as model output from running the IFS model; hereafter ERA5 (native PET) and ERA5-Land (native PET). and the probability ratios for the directly estimated return periods are shown in Table Y.Y.

Table 2.1.2.1: *Estimated return periods of effPr-24 events over the Ontario and the NWT regions and in the two reanalysis datasets with coverage of the event and three datasets that do not contain the event, and therefore fixed at event return periods of 4 years and 10 years in the 2026 climate.*

Dataset	Eff-pr 24: Ontario		Eff-pr 24: NWT	
	Magnitude (mm)	Return period (95% C.I.)	Magnitude (mm)	Return period (95% C.I.)
CPC	-279	3.71 (1.96 to 14.2)	-439	6.81 (3.19 to 78.7)
ERA5 (native PET)	1270	4.00 (2.39 to 8.73)	-338	10.0 (3.20 to 108.5)
ERA5 (Hargreaves)	315	4.23 (2.57 to 9.33)	-215	11.3 (4.03 to 108)
ERA5-Land (native PET)	-7830	4.00 (1.64 to 13.5)	-3090	10.0 (3.09 to 47.4)

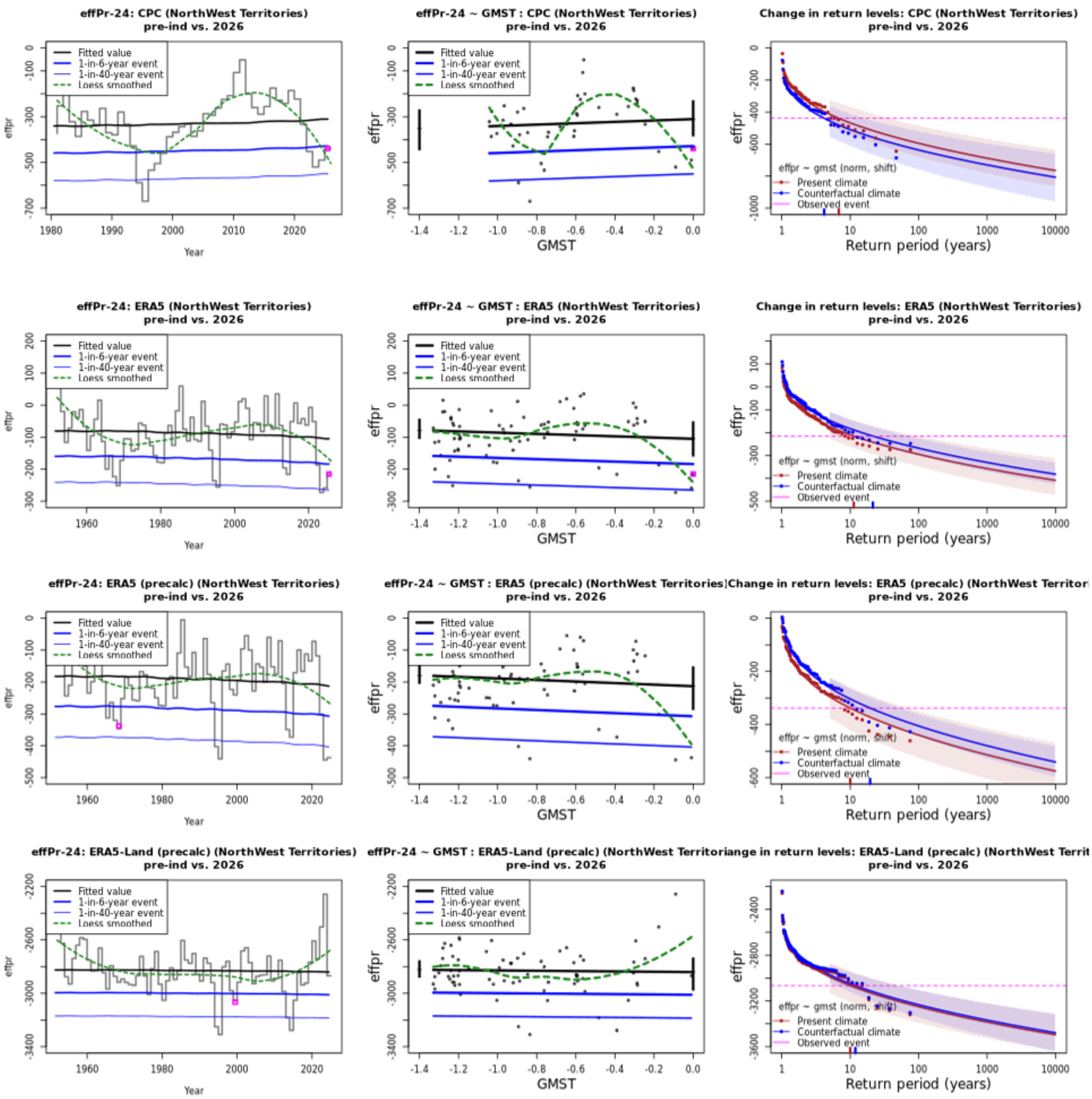

Figure 2.1.2.2*: Trend fitting for eff-Pr (24 month) for NW territories, based on CPC (top), ERA5 with PET Estimated based on Hargreave's estimation (top middle), ERA5-precealc (bottom middle) where the IFS model generated potential evaporation is used for estimating effective precip, and ERA5-Land -precalc (bottom), which is same as ERA55-pre-calc, but based on ERA5-Land*

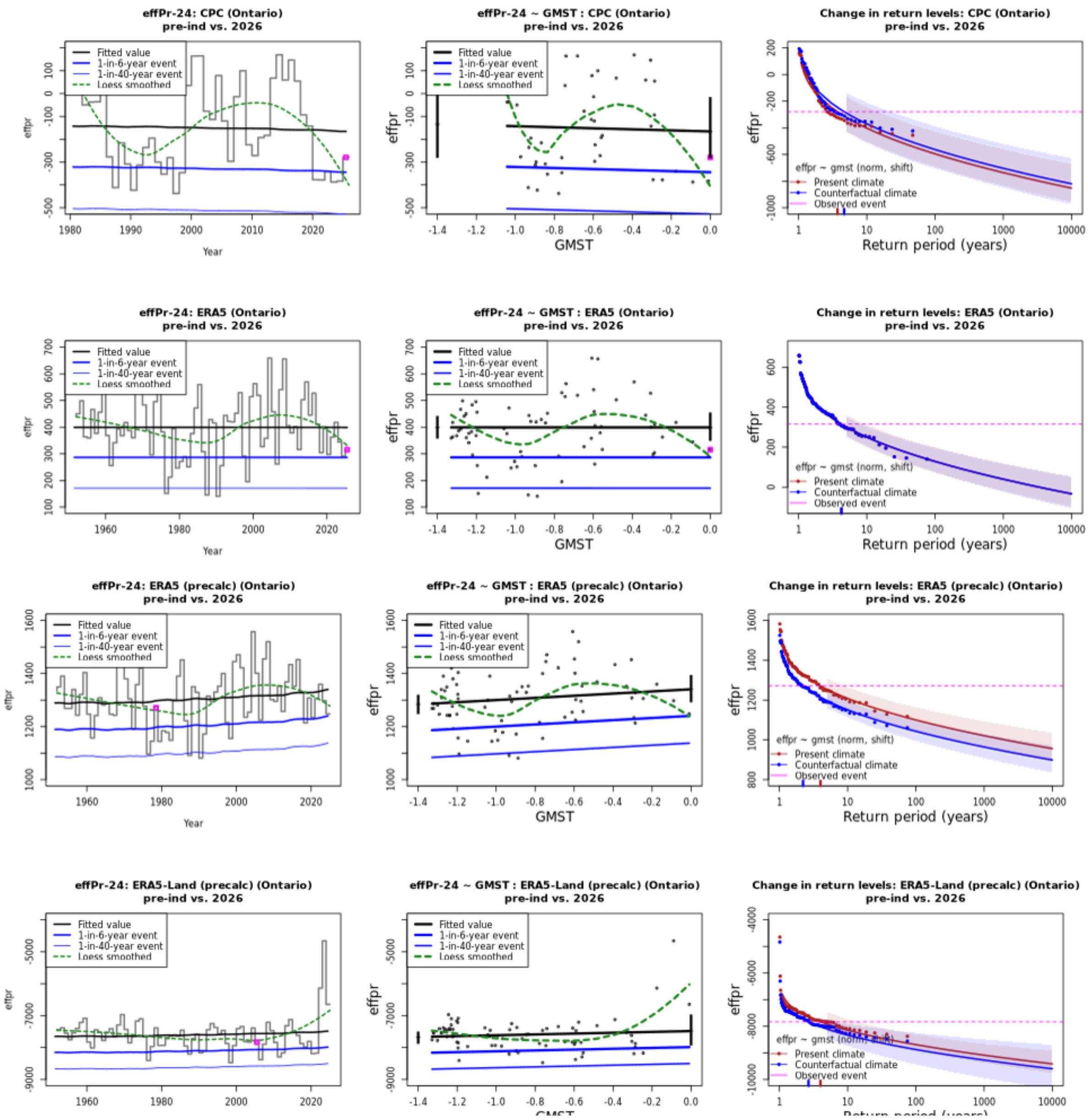

Figure 2.1.2.3*: same as Fig.2.1.1.3, for the Ontario region.*

Table 2.1.2.2 summarises the results from fitting non-stationary normal distributions that vary with GMST to the effective precipitation series in both the regions. There is a stronger association with GMST decreasing low effective precipitation over NWT, while the trends border on no change over the Ontario region. It should be noted that these results are not significant at 5% significance level; however this is expected in the case of rainfall owing to the large year-to-year-and multidecadal variability associated with rainfall in this region (see leftmost panels in Fig. 2.1.1.3 and 2.1.1.4).

The best estimated PR in ERA5 suggests a near doubling in the likelihood of two-year long drought in the NWT region with a 27 mm (in ERA5 where the PET for eff precip is calculated using Hargreave's estimation; hereafter ERA5) to 34 mm (where potential evaporation is available as model output from running the IFS model ; hereafter ERA5-precalc) decrease in the amount of effective precipitation associated with the 2026 drought event as compared to an event of similar rarity in a 1.4C cooler climate. ERA5-Land also mirrors this tendency, with a modest 21% increase in the chances of this event occurring in today's climate, with a decrease in rainfall amounts by 18.7 mm, as compared to an event of similar rarity in the pre-industrial climate. Trends in CPC dataset on the other hand shows a decrease, suggesting that multiyear droughts are becoming less likely over the region and consequently, such events becoming less intense or wetter (by about 42 mm) due to climate change.

Over the Ontario region, the trends are mixed with CPC suggesting a increasing trend in low precipitation events, with precipitation amounts decreasing by about 32 mm, ERA5-preclac indicating a decrease, with precipitation events wetter by 57mm, and bordering on no change in ERA5. ERA5-Land on the other hand shows a ~3091mm increase in rainfall amounts.

Table 2.1.2.2: *Change in probability ratio and magnitude for effPr-24 events over the Ontario and NWT regions due to GMST.*

Dataset	Eff-pr 24: Ontario		Eff-pr 24: NWT	
	Probability Ratio	Change in magnitude (mm)	Probability Ratio	Change in magnitude (mm)
CPC	1.25 (0.15 to 8.74)	-32.3 (-265 to 252)	0.61 (0.03 to 3.48)	42.0 (-89.7 to 255.3)
ERA5 (native PET)	0.55 (0.22 to 1.14)	56.9 (-13.2 to 129.5)	1.95 (0.16 to 11.6)	-34.3 (-132 to 69.6)
ERA5 (Hargreaves)	1.00 (0.38 to 2.55)	-0.23 (-79.3 to 80.1)	1.90 (0.16 to 10.4)	-26.9 (-103 to 59.1)
ERA5-Land (native PET)	0.67 (0.15 to 3.75)	184.16 (-416 to 870)	1.21 (0.18 to 11.6)	-18.8 (-214.8 to 152.4)

2.2 Summary of observed trends

2026's fire season in the Ontario and NWT regions was driven by sustained fire weather conditions, with a severe week of fire weather (DSR7x, estimated to have a 15-year return period compared to annual extremes) in Ontario driving rapid fire spread and large concurrent emissions affecting the highly populated southeast of Canada and northeastern United States. As of mid July, the highest week of fire weather in NWT was not rare (DSR7x, estimated to have a 2-year return period); the overall event was made severe due to the sustained period of fire weather that allowed for sustained fire activity. The effect of climate change on the highest week of fire weather was found to be strong in the Northwest Territories, with an increase in likelihood of approximately 27 times. According to the observed trend, we would therefore expect these severe weeks of consecutive fire-weather days to have been similarly rare in the preindustrial climate – to a return period of approximately 50 years. The 30-day events (DSR30x) were of very similar rarity, about a one-in-six year occurrence compared to past full fire seasons for both study regions. Both saw a substantial increase in likelihood due to climate change (approximately 8x in the Ontario region, and 16x in the NWT region), meaning that most-likely such an event would have been experienced about once a lifetime in a preindustrial climate.

Drought conditions are somewhat accounted for by the drought code component of the fire weather index, which requires long-term deficits in moisture for the most extreme fire-danger values to be reached. However, the drought code directly relates to the curing of dead fuels – specifically the deeper organic surface fuel layer and bulky dead logs and branches – and can saturate at well-below sub-annual timescales. A different effect is resultant from long-term drought, which stresses live vegetation and potentially increases ecosystem flammability (Jain et al., 2024). The 24-month moisture in NWT was found to have an approximately 10-year return period, meaning that it is a moderately unusual drought which likely contributed to ecosystem-level flammability. The effect of climate change varies between observational datasets, with the overall finding being an increasing effect due to human-caused climate change in IFS-based ERA5 datasets though no effect in CPC.

In the Ontario region, there was not a multi-year drought and the overall two-year long event had an approximately 4-year return period. Observational data yielded mixed effects due to climate change on two year drought over the Ontario region, though there is a known increasing effect at shorter timescales (Bonsal et al., 2025).

3 Attribution of trends

3.1 Evaluation of climate models

In the subsections below we show the results of the model evaluation for each location. The climate models are evaluated against the observations in their ability to capture:

1. Seasonal cycles: For this, we qualitatively compare the seasonal cycles based on model outputs against observations-based cycles in the FWI, and on a separate basis effective precipitation for the drought attribution. We discard the models that exhibit ill-defined peaks in their seasonal cycles. We also discard the model if the season onset/termination varies significantly from the observations.

2. Spatial patterns: Models that do not match the observations in terms of the large-scale FWI or effective precipitation patterns are excluded.

3. We discard the model if the model and observation parameters ranges of the GEV's shape and dispersion parameters do not overlap.

The models are labelled as 'good','reasonable', or 'bad' based on their performances in terms of the three criteria discussed above. A model is given an overall rating of 'good' if it is rated 'good' for all three characteristics. If there is at least one 'reasonable', then its overall rating will be 'reasonable' and 'bad' if there is at least one 'bad'. Due to having a limited number of distinct GCMs, but a large number of ensemble members for the DSRnx attribution, we take a more relaxed 'reasonable' selection criteria to ensure better sampling of model representation of Canadian fire weather. Tables of the model evaluation results can be found in Appendix A2.

3.2 Synthesis of fire weather results

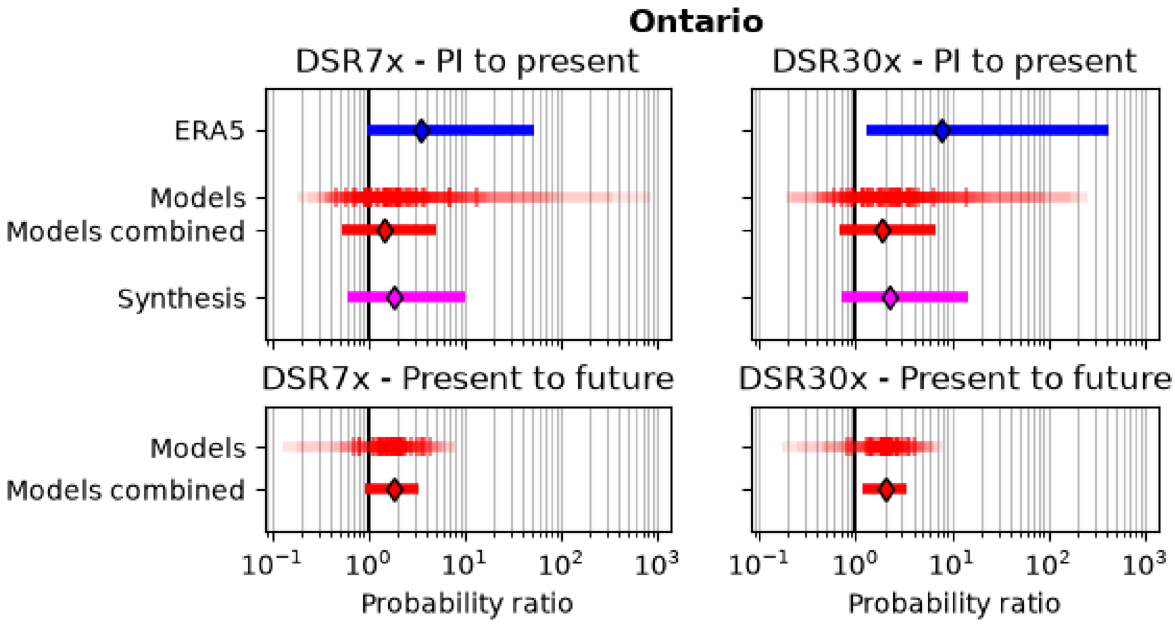

Figure 3.2.1: *Synthesis of probability ratios for 15-year DSR7x and 6-year DSR30x in the Ontario study region. Top row: change in likelihood of similarly extreme event from preindustrial (1.4°C cooler than the present) to 2026; bottom row: change in likelihood from the present to a future 1.4°C warmer climate.*

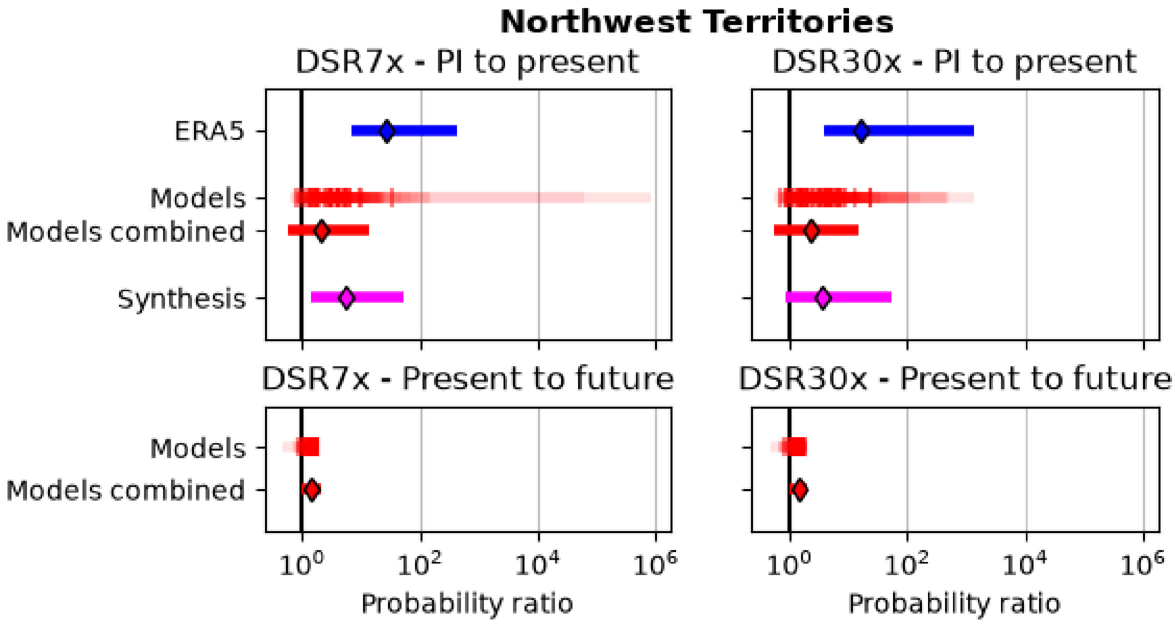

Figure 3.2.2: *As Figure 3.2.1, but for the NWT region (2-year DSR7x and 6-year DSR30x)*

For the event definitions described above we evaluate the influence of anthropogenic climate change on the events by calculating the probability ratio as well as the change in intensity using observations and climate models. Models which do not pass the evaluation described above are excluded from the analysis. The aim is to synthesise results from models that pass the evaluation along with the observations-based products, to give an overarching attribution statement. Tables of the results of this model fitting can be found in Appendix A2.

Figures 3.2.1 and 3.2.2 show the synthesised increase in probability of 7-day and 30-day DSR for the Ontario and NWT regions respectively. The observations are shown in blue, and models in red, with overlapping confidence intervals in the models shown in the shaded red bar. Observation-based products and models are combined into a single result in two ways. Firstly, we neglect common model uncertainties beyond the intermodel spread that is depicted by the model average, and compute the weighted average of models and observations: this is indicated by the magenta bar.

Ontario					
Data		**DSR7x**		**DSR30x**	
		Probability ratio (95% CI)	**Intensity change (-) (95% CI)**	**Probability ratio (95% CI)**	**Intensity change (-) (95% CI)**
Observations	**Past-Present**	3.49 (0.946, 52.4)	2.38 (-0.145, 5.44)	**7.74 (1.28, 412)**	**1.26 (0.173, 2.37)**
Models		1.46 (0.523, 5.08)	0.662 (-1.03, 2.52)	1.82 (0.666, 6.59)	0.629 (-0.461, 1.81)
Synthesis		1.80 (0.600, 10.1)	1.16 (-0.813, 3.43)	2.22 (0.704, 14.7)	0.955 (-0.134, 2.10)
Models only	**Present-Future**	1.79 (0.926, 3.36)	1.13 (-0.392, 2.93)	**2.01 (1.17, 3.34)**	0.881 (-0.0109, 1.98)

Table 3.2.1: Summary of results for Ontario region, for both DSR7x and DSR30x accumulations, presented in Figure 3.2.1: changes due to GMST include past-present changes and present-future changes. Statistically significant increases (decreases) in probability and intensity are highlighted in dark orange (blue), while non-significant increases are highlighted in light orange (blue). Statistically significant changes are also highlighted in ***bold*** *font.*

NWT					
Data		**DSR7x**		**DSR30x**	
		Probability ratio (95% CI)	**Intensity change (-) (95% CI)**	**Probability ratio (95% CI)**	**Intensity change (-) (95% CI)**
Observations	**Past-Present**	**27.2 (6.96, 425)**	**3.84 (2.47, 5.23)**	**16.3 (3.98, 1330)**	**2.12 (1.21, 3.19)**
Models		2.12 (0.572, 13.5)	1.89 (-0.774, 4.69)	2.24 (0.540, 14.6)	1.46 (-0.667, 3.68)
Synthesis		**5.47 (1.45, 50.6)**	**3.44 (1.73, 5.21)**	2.24 (0.540, 14.6)	**2.01 (0.799, 3.35)**
Models only	**Present-Future**	1.44 (0.954, 2.02)	1.55 (-0.994, 4.69)	**1.48 (1.00, 2.03)**	1.31 (-0.722, 3.83)

Table 3.2.2: As for Table 3.2.1, but for NWT region presented in Figure 3.2.2.

An overall increase of the likelihood of fire weather conditions as rare as July 2026 is seen across observations and models, for both timescales, and for both regions (Table 2.3.1, Table 2.3.2). The modelled trend is closer to emergence from natural variability in NWT – likely due to the greater rate of warming at that higher latitude. Projected emergence of the likelihood of the six-year event from natural variability were also projected by models for the DSR30x event in both regions.

Due to the limited availability of gridded datasets of sufficient time period for attribution analysis, we were only able to undertake the observed analysis using the ERA5 reanalysis product using Environment and Climate Change Canada's standard FWI calculation scheme. This was validated against another calculation of the FWI using ERA5 (via CEMS), but another good-quality reanalysis product was not available. This means that evaluation of the observed trends is not possible, beyond expert review of observed trends and comparison to the relatively abundant literature of Canadian fire weather attribution studies. Models generally showed a reduced magnitude of change compared to observations (Figure 3.21, Figure 3.2.2, Appendix A4), but there is agreement in sign, and emergence from natural variability in the magnitude of an event this rare in synthesis of models and observations of the NWT region.

3.3 Synthesis of multi-year drought results

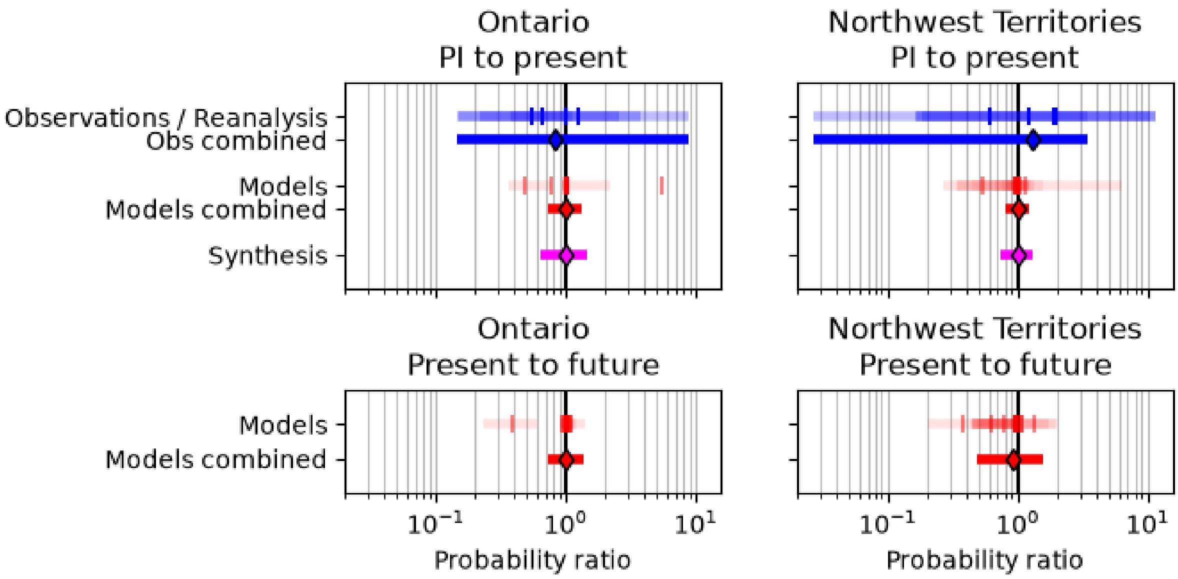

Figure 3.2.3: *As Figure 3.2.1, but for 24-month accumulated effective precipitation (X-year in Ontario and X-year in Northwest Territories)*

Applying the same attribution protocol as in Section 3.2, for the 24-year effective precipitation we see very little effect of warming in either the Ontario or NWT regions. We therefore communicate that there is a limited response of this two-year drought metric to climate change, and that this is expected to remain the case into the future. This does not necessarily apply to other drought metrics, which may be more sensitive to (for example) multiple years of low snowpack.

24 Month Effective Precipitation					
Data		**Ontario**		**NWT**	
		Probability ratio (95% CI)	**Intensity change (mm) (95% CI)**	**Probability ratio (95% CI)**	**Intensity change (mm) (95% CI)**
Observations	**Past-Present**	0.826 (0.173, 3.77)	52.2 (-257, 390)	1.29 (0.0856, 11.1)	-9.47 (-152, 150)
Models		1.00 (0.725, 1.31)	0.692 (-13.1, 16.5)	0.999 (0.812, 1.20)	-0.0388 (-9.33, 10.9)
Synthesis		0.995 (0.646, 1.47)	0.800 (-19.0, 22.9)	1.00 (0.742, 1.29)	-0.0809 (-13.4, 15.1)
Models only	**Present-Future**	0.995 (0.734, 1.36)	-0.998 (-13.5, 10.3)	0.927 (0.487, 1.57)	3.40 (-14.1, 25.8)

Table 3.2.1: Summary of results for Ontario region, for both DSR7x and DSR30x accumulations, presented in Figure 3.2.1: changes due to GMST include past-present changes and present-future changes. Statistically significant increases (decreases) in probability and intensity are highlighted in dark orange (blue), while non-significant increases are highlighted in light orange (blue). Statistically significant changes are also highlighted in ***bold*** *font.*

3.4 Conclusions hazard

Combining lines of evidence from the synthesis results of the past climate, results from future projections and physical knowledge we communicate that human-induced warming has already increased the likelihood of extreme 7-day periods of fire weather by nearly double in the Ontario region and by about five-fold in the NWT region. Longer term periods of extreme fire weather were found to have become about twice as likely in both regions than in a 1.4°C cooler climate.

Given current climate policies, in a world 2.8°C warmer than pre-industrial times, as compared to 1.4°C today, 7-day fire weather such as in this year would be another 1.8x and 1.4x more likely in the Ontario and NWT regions respectively – meaning that the NWT conditions would be expected to occur most years. 30-day periods as severe in 2026 would also be projected to increase in likelihood by 2x and 1.5x in the Ontario and NWT regions respectively.

The 24-month effective precipitation conditions were substantially rarer in the NWT region (10 years) compared to the Ontario region (4 years), and the likelihood of both events was found not to have appreciably changed due to warming.

4 Vulnerability and exposure

In this section we share a rapid assessment of vulnerability, exposure and response factors that can both increase or reduce risks and impacts from the wildfires.

4.1 Ecosystem, landscape and fuel availability

Canada's terrestrial ecology accounts for more than 300 billion tons of carbon wherein soil stores 94%, with peatland making up 32% of the soil's total carbon content (Wang et al., 2023). Since 2015, wildfires have become more frequent and have also seen a shift from western Canada to eastern Canada in Ontario, Quebec and Atlantic provinces (Fawkes, 2026). The study region in Ontario falls under parts of Lake St. Joseph Ecoregion (3S) and Lake Nipigon Ecoregion (3W). These are primarily dominated by coniferous forests, mixed forests and peatlands within the boreal forest region consisting of mixedwood(M-1/M-2), aspen (D-1/D-2) and limited boreal spruce (C-2) fuel type (Crins et al., 2009, GoC, 2026). The fire affected region in North Western Territories (NWT) and Northern Prairies is mainly dominated by mixedwood and aspen (D-1/D-2/M-1/M-2) with scattered boreal spruce (C-2) and jack pine (C-3) found in the Taiga plains and Taiga shield which is covered by 46% and 28% forested land respectively (Government of Northwestern Territories, 2022, GoC, 2026). Based on the Canadian Fire Behaviour Prediction (FBP) System, these categories of fuel type are often linked with rapid fire spread, active crown fires and high intensity wildfires, especially for conifer-dominated fuel type (Phelps and Beverly, 2022). Although these wildfires do not always display extreme fire behavior, the surge in fire load can overload response capacity (Erni et al., 2024). The coincidence of extreme fire weather conditions and lightning storms can lead to the simultaneous ignition of dozens to hundreds of fires in 1 or 2 days (ibid.). Along with other factors, Spruce budworm (insect species) defoliation can cause tree mortality, increasing fuel load ("ladder fuel") and susceptibility to wildfires. While they can influence how easily fires spark and spread, especially in favorable fire weather conditions, they vary from east to west Canada (Fewster et al., 2022).

A study done on Canadian Boreal Conifer Forests suggests that fuel reduction treatments to reduce the spread and intensity of fire are less effective when rates of spread and wind speeds are extremely high or extreme (Beverly et al., 2020). The comparatively small stature of boreal conifer trees combined with large surface fuel loads might further impede fuel treatment attempts as research indicates that the structure of the stand is more critical to fire dynamics than the species of trees within it (Phelps and Beverly, 2022; Beverly et al., 2020). Nevertheless, under the updated wildland fire management regulations, both North Western Territories and Ontario practiced preventative controlled burns, reduction of bush growth and fuel reduced corridors (Environmental Registry Ontario, 2025).

4.2 Sociodemographics

Since the wildfires were primarily in remote and ecologically dense areas, First Nation communities were disproportionately affected (Stallard et al., 2026). An analysis in 2021 found that despite being only 5% of Canada's population, Indigenous communities make up 42% of its wildfire evacuations (UNDRR, 2025). Other studies also show that a higher percentage of people living in reserves reside in areas with high fire risk (Erni, 2024). This fire specifically, has put thirteen communities in Ontario alone under evacuation orders including the Namaygoosisagagun First Nation, Lac La Croix First Nation, Collins First Nation, Whitesand First Nation and Lac des Mille Lacs First Nation (Bowden, 2026). The extent of the wildfires made evacuation particularly difficult as parts of several highways were closed causing several communities to evacuate by boat (The Canadian Press, 2026). Many residents described concern about the damage they are likely to face upon returning. Already it is becoming clear that there will be extensive damage to property with one community spokesperson describing their lands as completely leveled (Stallard et al., 2026).

This becomes an even greater concern with the added context that the long-term impacts of wildfires can be particularly damaging to Indigenous communities. Widespread fires can result in the loss of access to hunting grounds, trapping lines, and opportunities to collect wild plants and berries (Hohban et al., 2026). Moreover, due to colonial history, such as the residential school system, displacement and evacuation can be an even more intense social and psychological stressor for Indigenous populations (UNDRR, 2025). As the frequency and duration of wildfires in Canada increases as a result of climate change, time to recover between disasters shortens (Canadian Climate Institute, 2026). Ultimately, this could lead to compounding and continuing impacts on First Nations communities.

Firefighters themselves are also facing many of the same psychological and health impacts. Many wildland firefighters have expressed that the job has become increasingly more mentally and physically strenuous as fires have become larger and more complex (Cummings, 2023). Of the deaths directly linked to the fires themselves this season, all four were firefighters (Kothari, 2026; Windeyer & Tranter, 2026). Beyond the acute impacts, prolonged exposure to extreme heat, smoke, dehydration, physical excursion, and irregular sleep patterns, has been associated with cognitive decline in wildland firefighters (White, 2025). In a study on Canada's firefighters in particular, they were also found to be at increased risk of lung conditions, both acutely in the year of firefighting and in the years to follow (Cherry et al., 2024). Beyond the physical toll, wildland firefighters are also at increased risk for post-tramatic stress, anxiety, depression, and suicidal ideation. As these fire seasons become longer and more intense due to climate change, it is critical that the short and long-term impacts of the disaster on these vulnerable populations are considered and mitigated.

4.2.1 Health and air pollution

Still, the impacts of wildfires are felt far beyond the fires themselves and can have extensive transboundary impacts. As forests continued to burn, plumes of hazardous smoke traveled southward causing dangerous air quality levels in many major cities including Toronto, Boston, Chicago, and New York City (Fawkes et al., 2026). Generally, air quality ratings, a measurement of five major pollutants -- including ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide -- are considered hazardous over a rating of 300. In some places, this number rose above 1,000 (Graff & Malsky, 2026). Many towns and cities recorded their highest readings of PM 2.5 in 20 years, prompting air quality alerts in more than 20 states (Betts, 2026).

When air reaches this level of pollution, the likelihood of several adverse health impacts increases. Most immediately, people may experience stinging eyes, a scratchy throat, headache, fatigue, wheezing and coughing (Blum, 2026). From here, health impacts can become more acute with increased risk of stroke, cardiac arrest, and all-cause mortality (WHO, 2026). Specifically, studies have found that exposure to heavy smoke during wildfires raised the risk of out-of-hospital cardiac arrests up to 70% (Jones et al., 2020). Moreover, increased mortality rates can continue even after the smoke clears. A study of a similar wildfire event estimated that 5,400 acute deaths and 64,300 chronic deaths in North America and Europe were attributable to PM2.5 exposure to the 2023 Canadian wildfires (Zhang et al., 2025).

These effects are even more pronounced among populations with pre-existing vulnerabilities. Those with underlying health conditions, including asthma, heart, and lung disease are at particularly high risk for adverse health outcomes due to exposure to poor air quality (Blum, 2026). Certain demographic groups are also at elevated risk including children, pregnant women, and communities with lower socioeconomic status. The same study that quantified increased cardiac arrests, found that the effect was more pronounced for those living below the poverty line (Jones et al., 2020).

Concurrent and compounding extreme weather events can drastically increase morbidity and mortality, as well as strain health systems (Matthews et al. 2025; Marlier et al. 2026). This wildfire event coincided with a heat wave both in Canada (Rich, 2026) and the United States (Milman, 2026), generating co-exposure to poor air quality and extreme heat, potentially amplifying adverse health effects. Unfortunately, the co-occurrence of these events is becoming increasingly more common, with the highest co-exposure burden falling on rural communities with lower adaptive capacity (Cleland et al., 2025). Those who cannot afford or do not have access to air conditioning are highly vulnerable, often forced to choose between exposure to dangerous temperatures or hazardous air quality. Risk communication and public health messaging can also be complicated during concurrent hazards, for example opening windows during a heatwave, which may be unsafe during wildfires (Government of United Kingdom, 2025).

4.3 Wildland-built environment interface

Over twenty percent of Canada's landmass falls within the Wildland Urban Interface (WUI), with Ontario having one of the four largest interface areas (Johnston et al, 2026). In 2020 it was reported that thirteen percent of the Canadian population live in the wildland–urban interface (WUI), this included 32% of on-reserve First Nations population (Erni et al, 2020). Overall, compared to just 2.4% of the non-reserve population in Canada, 18.9% of residents of Indigenous reservations live in regions that are more vulnerable to wildfire. Additionally, with 3.2% (1275 individuals), NWT has the highest proportion of its population living in areas with a very high fire danger (Erni et al., 2024).

Land use and land cover (LULC) change assessed from 2010-2015 in Canada shows that 65% of forested area under the southern territorial border of Yukon, Northwest Territories and Nunavut was converted to cropland and nearly 35% of cropland and forests was turned into built-up/ settlements adversely impacting local environment (Environment and Climate Change Canada, 2021). Ontario, Quebec and the Prairies lost the most forest cover (<1,000 km²), these regions also had the highest conversion to settlement given the added pressure to convert natural areas to cropland to increase agricultural capacity when cropland is lost to urban growth (ibid.).

These drivers aid in increasing Canada's WUI, exposing communities and infrastructure to wildfire. A study reveals that 27.3% (11,533 units) and 55% (492,289 units) buildings are directly exposed to wildfires in NWT and Ontario respectively (Erni et al., 2024). Natural fuel load and built fuels, if combined, can create a complex dynamic affecting ignition and fire spread (Government of Northwest Territories, n.d.). The extent of infrastructure destruction estimates the direct costs of reconstruction, indirect expenses of evacuation, and shelter requirements (Abo El Ezz et al., 2022). In the last ten years, nearly 2,400 structures were destroyed due to WUI fires in Canada resulting in billions of dollars in economic losses (Lu et al., 2026).

As of 1 April 2026, property owners, particularly in northern Ontario and Mattawa, were mandated to reduce fuel load close to dwellings (with guidelines for reduction up to 30m from dwellings) including the thinning of shrubs, reduction of forest mass and creation of fire breaks on larger properties (Browning, 2026). Structures with wood-clad decks, single-pane windows, unscreened vents, and combustible roofing are particularly vulnerable because radiant heat, direct flame, and embers can ignite such spaces. Therefore, controlling potential risks in each of the three Home Ignition Zones (areas within 30 m) and removing any sites where embers could ignite structures can reduce exposure. (FireSmart, n.d.). Additionally, fuel breaks, terrain, water supply, road allowances, and fencing are among a few engineering considerations for fire suppression and prevention (FireSmart, 2025; Ontario Ministry of Natural Resources and Forestry, 2017).

4.4 Wildfire risk management

4.4.1 Governance

The framework for managing wildfire risk in Canada is complex and involves coordination across multiple agencies and shared responsibilities at the federal, provincial/territorial, and local levels, including Indigenous self-governed land (Tymstra et al. 2020). Primary responsibility for wildfire management rests with the provinces and territories on most lands, with federal agencies providing supporting, monitoring, and coordinating functions. Key national agencies include Parks Canada, Public Safety Canada, which provides whole-of-government support via the Government Operations Centre, and Natural Resources Canada, which includes the Canadian Forest Service. The Canadian Wildland Fire Information System (within Natural Resources Canada) monitors fire danger conditions and fire occurrences nationwide, producing current and forecast fire weather and fire behaviour maps using weather data from across Canada (Government of Canada, 2026). CWFIS also uses satellites and reported fire locations collected from fire management agencies to detect wildland fires. The Canadian Interagency Forest Fire Centre (CIFFC) supports federal fire management by operating as a non-profit hub owned collectively by federal, provincial, and territorial governments to coordinate mutual aid, equipment, and firefighting personnel sharing across jurisdictions and international borders (CIFFC, 2026). On First Nations land, fire management is led by First Nations governments, with support from provincial/territory agencies, and Indigenous Services Canada, which provides annual funding for fire protection services and fire insurance (Government of Canada, 2026). Additionally, Indigenous fire stewardship is practiced, which promotes the use of cultural burning practices by Indigenous peoples (Government of Canada, 2026).

At the provincial and territorial level, the Ministry of Natural Resources manages wildland fires in Ontario, guided by Wildland Fire Management Strategy (Government of Ontario, 2019). In the NWT, wildfire monitoring, management, and suppression are led by the Government of the Northwest Territories' Department of Environment and Climate Change (ECC) through its Forest Management Division (Government of the Northwest Territories, 2026). At the local level, municipalities carry responsibility for structural and wildland fire suppression within their limits. In Ontario, for example, municipalities are responsible for suppressing grass, brush, and wildland fires within their boundaries, though the Ministry is able to enter cost-sharing fire agreements in the provincial fire region (Government of Ontario, 2026).

The CIFFC acts as the main coordination hub among the multiple agencies responsible for fire management in Canada, facilitating multi-level cooperation, including resource sharing (e.g., personnel and equipment), sharing data (e.g., risk mapping), managing cross-border agreements, and supporting community-level risk prevention measures, such as FireSmart Canada. Governance challenges for this specific event have yet to be documented in the evidence base, however several barriers have been highlighted from previous fires, including inadequate funding and limited human resources (Tymstra et al. 2020). A further challenge is the fragmentation of responsibility across parallel provincial, federal, Indigenous, and municipal systems, and the division between structural and wildland firefighting at the Wildland-Urban Interface (WUI). Additionally, the speed and effectiveness of coordination across agencies remains a constraint, especially when rapid scale up is needed during major wildfires (Baird et al. 2023). Projected impacts of climate change are also a major threat, including longer wildfire seasons as well as increasing occurrence, fire intensity and area burned, raising the cost of implementing effective suppression practices (Tymstra et al. 2020).

4.4.2. Prevention (Early warning systems, detection, communication, and preparedness)

Evidence from news articles indicates that internal detection of the fires occurred before public or community warnings were issued, pointing to a possible breakdown between detection and communication (Ramzy, 2026; Hale, 2026; Bertrand, 2026). According to news reports, at Byers Lake, a resort owner reported smoke to authorities on June 30 but was told the fire was "being monitored" and posed no danger; an evacuation was only ordered on July 13, once flames were visible, and residents were alarmed (Ramzy, 2026). In another review report, Whitewater Lake First Nation reportedly identified the fire threatening their community roughly a week before receiving a last-minute evacuation call on July 15 (Hale, 2026), and Whitesand First Nation was told by Ministry of Natural Resources helicopter crews that there was "no fire" on July 13 despite heavy visible smoke, leading community leaders to arrange their own transport and self-evacuate hours ahead of the eventual 9:30 p.m. order (Bertrand, 2026). In the most severe case, Namaygoosisagagun (Collins) First Nation received no warning at all before the fire reached the community that same day, forcing residents to flee by boat as the fire approached (Hale, 2026; Bertrand, 2026).

This pattern reflects deeper structural gaps in who could access fire information and act on it. The Ministry of Natural Resources holds centralized responsibility for fire monitoring and the authority to issue evacuation orders, but real-time information and decision-making power were not consistently extended to the communities most at risk, particularly Indigenous communities (Hale, 2026; Bertrand, 2026). As the Whitesand and Byers Lake cases above illustrate, frontline observers routinely had more accurate, real-time knowledge of fire location and speed than the officials responsible for issuing warnings, creating a lag between what was known on the ground and what was officially acted upon (Ramzy, 2026; Bertrand, 2026). This points to gaps in the escalation pathway from local reporting to official warning, in coordination between the Ministry of Natural Resources and Indigenous leadership, and in the speed at which monitoring data was translated into public alerts. A provincial spokesperson acknowledged the response was occurring amid a "fluid and pressing emergency", citing ongoing coordination with federal and First Nations partners (Hale, 2026), though affected communities characterized the resulting communication and evacuation support as severely inadequate (Ramzy, 2026).

These access gaps directly shaped how communities perceived and responded to risk. In cases where residents could see or sense danger directly through smoke or flames, that perception drove them to act ahead of official assessments. Whitesand's self-evacuation, for example, began nearly five hours before the formal evacuation order, and Byers Lake residents evacuated only once flames were visible, overriding two weeks of official reassurance that the fire was under control (Ramzy, 2026). By contrast, in communities where no early information arrived at all, residents had no basis to act until disaster was already underway, as in Collins. Whitewater Lake's Chief Drake pointed to the cost of this gap directly, saying advance knowledge of the fire's severity would have let her community "salvage something" (Bertrand, 2026). Taken together, these cases suggest that self-generated risk perception reliably triggered protective action, while delayed or absent official communication narrowed the window communities had to cope with the threat.

4.4.3 Policies, legislation and plans

In 2025 Ontario updated its previous framework legislation, namely the Forest Fires Prevention Act of 1990, renaming it the Wildland Fire Management Act, whose regulatory changes took full effect by April 2026 (Environmental Registry Ontario, 2025). The amendments expanded prevention and mitigation measures, strengthened enforcement powers, and increased responsibilities of municipalities, business, and industry. Separately, Natural Resources Canada announced a total investment of $1.25 million to strengthen wildfire preparedness and response through risk mapping, emergency planning, evacuation coordination and the inclusion of local Indigenous knowledge into wildfire management (Govt of Canada, 2026).

In the NWT, a separate operational initiative took place. In May 2026, the Government of the Northwest Territories and the NWT Fire Chiefs Association launched a territory-wide WUI program that integrated structural and wildland firefighting, directly addressing coordination gaps identified during the 2023 wildfire season. This operational guidance established incident command structure, training guidelines, mutual-aid deployment and reimbursement procedures, and integrated resource management (Blake, 2026).

The strengthened frameworks, policies and operational mandates built on historical lessons from previous wildfires, particularly the 2023 and 2025 seasons (Canadian Climate Institute, 2026). Emergency fire management remains primarily a territorial/provincial responsibility supported by federal and national coordination. Strategic and operational plans complement legislation at each level. Nationally, the Canadian Council of Forest Ministers (CCFM), an intergovernmental body that brings together the federal, provincial, and territorial ministers responsible for forests and which was established to coordinate on shared forestry issues, developed the Canadian Wildland Fire Prevention and Mitigation Strategy (2024) to provide prevention and mitigation guidelines, which CIFFC is translating into an implementation action plan Canadian Council of Forest Ministers 2024; FireSmart Canada, 2026). This strategy provides proactive, integrated hazard management and interagency mobilisation, co-ordinated through the Canadian Interagency Forest Fire Centre.

Locally, Ontario's wildfire operations follow its Wildland Fire Management Strategy (Government of Ontario, 2019), and the amended Act requires specified entities to maintain and annually review a wildland fire management plan. In the NWT, the WUI program operates, instead, under Mutual Aid Guidelines that are reviewed annually and revised when necessary, and which define structure protection responsibilities and cross-agency deployment (Government of the Northwest Territories, 2026).

While both NWT and Ontario utilise the National Air Quality Management System, both jurisdictions also communicate particulate matter (amongst other) levels and risk with residents through the air quality health index. Mitigation measures in Ontario include regulations governing industry emissions, a complete ban of coal-fired energy generation and real-time ambient air tracking through over 30 monitoring stations (Ministry of environment, conservation and parks, 2026).

4.4.4 Response - protection, containment, and extinguishment

Numerous fires are still active across the Northwestern Territories and Ontario according to the Canadian Wildland Fire Information System, which has continued to identify widespread fire activity threatening communities and infrastructure in the region (Government of Canada, 2026). As of July 27, 2026, there are four priority fires in Ontario and is at Agency Preparedness Level 4 matching the national Preparedness Level, indicating wildland fire behaviour is significant within one more jurisdictions and the demand for resources is high through the Canadian Interagency Forest Fire Centre (CIFFC), and the potential for emerging significant wildland fires is such that resource demands are expected to continue or increase (CIFFC, 2026). It should be reinforced that the current total burned area represents an ongoing emergency rather than a completed event.

The operational and mobilization implications have been substantial. The federal government reported that more than 40 evacuation aircraft and more than 80 firefighting aircraft and helicopters had been deployed in northwestern Ontario, including water bombers, helicopters, reconnaissance aircraft and personnel transport aircraft (Government of Canada, 2026).Data gaps exist given this event is active.

The United States is currently (as of 27 July 2026) at preparedness level 5, which indicates shared resources are heavily committed, there is a heavy demand for available resources, and full commitment of resources is ongoing (Government of Canada, 2026). There is indication that coordination between the two countries will continue in response to the current wildfires (U.S. Mission to Canada, 2026). Since 1982, the U.S. and Canada have maintained an arrangement between the National Interagency Coordination Center (NICC) in the U.S. and the Canadian Interagency Forest Fire Centre (CIFFC) in Canada to ensure efficient resource sharing during peak fire activity. In 2023 a Memorandum of Understanding between Canada and the United States was renewed to enhance wildland fire cooperation across borders, including more efficient exchange of wildfire suppression resources and expanded information-sharing on fire management (U.S. Department of the Interior, 2023).

5 Conclusions

The three Canadian fire seasons of 2023-2025 saw record shattering exceedance of previous burned area records (CWFIS, 2026), and emissions greater than the previous 15 years combined (Jones et al., 2026). This year also saw record breaking burned area in northwestern Ontario, and burned area comparable to 2023, the highest burned area year on record, for the Northwest Territories study region. In addition to far reaching implications for the global carbon cycle, this has led to major health impacts – which are especially acute amongst firefighters and Indigenous communities.

Here we found that the fire weather conditions driving these fires have increased substantially in response to human caused climate change. This trend was more significant for the most severe 7-day fire weather period (DSR7x), which relates more to the rapid development of very large fires – seen in mid July (the Ontario region) and late June (the NWT region). Drought may have been a factor for the severe fire activity in NWT, but has not markedly shifted in response to human-caused climate change. DSR30x, of relevance to the sustained fire development seen in NWT, was a 6-year event and has approximately doubled in likelihood in both regions. The 30-day event is also projected to emerge from natural variability according to the synthesis of future climate model projections.

Data availability

All time series used in the attribution analysis are available via the Climate Explorer.

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This work used Imperial College Research Computing Service, DOI: 10.14469/hpc/2232.

This work used the KNMI Climate explorer web tool (https://climexp.knmi.nl/start.cgi).

References

All references are given as hyperlinks in the text.

Appendices

A1 Data and methods

A1.1 Observational data

We first use observational and reanalysis data to estimate the return period of a similar event in the present day and to assess the historical trends with increasing GMST. The datasets used are as follows:

Fire M3 - This product from Natural Resource Canada's Canadian Wildland Fire Information System estimates area burned and fire progression within Canada on a three-hourly timestep. The system uses remotely sensed hotspot observations from NASA LANCE, FIRMS, MODIS and VIIRS imagery and EUMETSAT Copernicus SLSTR imagery.

ERA5 - The European Centre for Medium-Range Weather Forecasts's 5th generation reanalysis product, ERA5, is a gridded dataset that combines historical observations into global estimates using advanced modelling and data assimilation systems (Hersbach et al., 2020). We use VARIABLE data from this product at a resolution of 0.5°×0.5° / 0.25°×0.25°, from the years 1950 to present.

ERA5-Land - This product is a replay of the land component of the ERA5 climate reanalysis (Muñoz-Sabater et al., 2021) produced by the European Centre for Medium-Range Weather Forecasts, with a finer spatial resolution of 0.1° (~9km grid spacing), at hourly time steps from 1950 to 5 days before the current date. The land model used is the tiled ECMWF Scheme for Surface Exchanges over Land incorporating land surface hydrology (H-TESSEL). We use VARIABLE data from this product at a resolution of 0.5°×0.5° / 0.25°×0.25°, from the years 1950 to present.

CPC - This is the gridded product from NOAA PSL, Boulder, Colorado, USA known as the CPC Global Unified Daily Gridded data, available at 0.5° x 0.5° resolution, for the period 1979-present. We use daily VARIABLE. Data are available from NOAA.

Covariates

As a measure of anthropogenic climate change we use the (low-pass filtered) global mean surface temperature (GMST), where GMST is taken from the National Aeronautics and Space Administration (NASA) Goddard Institute for Space Science (GISS) surface temperature analysis (GISTEMP, Hansen et al., 2010 and Lenssen et al. 2019). To remove the effect of the El Niño - Southern Oscillation on global mean temperatures, we use a four-year running mean of the GMST, centred on the third year.

A1.2 Model and experiment descriptions

For fire weather analysis, we used 131 members of 12 GCMs from CMIP6. For multi-year drought analysis, we used 19 members from 16 GCMs from CMIP6. For more details on CMIP6, see Eyring et al., (2016). For all simulations, the period 1850 to 2014 is based on historical simulations, while the SSP5-8.5 scenario is used for the remainder of the 21st century.

A1.3 Statistical methods

Methods for observational and model analysis and for model evaluation and synthesis are used according to the World Weather Attribution Protocol, described in Philip et al., (2020), with supporting details found in van Oldenborgh et al., (2021), Ciavarella et al., (2021), Otto et al., (2024) and here. The key steps, presented in sections 3-6, are: (3) trend estimation from observations; (4) model validation; (5) multi-model attribution; and (6) synthesis of the attribution statement.

In this report we analyse time series of the 7-day and 30-day annual maximum rolling mean of DSR, and 24-month accumulated effective precipitation (ending in July) eff-pr-24.

A nonstationary GEV distribution is used to model DSR7x and DSR30x. The distribution is assumed to scale exponentially with the covariates, with the dispersion (the ratio between the standard deviation and the mean) remaining constant over time; while for 24-month effective precipitation, a normal distribution is assumed to shift linearly with the covariates, while the variance remains constant. The parameters of the statistical model are estimated using maximum likelihood.

For each time series we calculate the return period and intensity of the event under study for the 2026 GMST and for 1.4°C cooler GMST: this allows us to compare the climate of now and of the preindustrial past without human-caused warming (based on Forster et al., 2026), by calculating the probability ratio (PR; the factor-change in the event's probability) and change in intensity of the event.

A2 Model evaluation tables

Table A2.1 Evaluation results of the climate models considered for attribution analysis of DSR7x (Ontario Region). For each model, the best estimates of the Dispersion and Shape parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	*Threshold for return period 15 yr*	*Dispersion Parameter*	*Shape Parameter*	*Seasonal Cycle*	*Spatial Pattern*	*Conclusion*
ACCESS-CM2 (r1i1p1f1)	*0.391*	*0.391 (0.291, 0.459)*	*0.0313 (-0.196, 0.3)*	*good*	*good*	*good*
ACCESS-CM2 (r2i1p1f1)	*0.465*	*0.465 (0.374, 0.515)*	*0.0904 (-0.345, 0.496)*	*good*	*good*	*good*
ACCESS-CM2 (r3i1p1f1)	*0.319*	*0.319 (0.235, 0.402)*	*0.21 (-0.416, 0.557)*	*good*	*good*	*reasonable*
ACCESS-ESM1-5 (r10i1p1f1)	*0.746*	*0.746 (0.577, 0.871)*	*0.193 (-0.122, 0.493)*	*reasonable*	*good*	*bad*

ACCESS-ESM1-5 (r11i1p1f1)	0.591	0.591 (0.446, 0.694)	**0.161 (-0.0872, 0.381)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r19i1p1f1)	0.693	0.693 (0.539, 0.811)	**0.133 (-0.188, 0.412)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r1i1p1f1)	0.543	**0.543 (0.417, 0.628)**	**0.198 (-0.0479, 0.479)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r2i1p1f1)	0.661	0.661 (0.526, 0.74)	**0.0163 (-0.404, 0.554)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r3i1p1f1)	0.697	0.697 (0.543, 0.806)	**-0.0413 (-0.376, 0.358)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r4i1p1f1)	0.535	**0.535 (0.41, 0.62)**	**0.0182 (-0.322, 0.359)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r5i1p1f1)	0.673	0.673 (0.538, 0.754)	**0.2 (-0.0759, 0.572)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r6i1p1f1)	0.778	0.778 (0.615, 0.911)	**0.232 (-0.0649, 0.508)**	reasonable	**good**	bad
ACCESS-ESM1-5 (r7i1p1f1)	0.574	**0.574 (0.427, 0.677)**	**0.0399 (-0.233, 0.43)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r8i1p1f1)	0.612	0.612 (0.48, 0.688)	**0.144 (-0.198, 0.576)**	reasonable	**good**	reasonable
ACCESS-ESM1-5 (r9i1p1f1)	0.769	0.769 (0.618, 0.884)	**0.243 (-0.204, 0.705)**	reasonable	**good**	bad
CanESM5 (r10i1p1f1)	0.373	**0.373 (0.29, 0.434)**	**0.0671 (-0.293, 0.292)**	**good**	**good**	**good**
CanESM5 (r10i1p2f1)	0.394	**0.394 (0.311, 0.454)**	**0.0236 (-0.235, 0.274)**	**good**	**good**	**good**
CanESM5 (r11i1p1f1)	0.356	0.356 (0.261, 0.406)	**0.213 (-0.0462, 0.704)**	**good**	**good**	reasonable
CanESM5 (r11i1p2f1)	0.351	0.351 (0.27, 0.407)	**0.172 (-0.187, 0.495)**	**good**	**good**	reasonable
CanESM5 (r12i1p1f1)	0.361	0.361 (0.267, 0.418)	**0.179 (-0.14, 0.502)**	**good**	**good**	reasonable
CanESM5 (r12i1p2f1)	0.421	**0.421 (0.329, 0.485)**	**0.205 (-0.0578, 0.422)**	**good**	**good**	**good**
CanESM5 (r13i1p1f1)	0.345	0.345 (0.258, 0.401)	**-0.0343 (-0.211, 0.199)**	**good**	**good**	reasonable
CanESM5 (r13i1p2f1)	0.424	**0.424 (0.332, 0.474)**	**-0.0528 (-0.465, 0.517)**	**good**	**good**	**good**
CanESM5 (r14i1p1f1)	0.368	**0.368 (0.286, 0.425)**	**0.111 (-0.195, 0.392)**	**good**	**good**	**good**
CanESM5 (r14i1p2f1)	0.375	**0.375 (0.277, 0.444)**	**0.0542 (-0.285, 0.327)**	**good**	**good**	**good**

CanESM5 (r15i1p1f1)	*0.375*	***0.375 (0.284, 0.441)***	*-0.085 (-0.474, 0.116)*	***good***	***good***	*bad*
CanESM5 (r15i1p2f1)	*0.347*	*0.347 (0.266, 0.403)*	***0.0471 (-0.308, 0.474)***	***good***	***good***	*reasonable*
CanESM5 (r16i1p1f1)	*0.362*	*0.362 (0.274, 0.415)*	***-0.0215 (-0.283, 0.172)***	***good***	***good***	*reasonable*
CanESM5 (r16i1p2f1)	*0.287*	*0.287 (0.223, 0.336)*	***0.0928 (-0.184, 0.301)***	***good***	***good***	*bad*
CanESM5 (r17i1p1f1)	*0.423*	***0.423 (0.321, 0.489)***	***-0.0687 (-0.433, 0.132)***	***good***	***good***	***good***
CanESM5 (r17i1p2f1)	*0.39*	***0.39 (0.298, 0.457)***	***0.232 (-0.139, 0.591)***	***good***	***good***	***good***
CanESM5 (r18i1p1f1)	*0.406*	***0.406 (0.318, 0.481)***	***0.0687 (-0.199, 0.258)***	***good***	***good***	***good***
CanESM5 (r18i1p2f1)	*0.369*	***0.369 (0.271, 0.449)***	***0.067 (-0.338, 0.313)***	***good***	***good***	***good***
CanESM5 (r19i1p1f1)	*0.456*	***0.456 (0.329, 0.533)***	*-0.116 (-0.512, 0.347)*	***good***	***good***	*bad*
CanESM5 (r19i1p2f1)	*0.433*	***0.433 (0.335, 0.492)***	***0.206 (-0.0397, 0.601)***	***good***	***good***	***good***
CanESM5 (r1i1p1f1)	*0.32*	*0.32 (0.221, 0.379)*	***0.217 (-0.0344, 0.548)***	***good***	***good***	*reasonable*
CanESM5 (r1i1p2f1)	*0.363*	*0.363 (0.252, 0.42)*	***0.324 (0.0222, 0.894)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p1f1)	*0.349*	*0.349 (0.267, 0.412)*	*-0.201 (-0.607, 0.0518)*	***good***	***good***	*bad*
CanESM5 (r20i1p2f1)	*0.399*	***0.399 (0.273, 0.485)***	***0.00205 (-0.201, 0.319)***	***good***	***good***	***good***
CanESM5 (r21i1p1f1)	*0.384*	***0.384 (0.301, 0.439)***	***0.0505 (-0.332, 0.374)***	***good***	***good***	***good***
CanESM5 (r21i1p2f1)	*0.394*	***0.394 (0.289, 0.459)***	***0.0247 (-0.382, 0.366)***	***good***	***good***	***good***
CanESM5 (r22i1p1f1)	*0.363*	*0.363 (0.276, 0.424)*	***0.146 (-0.121, 0.387)***	***good***	***good***	*reasonable*
CanESM5 (r22i1p2f1)	*0.375*	***0.375 (0.283, 0.435)***	***0.255 (-0.0299, 0.577)***	***good***	***good***	***good***
CanESM5 (r23i1p1f1)	*0.333*	*0.333 (0.241, 0.388)*	***0.155 (-0.256, 0.428)***	***good***	***good***	*reasonable*
CanESM5 (r23i1p2f1)	*0.467*	***0.467 (0.357, 0.552)***	*-0.08 (-0.279, 0.0939)*	***good***	***good***	*bad*
CanESM5 (r24i1p1f1)	*0.41*	***0.41 (0.313, 0.474)***	***0.35 (-0.0325, 0.748)***	***good***	***good***	***good***

CanESM5 (r24i1p2f1)	*0.352*	*0.352 (0.28, 0.403)*	***0.0693 (-0.223, 0.301)***	***good***	***good***	*reasonable*
CanESM5 (r25i1p1f1)	*0.393*	***0.393 (0.282, 0.472)***	***-0.0781 (-0.298, 0.232)***	***good***	***good***	***good***
CanESM5 (r25i1p2f1)	*0.453*	***0.453 (0.325, 0.541)***	***0.15 (-0.0945, 0.508)***	***good***	***good***	***good***
CanESM5 (r2i1p1f1)	*0.391*	***0.391 (0.268, 0.462)***	***0.24 (-0.37, 0.874)***	***good***	***good***	***good***
CanESM5 (r2i1p2f1)	*0.344*	*0.344 (0.268, 0.394)*	***-0.0772 (-0.488, 0.361)***	***good***	***good***	*reasonable*
CanESM5 (r3i1p1f1)	*0.35*	*0.35 (0.263, 0.401)*	***0.126 (-0.183, 0.437)***	***good***	***good***	*reasonable*
CanESM5 (r3i1p2f1)	*0.392*	***0.392 (0.292, 0.457)***	***0.0547 (-0.404, 0.424)***	***good***	***good***	***good***
CanESM5 (r4i1p1f1)	*0.374*	***0.374 (0.283, 0.432)***	***-0.0737 (-0.341, 0.276)***	***good***	***good***	***good***
CanESM5 (r4i1p2f1)	*0.39*	***0.39 (0.303, 0.449)***	***0.122 (-0.149, 0.364)***	***good***	***good***	***good***
CanESM5 (r5i1p1f1)	*0.303*	*0.303 (0.229, 0.35)*	***0.129 (-0.178, 0.381)***	***good***	***good***	*bad*
CanESM5 (r5i1p2f1)	*0.333*	*0.333 (0.255, 0.385)*	***0.018 (-0.208, 0.273)***	***good***	***good***	*reasonable*
CanESM5 (r6i1p1f1)	*0.452*	***0.452 (0.332, 0.532)***	***-0.0365 (-0.369, 0.245)***	***good***	***good***	***good***
CanESM5 (r6i1p2f1)	*0.43*	***0.43 (0.326, 0.509)***	***0.122 (-0.135, 0.458)***	***good***	***good***	***good***
CanESM5 (r7i1p1f1)	*0.396*	***0.396 (0.3, 0.463)***	***0.103 (-0.0962, 0.313)***	***good***	***good***	***good***
CanESM5 (r7i1p2f1)	*0.424*	***0.424 (0.318, 0.49)***	***0.264 (-0.149, 0.59)***	***good***	***good***	***good***
CanESM5 (r8i1p1f1)	*0.37*	***0.37 (0.281, 0.428)***	***0.123 (-0.212, 0.395)***	***good***	***good***	***good***
CanESM5 (r8i1p2f1)	*0.335*	*0.335 (0.223, 0.422)*	***0.277 (-0.223, 0.954)***	***good***	***good***	*reasonable*
CanESM5 (r9i1p1f1)	*0.396*	***0.396 (0.296, 0.457)***	***-0.0751 (-0.451, 0.431)***	***good***	***good***	***good***
CanESM5 (r9i1p2f1)	*0.425*	***0.425 (0.336, 0.511)***	***0.13 (-0.414, 0.471)***	***good***	***good***	***good***
EC-Earth3 (r1i1p1f1)	*0.469*	***0.469 (0.362, 0.534)***	***0.213 (-0.146, 0.494)***	***good***	***good***	***good***
GFDL-ESM4 (r1i1p1f1)	*0.55*	***0.55 (0.438, 0.627)***	***0.141 (-0.17, 0.405)***	*bad*	***good***	*bad*

HadGEM3-GC31-LL (r1i1p1f3)	*0.461*	***0.461 (0.371, 0.525)***	***-0.0546 (-0.49, 0.193)***	*reasonable*	***good***	*reasonable*
INM-CM4-8 (r1i1p1f1)	*0.58*	*0.58 (0.449, 0.664)*	***0.182 (-0.141, 0.416)***	*reasonable*	***good***	*reasonable*
IPSL-CM6A-LR (r10i1p1f1)	*0.346*	*0.346 (0.262, 0.409)*	***-0.0384 (-0.286, 0.176)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r11i1p1f1)	*0.386*	***0.386 (0.303, 0.445)***	***-0.0544 (-0.351, 0.236)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r14i1p1f1)	*0.408*	***0.408 (0.327, 0.465)***	***0.19 (-0.132, 0.459)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r1i1p1f1)	*0.366*	*0.366 (0.272, 0.444)*	***0.0169 (-0.514, 0.342)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r22i1p1f1)	*0.346*	*0.346 (0.265, 0.404)*	***0.237 (-0.0526, 0.507)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r25i1p1f1)	*0.334*	*0.334 (0.264, 0.377)*	***0.0538 (-0.189, 0.358)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	*0.353*	*0.353 (0.272, 0.401)*	***0.116 (-0.235, 0.658)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r3i1p1f1)	*0.33*	*0.33 (0.23, 0.409)*	***-0.00871 (-0.653, 0.426)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r4i1p1f1)	*0.407*	***0.407 (0.292, 0.468)***	***0.088 (-0.2, 0.537)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r5i1p1f1)	*0.443*	***0.443 (0.332, 0.502)***	***-0.0195 (-0.445, 0.463)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r6i1p1f1)	*0.332*	*0.332 (0.24, 0.388)*	***0.107 (-0.145, 0.408)***	***good***	*reasonable*	*reasonable*
MIROC6 (r10i1p1f1)	*0.361*	*0.361 (0.249, 0.436)*	***0.0507 (-0.175, 0.253)***	***good***	***good***	*reasonable*
MIROC6 (r11i1p1f1)	*0.348*	*0.348 (0.258, 0.409)*	*-0.321 (-0.732, 0.0404)*	***good***	***good***	*bad*
MIROC6 (r12i1p1f1)	*0.381*	***0.381 (0.31, 0.436)***	*-0.126 (-0.48, 0.165)*	***good***	***good***	*bad*
MIROC6 (r13i1p1f1)	*0.385*	***0.385 (0.309, 0.436)***	*-0.189 (-0.612, 0.281)*	***good***	***good***	*bad*
MIROC6 (r14i1p1f1)	*0.307*	*0.307 (0.21, 0.375)*	***-0.00141 (-0.336, 0.292)***	***good***	***good***	*reasonable*
MIROC6 (r15i1p1f1)	*0.326*	*0.326 (0.255, 0.378)*	***0.0237 (-0.337, 0.23)***	***good***	***good***	*reasonable*
MIROC6 (r16i1p1f1)	*0.325*	*0.325 (0.247, 0.381)*	*-0.169 (-0.409, 0.0336)*	***good***	***good***	*bad*
MIROC6 (r17i1p1f1)	*0.313*	*0.313 (0.215, 0.373)*	***0.184 (-0.122, 0.533)***	***good***	***good***	*reasonable*

MIROC6 (r18i1p1f1)	*0.343*	*0.343 (0.22, 0.422)*	*-0.132 (-0.365, 0.299)*	***good***	***good***	*bad*
MIROC6 (r19i1p1f1)	*0.365*	*0.365 (0.27, 0.421)*	***0.0419 (-0.222, 0.337)***	***good***	***good***	*reasonable*
MIROC6 (r1i1p1f1)	*0.284*	*0.284 (0.193, 0.346)*	***0.0376 (-0.375, 0.43)***	***good***	***good***	*bad*
MIROC6 (r20i1p1f1)	*0.404*	***0.404 (0.315, 0.465)***	*-0.19 (-0.621, 0.0942)*	***good***	***good***	*bad*
MIROC6 (r21i1p1f1)	*0.385*	***0.385 (0.299, 0.444)***	***-0.0407 (-0.404, 0.181)***	***good***	***good***	***good***
MIROC6 (r22i1p1f1)	*0.305*	*0.305 (0.219, 0.371)*	***-0.0627 (-0.346, 0.248)***	***good***	***good***	*reasonable*
MIROC6 (r23i1p1f1)	*0.308*	*0.308 (0.245, 0.346)*	***-0.026 (-0.416, 0.236)***	***good***	***good***	*bad*
MIROC6 (r24i1p1f1)	*0.335*	*0.335 (0.237, 0.398)*	***0.0895 (-0.101, 0.374)***	***good***	***good***	*reasonable*
MIROC6 (r25i1p1f1)	*0.318*	*0.318 (0.237, 0.372)*	***0.205 (-0.18, 0.715)***	***good***	***good***	*reasonable*
MIROC6 (r26i1p1f1)	*0.337*	*0.337 (0.254, 0.394)*	***0.022 (-0.305, 0.275)***	***good***	***good***	*reasonable*
MIROC6 (r27i1p1f1)	*0.375*	***0.375 (0.244, 0.46)***	***-0.0392 (-0.223, 0.273)***	***good***	***good***	***good***
MIROC6 (r28i1p1f1)	*0.352*	*0.352 (0.276, 0.412)*	***-0.0659 (-0.431, 0.209)***	***good***	***good***	*reasonable*
MIROC6 (r29i1p1f1)	*0.372*	***0.372 (0.277, 0.433)***	***0.0535 (-0.196, 0.365)***	***good***	***good***	***good***
MIROC6 (r2i1p1f1)	*0.37*	***0.37 (0.275, 0.428)***	***-0.00103 (-0.22, 0.332)***	***good***	***good***	***good***
MIROC6 (r30i1p1f1)	*0.257*	*0.257 (0.18, 0.305)*	***0.145 (-0.0561, 0.535)***	***good***	***good***	*bad*
MIROC6 (r31i1p1f1)	*0.337*	*0.337 (0.249, 0.403)*	***-0.00164 (-0.41, 0.332)***	***good***	***good***	*reasonable*
MIROC6 (r32i1p1f1)	*0.37*	***0.37 (0.272, 0.437)***	*-0.079 (-0.296, 0.179)*	***good***	***good***	*bad*
MIROC6 (r33i1p1f1)	*0.349*	*0.349 (0.262, 0.405)*	***0.227 (-0.0659, 0.626)***	***good***	***good***	*reasonable*
MIROC6 (r34i1p1f1)	*0.337*	*0.337 (0.258, 0.391)*	***0.0929 (-0.202, 0.371)***	***good***	***good***	*reasonable*
MIROC6 (r35i1p1f1)	*0.293*	*0.293 (0.22, 0.345)*	***0.196 (-0.0875, 0.497)***	***good***	***good***	*bad*
MIROC6 (r36i1p1f1)	*0.318*	*0.318 (0.243, 0.379)*	*-0.171 (-0.647, 0.161)*	***good***	***good***	*bad*

MIROC6 (r37i1p1f1)	*0.331*	*0.331 (0.248, 0.391)*	***-0.0593 (-0.261, 0.103)***	***good***	***good***	*reasonable*
MIROC6 (r38i1p1f1)	*0.436*	***0.436 (0.313, 0.509)***	***-0.0261 (-0.292, 0.258)***	***good***	***good***	***good***
MIROC6 (r39i1p1f1)	*0.393*	***0.393 (0.238, 0.474)***	***0.0203 (-0.239, 0.593)***	***good***	***good***	***good***
MIROC6 (r3i1p1f1)	*0.313*	*0.313 (0.229, 0.379)*	*-0.103 (-0.612, 0.0924)*	***good***	***good***	*bad*
MIROC6 (r40i1p1f1)	*0.283*	*0.283 (0.184, 0.333)*	***-0.0373 (-0.312, 0.484)***	***good***	***good***	*bad*
MIROC6 (r41i1p1f1)	*0.335*	*0.335 (0.267, 0.382)*	***-0.0573 (-0.308, 0.184)***	***good***	***good***	*reasonable*
MIROC6 (r42i1p1f1)	*0.338*	*0.338 (0.225, 0.406)*	***-0.0165 (-0.18, 0.23)***	***good***	***good***	*reasonable*
MIROC6 (r43i1p1f1)	*0.395*	***0.395 (0.308, 0.466)***	*-0.0954 (-0.349, 0.121)*	***good***	***good***	*bad*
MIROC6 (r44i1p1f1)	*0.4*	***0.4 (0.311, 0.467)***	***0.0633 (-0.296, 0.279)***	***good***	***good***	***good***
MIROC6 (r45i1p1f1)	*0.323*	*0.323 (0.233, 0.383)*	***-0.0367 (-0.26, 0.286)***	***good***	***good***	*reasonable*
MIROC6 (r46i1p1f1)	*0.361*	*0.361 (0.278, 0.422)*	*-0.108 (-0.406, 0.326)*	***good***	***good***	*bad*
MIROC6 (r47i1p1f1)	*0.329*	*0.329 (0.247, 0.381)*	***-0.0387 (-0.441, 0.185)***	***good***	***good***	*reasonable*
MIROC6 (r48i1p1f1)	*0.339*	*0.339 (0.259, 0.408)*	***-0.0284 (-0.586, 0.209)***	***good***	***good***	*reasonable*
MIROC6 (r4i1p1f1)	*0.339*	*0.339 (0.274, 0.391)*	***0.0111 (-0.201, 0.284)***	***good***	***good***	*reasonable*
MIROC6 (r50i1p1f1)	*0.323*	*0.323 (0.218, 0.404)*	*-0.158 (-0.54, 0.146)*	***good***	***good***	*bad*
MIROC6 (r5i1p1f1)	*0.432*	***0.432 (0.32, 0.496)***	***0.0798 (-0.179, 0.453)***	***good***	***good***	***good***
MIROC6 (r6i1p1f1)	*0.3*	*0.3 (0.213, 0.354)*	***0.035 (-0.159, 0.258)***	***good***	***good***	*bad*
MIROC6 (r7i1p1f1)	*0.409*	***0.409 (0.295, 0.487)***	***-0.0425 (-0.404, 0.179)***	***good***	***good***	***good***
MIROC6 (r8i1p1f1)	*0.372*	***0.372 (0.293, 0.429)***	*-0.113 (-0.379, 0.16)*	***good***	***good***	*bad*
MIROC6 (r9i1p1f1)	*0.311*	*0.311 (0.24, 0.364)*	***0.123 (-0.235, 0.464)***	***good***	***good***	*bad*
MPI-ESM1-2-LR (r1i1p1f1)	*0.571*	***0.571 (0.448, 0.649)***	***-0.00893 (-0.351, 0.486)***	*bad*	***good***	*bad*

MPI-ESM1-2-LR (r2i1p1f1)	0.547	***0.547 (0.419, 0.626)***	*0.583 (0.19, 1.)*	*bad*	***good***	*bad*
NorESM2-MM (r1i1p1f1)	0.352	*0.352 (0.256, 0.419)*	***-0.0225 (-0.191, 0.152)***	***good***	***good***	*reasonable*
NorESM2-MM (r2i1p1f1)	0.37	***0.37 (0.274, 0.455)***	***-0.00192 (-0.391, 0.248)***	***good***	***good***	***good***
TaiESM1 (r1i1p1f1)	0.304	*0.304 (0.233, 0.352)*	*-0.151 (-0.458, 0.263)*	*reasonable*	***good***	*bad*

Table A2.2 Evaluation results of the climate models considered for attribution analysis of DSR7x (NWT Region). For each model, the best estimates of the Dispersion and Shape parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	***Threshold for return period 2 yr***	***Dispersion Parameter***	***Shape Parameter***	***Seasonal Cycle***	***Spatial Pattern***	***Conclusion***
ACCESS-CM2 (r1i1p1f1)	0.359	***0.359 (0.27, 0.429)***	*0.183 (-0.167, 0.547)*	***good***	***good***	*reasonable*
ACCESS-CM2 (r2i1p1f1)	0.440	***0.44 (0.313, 0.521)***	*0.423 (0.0444, 0.932)*	***good***	***good***	*reasonable*
ACCESS-CM2 (r3i1p1f1)	0.352	***0.352 (0.252, 0.419)***	*0.314 (-0.0448, 0.675)*	***good***	***good***	*reasonable*
ACCESS-ESM 1-5 (r10i1p1f1)	0.638	*0.638 (0.486, 0.743)*	*0.575 (0.271, 1.09)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r11i1p1f1)	0.514	*0.514 (0.404, 0.596)*	***0.0409 (-0.214, 0.294)***	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r19i1p1f1)	0.674	*0.674 (0.499, 0.794)*	*0.309 (0.0224, 0.592)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r1i1p1f1)	0.705	*0.705 (0.541, 0.799)*	*0.572 (0.215, 0.934)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r2i1p1f1)	0.529	*0.529 (0.411, 0.607)*	*0.221 (-0.0302, 0.498)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r3i1p1f1)	0.588	*0.588 (0.45, 0.688)*	***0.165 (-0.137, 0.436)***	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r4i1p1f1)	0.636	*0.636 (0.483, 0.728)*	*0.662 (0.29, 1.13)*	*reasonable*	***good***	*bad*

ACCESS-ESM 1-5 (r5i1p1f1)	0.563	*0.563 (0.434, 0.653)*	*0.246 (-0.0629, 0.53)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r6i1p1f1)	0.545	*0.545 (0.408, 0.622)*	*0.241 (-0.176, 0.506)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r7i1p1f1)	0.741	*0.741 (0.567, 0.845)*	*0.463 (0.123, 1.31)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r8i1p1f1)	0.651	*0.651 (0.436, 0.747)*	*0.375 (0.103, 1.3)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r9i1p1f1)	0.645	*0.645 (0.508, 0.741)*	*0.419 (0.12, 0.724)*	*reasonable*	***good***	*bad*
CanESM5 (r10i1p1f1)	0.521	*0.521 (0.409, 0.589)*	***-0.00733 (-0.536, 0.307)***	***good***	***good***	*reasonable*
CanESM5 (r10i1p2f1)	0.509	*0.509 (0.392, 0.587)*	***0.0873 (-0.208, 0.537)***	***good***	***good***	*reasonable*
CanESM5 (r11i1p1f1)	0.453	*0.453 (0.36, 0.518)*	***0.104 (-0.17, 0.459)***	***good***	***good***	*reasonable*
CanESM5 (r11i1p2f1)	0.442	***0.442 (0.334, 0.514)***	***0.00642 (-0.263, 0.301)***	***good***	***good***	***good***
CanESM5 (r12i1p1f1)	0.488	*0.488 (0.352, 0.556)*	***0.0995 (-0.278, 0.51)***	***good***	***good***	*reasonable*
CanESM5 (r12i1p2f1)	0.512	*0.512 (0.402, 0.575)*	***0.143 (-0.184, 0.56)***	***good***	***good***	*reasonable*
CanESM5 (r13i1p1f1)	0.567	*0.567 (0.432, 0.664)*	***0.0534 (-0.203, 0.247)***	***good***	***good***	*reasonable*
CanESM5 (r13i1p2f1)	0.482	*0.482 (0.386, 0.542)*	***-0.00149 (-0.361, 0.362)***	***good***	***good***	*reasonable*
CanESM5 (r14i1p1f1)	0.497	*0.497 (0.393, 0.576)*	*0.275 (-0.0506, 0.549)*	***good***	***good***	*reasonable*
CanESM5 (r14i1p2f1)	0.569	*0.569 (0.449, 0.648)*	***-0.115 (-0.575, 0.277)***	***good***	***good***	*reasonable*
CanESM5 (r15i1p1f1)	0.603	*0.603 (0.483, 0.691)*	***-0.12 (-0.655, 0.345)***	***good***	***good***	*bad*
CanESM5 (r15i1p2f1)	0.549	*0.549 (0.433, 0.617)*	***-0.00745 (-0.257, 0.355)***	***good***	***good***	*reasonable*
CanESM5 (r16i1p1f1)	0.461	*0.461 (0.346, 0.534)*	***0.15 (-0.184, 0.486)***	***good***	***good***	*reasonable*
CanESM5 (r16i1p2f1)	0.429	***0.429 (0.319, 0.502)***	***-0.0601 (-0.375, 0.226)***	***good***	***good***	***good***
CanESM5 (r17i1p1f1)	0.509	*0.509 (0.396, 0.583)*	***-0.0674 (-0.34, 0.221)***	***good***	***good***	*reasonable*

CanESM5 (r17i1p2f1)	*0.520*	*0.52 (0.387, 0.602)*	***0.0808 (-0.39, 0.366)***	***good***	***good***	*reasonable*
CanESM5 (r18i1p1f1)	*0.516*	*0.516 (0.412, 0.588)*	***0.157 (-0.114, 0.382)***	***good***	***good***	*reasonable*
CanESM5 (r18i1p2f1)	*0.515*	*0.515 (0.407, 0.593)*	***0.106 (-0.261, 0.397)***	***good***	***good***	*reasonable*
CanESM5 (r19i1p1f1)	*0.529*	*0.529 (0.41, 0.593)*	***0.126 (-0.197, 0.585)***	***good***	***good***	*reasonable*
CanESM5 (r19i1p2f1)	*0.502*	*0.502 (0.366, 0.592)*	***0.13 (-0.0844, 0.354)***	***good***	***good***	*reasonable*
CanESM5 (r1i1p1f1)	*0.568*	*0.568 (0.441, 0.66)*	***-0.116 (-0.422, 0.308)***	***good***	***good***	*reasonable*
CanESM5 (r1i1p2f1)	*0.460*	*0.46 (0.354, 0.53)*	***-0.183 (-0.584, 0.0401)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p1f1)	*0.551*	*0.551 (0.447, 0.614)*	***0.034 (-0.307, 0.441)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p2f1)	*0.501*	*0.501 (0.368, 0.599)*	***0.124 (-0.268, 0.385)***	***good***	***good***	*reasonable*
CanESM5 (r21i1p1f1)	*0.503*	*0.503 (0.381, 0.582)*	***0.131 (-0.0805, 0.405)***	***good***	***good***	*reasonable*
CanESM5 (r21i1p2f1)	*0.518*	*0.518 (0.419, 0.579)*	***0.119 (-0.282, 0.488)***	***good***	***good***	*reasonable*
CanESM5 (r22i1p1f1)	*0.475*	*0.475 (0.372, 0.544)*	*0.327 (-0.029, 0.686)*	***good***	***good***	*reasonable*
CanESM5 (r22i1p2f1)	*0.492*	*0.492 (0.377, 0.564)*	*0.262 (-0.074, 0.604)*	***good***	***good***	*reasonable*
CanESM5 (r23i1p1f1)	*0.499*	*0.499 (0.387, 0.563)*	***0.0457 (-0.264, 0.422)***	***good***	***good***	*reasonable*
CanESM5 (r23i1p2f1)	*0.444*	***0.444 (0.346, 0.521)***	***0.0451 (-0.16, 0.251)***	***good***	***good***	***good***
CanESM5 (r24i1p1f1)	*0.391*	***0.391 (0.299, 0.452)***	*-0.248 (-0.519, 0.0229)*	***good***	***good***	*bad*
CanESM5 (r24i1p2f1)	*0.503*	*0.503 (0.405, 0.566)*	***-0.0344 (-0.455, 0.267)***	***good***	***good***	*reasonable*
CanESM5 (r25i1p1f1)	*0.405*	***0.405 (0.292, 0.491)***	*-0.229 (-0.51, -0.0378)*	***good***	***good***	*bad*
CanESM5 (r25i1p2f1)	*0.558*	*0.558 (0.437, 0.645)*	***-0.0106 (-0.38, 0.365)***	***good***	***good***	*reasonable*
CanESM5 (r2i1p1f1)	*0.531*	*0.531 (0.421, 0.608)*	***0.0719 (-0.244, 0.337)***	***good***	***good***	*reasonable*

CanESM5 (r2i1p2f1)	0.466	*0.466 (0.351, 0.533)*	***0.157 (-0.0753, 0.574)***	***good***	***good***	*reasonable*
CanESM5 (r3i1p1f1)	0.415	***0.415 (0.323, 0.478)***	***0.104 (-0.231, 0.358)***	***good***	***good***	***good***
CanESM5 (r3i1p2f1)	0.571	*0.571 (0.457, 0.658)*	***-0.0176 (-0.397, 0.316)***	***good***	***good***	*bad*
CanESM5 (r4i1p1f1)	0.468	*0.468 (0.353, 0.556)*	***0.129 (-0.62, 0.628)***	***good***	***good***	*reasonable*
CanESM5 (r4i1p2f1)	0.453	*0.453 (0.334, 0.533)*	*0.267 (0.0226, 0.626)*	***good***	***good***	*reasonable*
CanESM5 (r5i1p1f1)	0.525	*0.525 (0.354, 0.613)*	*0.276 (0.0136, 0.621)*	***good***	***good***	*reasonable*
CanESM5 (r5i1p2f1)	0.475	*0.475 (0.38, 0.543)*	*0.208 (-0.0916, 0.493)*	***good***	***good***	*reasonable*
CanESM5 (r6i1p1f1)	0.462	*0.462 (0.362, 0.531)*	***-0.109 (-0.578, 0.274)***	***good***	***good***	*reasonable*
CanESM5 (r6i1p2f1)	0.484	*0.484 (0.377, 0.567)*	***-0.0147 (-0.221, 0.185)***	***good***	***good***	*reasonable*
CanESM5 (r7i1p1f1)	0.512	*0.512 (0.398, 0.59)*	***0.0437 (-0.305, 0.373)***	***good***	***good***	*reasonable*
CanESM5 (r7i1p2f1)	0.564	*0.564 (0.438, 0.657)*	***-0.0567 (-0.391, 0.19)***	***good***	***good***	*reasonable*
CanESM5 (r8i1p1f1)	0.523	*0.523 (0.405, 0.596)*	*0.186 (-0.235, 0.479)*	***good***	***good***	*reasonable*
CanESM5 (r8i1p2f1)	0.493	*0.493 (0.391, 0.552)*	*0.204 (-0.12, 0.648)*	***good***	***good***	*reasonable*
CanESM5 (r9i1p1f1)	0.538	*0.538 (0.437, 0.602)*	*0.186 (-0.113, 0.654)*	***good***	***good***	*reasonable*
CanESM5 (r9i1p2f1)	0.531	*0.531 (0.354, 0.634)*	***0.144 (-0.136, 0.576)***	***good***	***good***	*reasonable*
EC-Earth3 (r1i1p1f1)	0.484	*0.484 (0.359, 0.566)*	***0.107 (-0.214, 0.463)***	***good***	***good***	*reasonable*
GFDL-ESM4 (r1i1p1f1)	0.516	*0.516 (0.391, 0.591)*	*0.269 (-0.0481, 0.559)*	*bad*	***good***	*bad*
HadGEM3-GC31-LL (r1i1p1f3)	0.487	*0.487 (0.377, 0.557)*	*0.216 (-0.0236, 0.528)*	*reasonable*	***good***	*reasonable*
INM-CM4-8 (r1i1p1f1)	0.413	***0.413 (0.309, 0.482)***	*0.441 (0.131, 0.888)*	*reasonable*	***good***	*reasonable*

IPSL-CM6A-LR (r10i1p1f1)	*0.400*	***0.4 (0.309, 0.465)***	***-0.156 (-0.471, 0.149)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r11i1p1f1)	*0.396*	***0.396 (0.298, 0.46)***	***0.0297 (-0.458, 0.273)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r14i1p1f1)	*0.387*	***0.387 (0.274, 0.456)***	***-0.000649 (-0.319, 0.343)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r1i1p1f1)	*0.434*	***0.434 (0.316, 0.505)***	***0.0295 (-0.245, 0.326)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r22i1p1f1)	*0.416*	***0.416 (0.329, 0.472)***	***0.0693 (-0.335, 0.394)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r25i1p1f1)	*0.365*	***0.365 (0.285, 0.427)***	*0.198 (-0.104, 0.425)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	*0.348*	***0.348 (0.247, 0.415)***	*0.26 (-0.0249, 0.756)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r3i1p1f1)	*0.388*	***0.388 (0.302, 0.452)***	***-0.0073 (-0.442, 0.252)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r4i1p1f1)	*0.388*	***0.388 (0.304, 0.45)***	***-0.108 (-0.369, 0.0943)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r5i1p1f1)	*0.361*	***0.361 (0.272, 0.423)***	***0.0592 (-0.188, 0.403)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r6i1p1f1)	*0.378*	***0.378 (0.278, 0.433)***	***-0.0354 (-0.398, 0.454)***	***good***	*reasonable*	*reasonable*
MIROC6 (r10i1p1f1)	*0.332*	***0.332 (0.234, 0.405)***	***-0.124 (-0.534, 0.0921)***	***good***	***good***	***good***
MIROC6 (r11i1p1f1)	*0.379*	***0.379 (0.293, 0.435)***	*-0.311 (-0.619, 0.025)*	***good***	***good***	*bad*
MIROC6 (r12i1p1f1)	*0.343*	***0.343 (0.257, 0.416)***	*-0.208 (-0.531, 0.0209)*	***good***	***good***	*bad*
MIROC6 (r13i1p1f1)	*0.38*	***0.38 (0.284, 0.449)***	***-0.167 (-0.433, 0.0721)***	***good***	***good***	***good***
MIROC6 (r14i1p1f1)	*0.358*	***0.358 (0.274, 0.43)***	*-0.253 (-0.74, -0.0409)*	***good***	***good***	*bad*
MIROC6 (r15i1p1f1)	*0.324*	***0.324 (0.253, 0.372)***	***0.0439 (-0.252, 0.352)***	***good***	***good***	***good***
MIROC6 (r16i1p1f1)	*0.342*	***0.342 (0.253, 0.411)***	*-0.343 (-0.754, -0.00261)*	***good***	***good***	*bad*
MIROC6 (r17i1p1f1)	*0.391*	***0.391 (0.31, 0.445)***	***-0.0198 (-0.271, 0.234)***	***good***	***good***	***good***
MIROC6 (r18i1p1f1)	*0.347*	***0.347 (0.272, 0.398)***	*-0.286 (-0.582, -0.073)*	***good***	***good***	*bad*
MIROC6 (r19i1p1f1)	*0.361*	***0.361 (0.284, 0.425)***	***-0.155 (-0.394, -0.0149)***	***good***	***good***	***good***

MIROC6 (r1i1p1f1)	*0.375*	***0.375 (0.286, 0.443)***	*-0.226 (-0.547, -0.0875)*	***good***	***good***	*bad*
MIROC6 (r20i1p1f1)	*0.316*	***0.316 (0.25, 0.366)***	***0.0205 (-0.205, 0.315)***	***good***	***good***	***good***
MIROC6 (r21i1p1f1)	*0.387*	***0.387 (0.303, 0.448)***	***-0.112 (-0.381, 0.125)***	***good***	***good***	***good***
MIROC6 (r22i1p1f1)	*0.312*	***0.312 (0.234, 0.377)***	*-0.416 (-0.775, -0.191)*	***good***	***good***	*bad*
MIROC6 (r23i1p1f1)	*0.386*	***0.386 (0.308, 0.445)***	*-0.218 (-0.665, 0.0843)*	***good***	***good***	*bad*
MIROC6 (r24i1p1f1)	*0.344*	***0.344 (0.253, 0.409)***	***-0.0851 (-0.583, 0.104)***	***good***	***good***	***good***
MIROC6 (r25i1p1f1)	*0.293*	***0.293 (0.208, 0.352)***	*-0.223 (-0.676, 0.0441)*	***good***	***good***	*bad*
MIROC6 (r26i1p1f1)	*0.364*	***0.364 (0.273, 0.423)***	***-0.155 (-0.431, 0.146)***	***good***	***good***	***good***
MIROC6 (r27i1p1f1)	*0.326*	***0.326 (0.249, 0.385)***	*-0.302 (-0.542, -0.0977)*	***good***	***good***	*bad*
MIROC6 (r28i1p1f1)	*0.331*	***0.331 (0.259, 0.38)***	***-0.103 (-0.479, 0.16)***	***good***	***good***	***good***
MIROC6 (r29i1p1f1)	*0.39*	***0.39 (0.299, 0.448)***	***-0.0318 (-0.504, 0.235)***	***good***	***good***	***good***
MIROC6 (r2i1p1f1)	*0.321*	***0.321 (0.244, 0.384)***	***-0.161 (-0.677, 0.0534)***	***good***	***good***	***good***
MIROC6 (r30i1p1f1)	*0.349*	***0.349 (0.262, 0.409)***	***-0.00441 (-0.225, 0.248)***	***good***	***good***	***good***
MIROC6 (r31i1p1f1)	*0.27*	***0.27 (0.217, 0.317)***	*-0.444 (-0.809, -0.151)*	***good***	***good***	*bad*
MIROC6 (r32i1p1f1)	*0.299*	***0.299 (0.237, 0.344)***	***-0.0176 (-0.311, 0.182)***	***good***	***good***	***good***
MIROC6 (r33i1p1f1)	*0.355*	***0.355 (0.26, 0.423)***	***-0.0403 (-0.386, 0.195)***	***good***	***good***	***good***
MIROC6 (r34i1p1f1)	*0.271*	***0.271 (0.206, 0.324)***	*-0.248 (-0.589, 0.0358)*	***good***	***good***	*bad*
MIROC6 (r35i1p1f1)	*0.364*	***0.364 (0.265, 0.428)***	*-0.276 (-0.612, 0.123)*	***good***	***good***	*bad*
MIROC6 (r36i1p1f1)	*0.355*	***0.355 (0.274, 0.412)***	***-0.0374 (-0.303, 0.281)***	***good***	***good***	***good***
MIROC6 (r37i1p1f1)	*0.325*	***0.325 (0.254, 0.369)***	***-0.126 (-0.42, 0.0855)***	***good***	***good***	***good***
MIROC6 (r38i1p1f1)	*0.36*	***0.36 (0.27, 0.416)***	***-0.114 (-0.354, 0.179)***	***good***	***good***	***good***

MIROC6 (r39i1p1f1)	*0.357*	***0.357 (0.271, 0.42)***	***-0.127 (-0.424, 0.116)***	***good***	***good***	***good***
MIROC6 (r3i1p1f1)	*0.381*	***0.381 (0.285, 0.458)***	*-0.249 (-0.657, 0.144)*	***good***	***good***	*bad*
MIROC6 (r40i1p1f1)	*0.353*	***0.353 (0.274, 0.41)***	***-0.113 (-0.376, 0.151)***	***good***	***good***	***good***
MIROC6 (r41i1p1f1)	*0.359*	***0.359 (0.27, 0.431)***	*-0.235 (-0.638, -0.0649)*	***good***	***good***	*bad*
MIROC6 (r42i1p1f1)	*0.306*	***0.306 (0.209, 0.372)***	***-0.121 (-0.41, 0.0571)***	***good***	***good***	***good***
MIROC6 (r43i1p1f1)	*0.396*	***0.396 (0.298, 0.465)***	*-0.321 (-0.658, 0.236)*	***good***	***good***	*bad*
MIROC6 (r44i1p1f1)	*0.345*	***0.345 (0.266, 0.404)***	***-0.174 (-0.428, 0.0626)***	***good***	***good***	***good***
MIROC6 (r45i1p1f1)	*0.323*	***0.323 (0.245, 0.381)***	***-0.172 (-0.415, -0.00807)***	***good***	***good***	***good***
MIROC6 (r46i1p1f1)	*0.384*	***0.384 (0.287, 0.466)***	*-0.419 (-0.772, -0.252)*	***good***	***good***	*bad*
MIROC6 (r47i1p1f1)	*0.331*	***0.331 (0.241, 0.4)***	***-0.171 (-0.449, 0.038)***	***good***	***good***	***good***
MIROC6 (r48i1p1f1)	*0.335*	***0.335 (0.256, 0.394)***	***-0.123 (-0.306, 0.0847)***	***good***	***good***	***good***
MIROC6 (r4i1p1f1)	*0.355*	***0.355 (0.218, 0.437)***	***-0.169 (-0.442, 0.425)***	***good***	***good***	***good***
MIROC6 (r50i1p1f1)	*0.351*	***0.351 (0.281, 0.398)***	***-0.163 (-0.559, 0.166)***	***good***	***good***	***good***
MIROC6 (r5i1p1f1)	*0.323*	***0.323 (0.25, 0.379)***	*-0.204 (-0.606, 0.0442)*	***good***	***good***	*bad*
MIROC6 (r6i1p1f1)	*0.342*	***0.342 (0.267, 0.4)***	*-0.375 (-0.727, -0.103)*	***good***	***good***	*bad*
MIROC6 (r7i1p1f1)	*0.33*	***0.33 (0.251, 0.381)***	***-0.049 (-0.334, 0.253)***	***good***	***good***	***good***
MIROC6 (r8i1p1f1)	*0.426*	***0.426 (0.327, 0.497)***	***0.00961 (-0.782, 0.301)***	***good***	***good***	***good***
MIROC6 (r9i1p1f1)	*0.336*	***0.336 (0.259, 0.408)***	***-0.17 (-0.743, 0.242)***	***good***	***good***	***good***
MPI-ESM1-2-LR (r1i1p1f1)	*0.541*	*0.541 (0.414, 0.617)*	*0.398 (-0.00314, 0.831)*	*bad*	***good***	*bad*
MPI-ESM1-2-LR (r2i1p1f1)	*0.609*	*0.609 (0.477, 0.694)*	***-0.0382 (-0.436, 0.308)***	*bad*	***good***	*bad*
NorESM2-MM (r1i1p1f1)	*0.396*	***0.396 (0.31, 0.466)***	***-0.0642 (-0.268, 0.146)***	***good***	***good***	***good***

NorESM2-MM (r2i1p1f1)	*0.353*	***0.353 (0.268, 0.41)***	***-0.145 (-0.492, 0.0414)***	***good***	***good***	***good***
TaiESM1 (r1i1p1f1)	*0.248*	***0.248 (0.178, 0.294)***	***-0.182 (-0.492, 0.0756)***	*reasonable*	***good***	*reasonable*

Table A2.3 Evaluation results of the climate models considered for attribution analysis of DSR30x (Ontario Region). For each model, the best estimates of the Dispersion and Shape parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	***Threshold for return period 6 yr***	***Dispersion Parameter***	***Shape Parameter***	***Seasonal Cycle***	***Spatial Pattern***	***Conclusion***
ACCESS-CM2 (r1i1p1f1)	*0.376*	*0.376 (0.251, 0.448)*	***0.0325 (-0.228, 0.418)***	***good***	***good***	*reasonable*
ACCESS-CM2 (r2i1p1f1)	*0.425*	***0.425 (0.332, 0.487)***	***0.144 (-0.122, 0.468)***	***good***	***good***	***good***
ACCESS-CM2 (r3i1p1f1)	*0.266*	*0.266 (0.203, 0.327)*	*0.279 (-0.146, 0.64)*	***good***	***good***	*bad*
ACCESS-ESM 1-5 (r10i1p1f1)	*0.765*	*0.765 (0.578, 0.912)*	*0.26 (-0.0323, 0.509)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r11i1p1f1)	*0.685*	*0.685 (0.527, 0.802)*	*0.26 (-0.0276, 0.5)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r19i1p1f1)	*0.734*	*0.734 (0.559, 0.855)*	***0.19 (-0.289, 0.459)***	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r1i1p1f1)	*0.644*	*0.644 (0.496, 0.748)*	*0.218 (-0.0522, 0.515)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r2i1p1f1)	*0.726*	*0.726 (0.593, 0.822)*	*0.207 (-0.294, 0.645)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r3i1p1f1)	*0.732*	*0.732 (0.567, 0.848)*	***0.0624 (-0.253, 0.425)***	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r4i1p1f1)	*0.618*	*0.618 (0.482, 0.698)*	***0.109 (-0.195, 0.421)***	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r5i1p1f1)	*0.757*	*0.757 (0.598, 0.847)*	*0.347 (0.0302, 0.811)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r6i1p1f1)	*0.822*	*0.822 (0.638, 0.973)*	*0.322 (0.024, 0.595)*	*reasonable*	***good***	*bad*

ACCESS-ESM 1-5 (r7i1p1f1)	0.642	*0.642 (0.484, 0.748)*	***0.181 (-0.231, 0.585)***	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r8i1p1f1)	0.676	*0.676 (0.531, 0.763)*	*0.249 (-0.21, 0.643)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r9i1p1f1)	0.807	*0.807 (0.653, 0.91)*	*0.361 (-0.382, 0.852)*	*reasonable*	***good***	*bad*
CanESM5 (r10i1p1f1)	0.365	*0.365 (0.268, 0.428)*	***0.149 (-0.217, 0.416)***	***good***	***good***	*reasonable*
CanESM5 (r10i1p2f1)	0.428	***0.428 (0.339, 0.498)***	***-0.079 (-0.385, 0.136)***	***good***	***good***	***good***
CanESM5 (r11i1p1f1)	0.335	*0.335 (0.25, 0.397)*	*0.357 (0.0264, 0.748)*	***good***	***good***	*reasonable*
CanESM5 (r11i1p2f1)	0.364	*0.364 (0.281, 0.428)*	*0.295 (-0.115, 0.695)*	***good***	***good***	*reasonable*
CanESM5 (r12i1p1f1)	0.374	*0.374 (0.279, 0.432)*	*0.196 (-0.0705, 0.477)*	***good***	***good***	*reasonable*
CanESM5 (r12i1p2f1)	0.459	***0.459 (0.347, 0.531)***	*0.273 (0.0456, 0.49)*	***good***	***good***	*reasonable*
CanESM5 (r13i1p1f1)	0.348	*0.348 (0.272, 0.401)*	***0.0103 (-0.314, 0.38)***	***good***	***good***	*reasonable*
CanESM5 (r13i1p2f1)	0.422	***0.422 (0.326, 0.485)***	***-0.00566 (-0.303, 0.246)***	***good***	***good***	***good***
CanESM5 (r14i1p1f1)	0.376	*0.376 (0.304, 0.427)*	***0.165 (-0.0875, 0.48)***	***good***	***good***	*reasonable*
CanESM5 (r14i1p2f1)	0.379	*0.379 (0.294, 0.436)*	***0.0876 (-0.257, 0.455)***	***good***	***good***	*reasonable*
CanESM5 (r15i1p1f1)	0.38	*0.38 (0.298, 0.437)*	***-0.0239 (-0.399, 0.245)***	***good***	***good***	*reasonable*
CanESM5 (r15i1p2f1)	0.319	*0.319 (0.237, 0.37)*	*0.198 (-0.0757, 0.539)*	***good***	***good***	*bad*
CanESM5 (r16i1p1f1)	0.396	***0.396 (0.295, 0.454)***	***-0.0805 (-0.389, 0.257)***	***good***	***good***	***good***
CanESM5 (r16i1p2f1)	0.356	*0.356 (0.256, 0.424)*	***0.126 (-0.0841, 0.348)***	***good***	***good***	*reasonable*
CanESM5 (r17i1p1f1)	0.41	***0.41 (0.301, 0.489)***	***0.0559 (-0.321, 0.317)***	***good***	***good***	***good***
CanESM5 (r17i1p2f1)	0.351	*0.351 (0.267, 0.414)*	***0.188 (-0.156, 0.544)***	***good***	***good***	*reasonable*

CanESM5 (r18i1p1f1)	*0.399*	***0.399 (0.31, 0.467)***	***0.0949 (-0.198, 0.259)***	***good***	***good***	***good***
CanESM5 (r18i1p2f1)	*0.404*	***0.404 (0.299, 0.475)***	***0.0844 (-0.321, 0.335)***	***good***	***good***	***good***
CanESM5 (r19i1p1f1)	*0.446*	***0.446 (0.318, 0.524)***	***-0.0431 (-0.349, 0.268)***	***good***	***good***	***good***
CanESM5 (r19i1p2f1)	*0.438*	***0.438 (0.35, 0.485)***	***0.0379 (-0.234, 0.414)***	***good***	***good***	***good***
CanESM5 (r1i1p1f1)	*0.338*	*0.338 (0.238, 0.403)*	*0.261 (0.0164, 0.654)*	***good***	***good***	*reasonable*
CanESM5 (r1i1p2f1)	*0.36*	*0.36 (0.205, 0.424)*	***0.155 (-0.112, 0.966)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p1f1)	*0.359*	*0.359 (0.278, 0.423)*	***-0.179 (-0.414, 0.0494)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p2f1)	*0.404*	***0.404 (0.265, 0.488)***	***0.0988 (-0.246, 0.524)***	***good***	***good***	***good***
CanESM5 (r21i1p1f1)	*0.373*	*0.373 (0.281, 0.43)*	*0.246 (-0.217, 0.647)*	***good***	***good***	*reasonable*
CanESM5 (r21i1p2f1)	*0.425*	***0.425 (0.325, 0.497)***	***0.119 (-0.325, 0.346)***	***good***	***good***	***good***
CanESM5 (r22i1p1f1)	*0.386*	***0.386 (0.297, 0.454)***	***-0.00244 (-0.346, 0.31)***	***good***	***good***	***good***
CanESM5 (r22i1p2f1)	*0.378*	*0.378 (0.279, 0.44)*	***0.173 (-0.0966, 0.526)***	***good***	***good***	*reasonable*
CanESM5 (r23i1p1f1)	*0.364*	*0.364 (0.275, 0.421)*	***0.189 (-0.273, 0.463)***	***good***	***good***	*reasonable*
CanESM5 (r23i1p2f1)	*0.462*	***0.462 (0.346, 0.545)***	***0.018 (-0.357, 0.253)***	***good***	***good***	***good***
CanESM5 (r24i1p1f1)	*0.475*	***0.475 (0.376, 0.54)***	***0.13 (-0.314, 0.615)***	***good***	***good***	***good***
CanESM5 (r24i1p2f1)	*0.336*	*0.336 (0.218, 0.397)*	***0.159 (-0.184, 0.747)***	***good***	***good***	*reasonable*
CanESM5 (r25i1p1f1)	*0.394*	***0.394 (0.271, 0.467)***	***-0.0303 (-0.264, 0.487)***	***good***	***good***	***good***
CanESM5 (r25i1p2f1)	*0.401*	***0.401 (0.243, 0.478)***	*0.195 (-0.0363, 1.03)*	***good***	***good***	*reasonable*
CanESM5 (r2i1p1f1)	*0.393*	***0.393 (0.273, 0.463)***	***0.155 (-0.236, 0.844)***	***good***	***good***	***good***
CanESM5 (r2i1p2f1)	*0.396*	***0.396 (0.318, 0.445)***	***-0.165 (-0.612, 0.157)***	***good***	***good***	***good***

CanESM5 (r3i1p1f1)	*0.397*	***0.397 (0.279, 0.469)***	***0.132 (-0.0929, 0.422)***	***good***	***good***	***good***
CanESM5 (r3i1p2f1)	*0.398*	***0.398 (0.295, 0.474)***	***0.0194 (-0.589, 0.422)***	***good***	***good***	***good***
CanESM5 (r4i1p1f1)	*0.391*	***0.391 (0.295, 0.451)***	***-0.123 (-0.49, 0.355)***	***good***	***good***	***good***
CanESM5 (r4i1p2f1)	*0.388*	***0.388 (0.279, 0.457)***	***0.156 (-0.112, 0.474)***	***good***	***good***	***good***
CanESM5 (r5i1p1f1)	*0.391*	***0.391 (0.284, 0.455)***	***0.144 (-0.134, 0.526)***	***good***	***good***	***good***
CanESM5 (r5i1p2f1)	*0.328*	*0.328 (0.239, 0.387)*	*0.22 (-0.0489, 0.599)*	***good***	***good***	*reasonable*
CanESM5 (r6i1p1f1)	*0.462*	***0.462 (0.364, 0.532)***	***-0.0551 (-0.443, 0.199)***	***good***	***good***	***good***
CanESM5 (r6i1p2f1)	*0.422*	***0.422 (0.295, 0.506)***	***0.0788 (-0.147, 0.446)***	***good***	***good***	***good***
CanESM5 (r7i1p1f1)	*0.436*	***0.436 (0.322, 0.512)***	***0.119 (-0.141, 0.355)***	***good***	***good***	***good***
CanESM5 (r7i1p2f1)	*0.374*	*0.374 (0.264, 0.434)*	*0.209 (-0.121, 0.618)*	***good***	***good***	*reasonable*
CanESM5 (r8i1p1f1)	*0.343*	*0.343 (0.232, 0.408)*	***0.109 (-0.146, 0.582)***	***good***	***good***	*reasonable*
CanESM5 (r8i1p2f1)	*0.339*	*0.339 (0.256, 0.422)*	***0.0507 (-0.468, 0.368)***	***good***	***good***	*reasonable*
CanESM5 (r9i1p1f1)	*0.416*	***0.416 (0.313, 0.483)***	***-0.192 (-0.58, 0.258)***	***good***	***good***	***good***
CanESM5 (r9i1p2f1)	*0.481*	***0.481 (0.381, 0.547)***	***0.171 (-0.221, 0.474)***	***good***	***good***	***good***
EC-Earth3 (r1i1p1f1)	*0.457*	***0.457 (0.341, 0.525)***	*0.256 (-0.188, 0.65)*	***good***	***good***	*reasonable*
GFDL-ESM4 (r1i1p1f1)	*0.497*	***0.497 (0.381, 0.587)***	*0.227 (-0.0719, 0.559)*	*bad*	***good***	*bad*
HadGEM3-GC31-LL (r1i1p1f3)	*0.484*	***0.484 (0.361, 0.57)***	***0.0518 (-0.215, 0.417)***	*reasonable*	***good***	*reasonable*
INM-CM4-8 (r1i1p1f1)	*0.595*	*0.595 (0.459, 0.68)*	***0.172 (-0.161, 0.441)***	*reasonable*	***good***	*reasonable*
IPSL-CM6A-LR (r10i1p1f1)	*0.36*	*0.36 (0.278, 0.422)*	***0.0451 (-0.195, 0.249)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r11i1p1f1)	*0.379*	*0.379 (0.289, 0.451)*	***-0.0501 (-0.307, 0.18)***	***good***	*reasonable*	*reasonable*

IPSL-CM6A-LR (r14i1p1f1)	*0.387*	***0.387 (0.308, 0.45)***	*0.326 (0.0467, 0.571)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r1i1p1f1)	*0.39*	***0.39 (0.269, 0.466)***	***-0.0311 (-0.365, 0.451)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r22i1p1f1)	*0.382*	*0.382 (0.277, 0.458)*	***0.112 (-0.156, 0.447)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r25i1p1f1)	*0.372*	*0.372 (0.293, 0.428)*	***-0.0294 (-0.216, 0.189)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	*0.376*	*0.376 (0.308, 0.423)*	***-0.0837 (-0.365, 0.261)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r3i1p1f1)	*0.349*	*0.349 (0.254, 0.416)*	***0.00356 (-0.489, 0.439)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r4i1p1f1)	*0.44*	***0.44 (0.304, 0.507)***	***0.136 (-0.219, 0.65)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r5i1p1f1)	*0.424*	***0.424 (0.292, 0.491)***	***0.12 (-0.124, 0.551)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r6i1p1f1)	*0.343*	*0.343 (0.258, 0.392)*	***0.00362 (-0.343, 0.56)***	***good***	*reasonable*	*reasonable*
MIROC6 (r10i1p1f1)	*0.347*	*0.347 (0.244, 0.418)*	***0.0289 (-0.182, 0.317)***	***good***	***good***	*reasonable*
MIROC6 (r11i1p1f1)	*0.367*	*0.367 (0.284, 0.428)*	*-0.296 (-0.637, -0.0301)*	***good***	***good***	*bad*
MIROC6 (r12i1p1f1)	*0.367*	*0.367 (0.288, 0.423)*	***-0.0377 (-0.347, 0.197)***	***good***	***good***	*reasonable*
MIROC6 (r13i1p1f1)	*0.439*	***0.439 (0.347, 0.503)***	*-0.356 (-0.709, 0.0958)*	***good***	***good***	*bad*
MIROC6 (r14i1p1f1)	*0.294*	*0.294 (0.219, 0.356)*	***0.145 (-0.122, 0.359)***	***good***	***good***	*bad*
MIROC6 (r15i1p1f1)	*0.353*	*0.353 (0.27, 0.416)*	***0.0908 (-0.356, 0.34)***	***good***	***good***	*reasonable*
MIROC6 (r16i1p1f1)	*0.355*	*0.355 (0.276, 0.416)*	***-0.183 (-0.459, 0.0292)***	***good***	***good***	*reasonable*
MIROC6 (r17i1p1f1)	*0.355*	*0.355 (0.243, 0.426)*	***0.0898 (-0.286, 0.353)***	***good***	***good***	*reasonable*
MIROC6 (r18i1p1f1)	*0.371*	*0.371 (0.261, 0.442)*	***-0.143 (-0.399, 0.292)***	***good***	***good***	*reasonable*
MIROC6 (r19i1p1f1)	*0.407*	***0.407 (0.313, 0.463)***	***0.00164 (-0.22, 0.247)***	***good***	***good***	***good***
MIROC6 (r1i1p1f1)	*0.3*	*0.3 (0.224, 0.372)*	*0.253 (-0.211, 0.618)*	***good***	***good***	*bad*
MIROC6 (r20i1p1f1)	*0.394*	***0.394 (0.299, 0.455)***	***0.112 (-0.402, 0.435)***	***good***	***good***	***good***

MIROC6 (r21i1p1f1)	*0.448*	***0.448 (0.345, 0.52)***	***-0.114 (-0.507, 0.0681)***	***good***	***good***	***good***
MIROC6 (r22i1p1f1)	*0.364*	*0.364 (0.257, 0.434)*	***0.00636 (-0.286, 0.441)***	***good***	***good***	*reasonable*
MIROC6 (r23i1p1f1)	*0.321*	*0.321 (0.238, 0.367)*	***0.137 (-0.23, 0.548)***	***good***	***good***	*bad*
MIROC6 (r24i1p1f1)	*0.39*	***0.39 (0.274, 0.46)***	***0.136 (-0.0748, 0.462)***	***good***	***good***	***good***
MIROC6 (r25i1p1f1)	*0.368*	*0.368 (0.275, 0.426)*	***0.0856 (-0.328, 0.551)***	***good***	***good***	*reasonable*
MIROC6 (r26i1p1f1)	*0.35*	*0.35 (0.274, 0.407)*	***0.162 (-0.168, 0.451)***	***good***	***good***	*reasonable*
MIROC6 (r27i1p1f1)	*0.371*	*0.371 (0.236, 0.445)*	***0.0813 (-0.0819, 0.42)***	***good***	***good***	*reasonable*
MIROC6 (r28i1p1f1)	*0.381*	*0.381 (0.291, 0.442)*	***-0.0916 (-0.499, 0.173)***	***good***	***good***	*reasonable*
MIROC6 (r29i1p1f1)	*0.363*	*0.363 (0.262, 0.432)*	***-0.0213 (-0.237, 0.332)***	***good***	***good***	*reasonable*
MIROC6 (r2i1p1f1)	*0.419*	***0.419 (0.296, 0.505)***	***-0.151 (-0.491, 0.223)***	***good***	***good***	***good***
MIROC6 (r30i1p1f1)	*0.259*	*0.259 (0.197, 0.306)*	*0.269 (-0.0715, 0.608)*	***good***	***good***	*bad*
MIROC6 (r31i1p1f1)	*0.386*	*0.386 (0.309, 0.445)*	***0.00246 (-0.325, 0.246)***	***good***	***good***	*reasonable*
MIROC6 (r32i1p1f1)	*0.402*	***0.402 (0.283, 0.488)***	***-0.0258 (-0.217, 0.229)***	***good***	***good***	***good***
MIROC6 (r33i1p1f1)	*0.364*	*0.364 (0.271, 0.416)*	*0.285 (-0.0191, 0.654)*	***good***	***good***	*reasonable*
MIROC6 (r34i1p1f1)	*0.34*	*0.34 (0.252, 0.395)*	*0.243 (-0.123, 0.761)*	***good***	***good***	*reasonable*
MIROC6 (r35i1p1f1)	*0.38*	*0.38 (0.301, 0.433)*	***0.0965 (-0.153, 0.35)***	***good***	***good***	*reasonable*
MIROC6 (r36i1p1f1)	*0.34*	*0.34 (0.256, 0.395)*	***-0.0622 (-0.379, 0.106)***	***good***	***good***	*reasonable*
MIROC6 (r37i1p1f1)	*0.371*	*0.371 (0.297, 0.428)*	***-0.000277 (-0.205, 0.237)***	***good***	***good***	*reasonable*
MIROC6 (r38i1p1f1)	*0.448*	***0.448 (0.316, 0.532)***	***0.0112 (-0.21, 0.239)***	***good***	***good***	***good***
MIROC6 (r39i1p1f1)	*0.439*	***0.439 (0.289, 0.526)***	***0.0422 (-0.253, 0.593)***	***good***	***good***	***good***

MIROC6 (r3i1p1f1)	*0.325*	*0.325 (0.236, 0.384)*	***-0.0606 (-0.571, 0.305)***	***good***	***good***	*bad*
MIROC6 (r40i1p1f1)	*0.297*	*0.297 (0.216, 0.347)*	***-0.128 (-0.426, 0.203)***	***good***	***good***	*bad*
MIROC6 (r41i1p1f1)	*0.318*	*0.318 (0.259, 0.357)*	***-0.0718 (-0.499, 0.165)***	***good***	***good***	*bad*
MIROC6 (r42i1p1f1)	*0.364*	*0.364 (0.27, 0.421)*	***0.0048 (-0.239, 0.244)***	***good***	***good***	*reasonable*
MIROC6 (r43i1p1f1)	*0.401*	***0.401 (0.303, 0.474)***	***0.0673 (-0.209, 0.272)***	***good***	***good***	***good***
MIROC6 (r44i1p1f1)	*0.401*	***0.401 (0.301, 0.464)***	***0.097 (-0.195, 0.391)***	***good***	***good***	***good***
MIROC6 (r45i1p1f1)	*0.292*	*0.292 (0.205, 0.343)*	***-0.0427 (-0.278, 0.206)***	***good***	***good***	*bad*
MIROC6 (r46i1p1f1)	*0.43*	***0.43 (0.326, 0.488)***	*-0.333 (-0.645, 0.548)*	***good***	***good***	*reasonable*
MIROC6 (r47i1p1f1)	*0.343*	*0.343 (0.257, 0.397)*	***0.00289 (-0.318, 0.244)***	***good***	***good***	*reasonable*
MIROC6 (r48i1p1f1)	*0.364*	*0.364 (0.266, 0.441)*	***0.0407 (-0.357, 0.276)***	***good***	***good***	*reasonable*
MIROC6 (r4i1p1f1)	*0.364*	*0.364 (0.274, 0.429)*	***-0.0914 (-0.367, 0.131)***	***good***	***good***	*reasonable*
MIROC6 (r50i1p1f1)	*0.382*	*0.382 (0.265, 0.464)*	***-0.14 (-0.515, 0.408)***	***good***	***good***	*reasonable*
MIROC6 (r5i1p1f1)	*0.442*	***0.442 (0.315, 0.515)***	***0.13 (-0.115, 0.551)***	***good***	***good***	***good***
MIROC6 (r6i1p1f1)	*0.302*	*0.302 (0.197, 0.373)*	***0.0451 (-0.174, 0.457)***	***good***	***good***	*bad*
MIROC6 (r7i1p1f1)	*0.432*	***0.432 (0.317, 0.502)***	***0.0031 (-0.349, 0.297)***	***good***	***good***	***good***
MIROC6 (r8i1p1f1)	*0.374*	*0.374 (0.281, 0.434)*	***-0.00566 (-0.393, 0.403)***	***good***	***good***	*reasonable*
MIROC6 (r9i1p1f1)	*0.365*	*0.365 (0.27, 0.427)*	***0.107 (-0.137, 0.376)***	***good***	***good***	*reasonable*
MPI-ESM1-2-LR (r1i1p1f1)	*0.621*	*0.621 (0.506, 0.694)*	***0.0798 (-0.444, 0.52)***	*bad*	***good***	*bad*
MPI-ESM1-2-LR (r2i1p1f1)	*0.588*	*0.588 (0.434, 0.681)*	*0.633 (0.299, 1.09)*	*bad*	***good***	*bad*
NorESM2-MM (r1i1p1f1)	*0.346*	*0.346 (0.274, 0.399)*	***-0.0545 (-0.272, 0.165)***	***good***	***good***	*reasonable*
NorESM2-MM (r2i1p1f1)	*0.363*	*0.363 (0.284, 0.427)*	***-0.00152 (-0.255, 0.231)***	***good***	***good***	*reasonable*

TaiESM1 (r1i1p1f1)	*0.353*	*0.353 (0.284, 0.4)*	***-0.0437 (-0.299, 0.283)***	*reasonable*	***good***	*reasonable*

Table A2.4 Evaluation results of the climate models considered for attribution analysis of DSR30x (NWT Region). For each model, the best estimates of the Dispersion and Shape parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	***Threshold for return period 6 yr***	***Dispersion Parameter***	***Shape Parameter***	***Seasonal Cycle***	***Spatial Pattern***	***Conclusion***
ACCESS-CM2 (r1i1p1f1)	*0.334*	***0.334 (0.261, 0.39)***	*0.119 (-0.113, 0.361)*	***good***	***good***	*reasonable*
ACCESS-CM2 (r2i1p1f1)	*0.491*	*0.491 (0.38, 0.571)*	*0.317 (-0.119, 0.719)*	***good***	***good***	*reasonable*
ACCESS-CM2 (r3i1p1f1)	*0.381*	***0.381 (0.29, 0.449)***	*0.371 (0.0662, 0.744)*	***good***	***good***	*reasonable*
ACCESS-ESM 1-5 (r10i1p1f1)	*0.624*	*0.624 (0.459, 0.747)*	*0.603 (0.31, 1.01)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r11i1p1f1)	*0.5*	*0.5 (0.356, 0.59)*	*0.127 (-0.171, 0.574)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r19i1p1f1)	*0.702*	*0.702 (0.535, 0.814)*	*0.354 (0.0782, 0.641)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r1i1p1f1)	*0.754*	*0.754 (0.561, 0.872)*	*0.517 (0.221, 0.858)*	*reasonable*	***good***	*bad*
ACCESS-ESM 1-5 (r2i1p1f1)	*0.518*	*0.518 (0.399, 0.594)*	*0.256 (-0.0963, 0.658)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r3i1p1f1)	*0.594*	*0.594 (0.437, 0.697)*	*0.183 (-0.0673, 0.439)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r4i1p1f1)	*0.6*	*0.6 (0.46, 0.696)*	*0.784 (0.372, 1.22)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r5i1p1f1)	*0.556*	*0.556 (0.439, 0.634)*	*0.346 (-0.00822, 0.74)*	*reasonable*	***good***	*reasonable*
ACCESS-ESM 1-5 (r6i1p1f1)	*0.548*	*0.548 (0.422, 0.62)*	*0.308 (-0.117, 0.632)*	*reasonable*	***good***	*reasonable*

ACCESS-ESM 1-5 (r7i1p1f1)	0.742	0.742 (0.582, 0.875)	0.466 (0.163, 1.01)	reasonable	**good**	bad
ACCESS-ESM 1-5 (r8i1p1f1)	0.647	0.647 (0.431, 0.742)	0.447 (0.21, 1.37)	reasonable	**good**	reasonable
ACCESS-ESM 1-5 (r9i1p1f1)	0.689	0.689 (0.546, 0.777)	0.432 (0.107, 0.802)	reasonable	**good**	bad
CanESM5 (r10i1p1f1)	0.572	0.572 (0.447, 0.64)	**-0.162 (-0.723, 0.395)**	**good**	**good**	reasonable
CanESM5 (r10i1p2f1)	0.592	0.592 (0.448, 0.694)	0.14 (-0.125, 0.528)	**good**	**good**	reasonable
CanESM5 (r11i1p1f1)	0.531	0.531 (0.429, 0.593)	0.201 (-0.154, 0.716)	**good**	**good**	reasonable
CanESM5 (r11i1p2f1)	0.5	0.5 (0.392, 0.568)	**-0.0643 (-0.287, 0.199)**	**good**	**good**	reasonable
CanESM5 (r12i1p1f1)	0.516	0.516 (0.402, 0.578)	0.236 (-0.164, 0.622)	**good**	**good**	reasonable
CanESM5 (r12i1p2f1)	0.568	0.568 (0.43, 0.649)	0.293 (-0.00213, 0.633)	**good**	**good**	reasonable
CanESM5 (r13i1p1f1)	0.609	0.609 (0.473, 0.697)	**0.0887 (-0.332, 0.342)**	**good**	**good**	bad
CanESM5 (r13i1p2f1)	0.523	0.523 (0.414, 0.612)	**-0.00546 (-0.253, 0.212)**	**good**	**good**	reasonable
CanESM5 (r14i1p1f1)	0.568	0.568 (0.391, 0.677)	0.24 (-0.136, 0.812)	**good**	**good**	reasonable
CanESM5 (r14i1p2f1)	0.598	0.598 (0.479, 0.677)	0.116 (-0.514, 0.572)	**good**	**good**	bad
CanESM5 (r15i1p1f1)	0.628	0.628 (0.488, 0.736)	**-0.0385 (-0.367, 0.306)**	**good**	**good**	bad
CanESM5 (r15i1p2f1)	0.599	0.599 (0.481, 0.66)	**0.00251 (-0.3, 0.634)**	**good**	**good**	bad
CanESM5 (r16i1p1f1)	0.479	0.479 (0.353, 0.559)	0.302 (-0.077, 0.66)	**good**	**good**	reasonable
CanESM5 (r16i1p2f1)	0.463	**0.463 (0.355, 0.54)**	**-0.0677 (-0.396, 0.213)**	**good**	**good**	**good**
CanESM5 (r17i1p1f1)	0.567	0.567 (0.45, 0.645)	**-0.132 (-0.447, 0.202)**	**good**	**good**	reasonable
CanESM5 (r17i1p2f1)	0.594	0.594 (0.457, 0.673)	0.176 (-0.354, 0.561)	**good**	**good**	reasonable
CanESM5 (r18i1p1f1)	0.567	0.567 (0.45, 0.644)	0.207 (-0.0418, 0.471)	**good**	**good**	reasonable

CanESM5 (r18i1p2f1)	0.515	*0.515 (0.408, 0.581)*	***0.107 (-0.194, 0.402)***	***good***	***good***	*reasonable*
CanESM5 (r19i1p1f1)	0.539	*0.539 (0.419, 0.611)*	***0.0182 (-0.281, 0.596)***	***good***	***good***	*reasonable*
CanESM5 (r19i1p2f1)	0.533	*0.533 (0.384, 0.626)*	*0.163 (-0.0369, 0.394)*	***good***	***good***	*reasonable*
CanESM5 (r1i1p1f1)	0.614	***0.614 (0.473, 0.704)***	***-0.0564 (-0.347, 0.614)***	***good***	***good***	*bad*
CanESM5 (r1i1p2f1)	0.523	*0.523 (0.419, 0.596)*	***-0.134 (-0.55, 0.236)***	***good***	***good***	*reasonable*
CanESM5 (r20i1p1f1)	0.573	***0.573 (0.466, 0.636)***	*0.186 (-0.224, 0.612)*	***good***	***good***	*bad*
CanESM5 (r20i1p2f1)	0.511	*0.511 (0.37, 0.62)*	***0.1 (-0.328, 0.398)***	***good***	***good***	*reasonable*
CanESM5 (r21i1p1f1)	0.524	*0.524 (0.39, 0.591)*	*0.191 (-0.121, 0.518)*	***good***	***good***	*reasonable*
CanESM5 (r21i1p2f1)	0.519	*0.519 (0.413, 0.587)*	*0.244 (-0.0857, 0.637)*	***good***	***good***	*reasonable*
CanESM5 (r22i1p1f1)	0.511	*0.511 (0.411, 0.572)*	*0.282 (-0.0457, 0.558)*	***good***	***good***	*reasonable*
CanESM5 (r22i1p2f1)	0.537	*0.537 (0.431, 0.607)*	*0.228 (-0.153, 0.572)*	***good***	***good***	*reasonable*
CanESM5 (r23i1p1f1)	0.58	*0.58 (0.448, 0.657)*	***0.0951 (-0.297, 0.449)***	***good***	***good***	*reasonable*
CanESM5 (r23i1p2f1)	0.501	*0.501 (0.38, 0.593)*	***0.0695 (-0.233, 0.267)***	***good***	***good***	*reasonable*
CanESM5 (r24i1p1f1)	0.458	***0.458 (0.338, 0.53)***	***-0.022 (-0.369, 0.321)***	***good***	***good***	***good***
CanESM5 (r24i1p2f1)	0.518	*0.518 (0.409, 0.591)*	***-0.0642 (-0.351, 0.178)***	***good***	***good***	*reasonable*
CanESM5 (r25i1p1f1)	0.462	***0.462 (0.33, 0.56)***	***-0.052 (-0.251, 0.166)***	***good***	***good***	***good***
CanESM5 (r25i1p2f1)	0.568	*0.568 (0.44, 0.682)*	***0.0297 (-0.203, 0.26)***	***good***	***good***	*reasonable*
CanESM5 (r2i1p1f1)	0.559	*0.559 (0.431, 0.653)*	*0.228 (-0.057, 0.449)*	***good***	***good***	*reasonable*
CanESM5 (r2i1p2f1)	0.492	*0.492 (0.38, 0.561)*	*0.194 (-0.0413, 0.579)*	***good***	***good***	*reasonable*

CanESM5 (r3i1p1f1)	*0.475*	*0.475 (0.379, 0.536)*	*0.221 (-0.193, 0.504)*	***good***	***good***	*reasonable*
CanESM5 (r3i1p2f1)	*0.578*	*0.578 (0.458, 0.668)*	*0.171 (-0.123, 0.451)*	***good***	***good***	*reasonable*
CanESM5 (r4i1p1f1)	*0.508*	*0.508 (0.396, 0.594)*	*0.147 (-0.405, 0.537)*	***good***	***good***	*reasonable*
CanESM5 (r4i1p2f1)	*0.502*	*0.502 (0.37, 0.592)*	*0.193 (-0.0392, 0.494)*	***good***	***good***	*reasonable*
CanESM5 (r5i1p1f1)	*0.605*	*0.605 (0.439, 0.707)*	*0.162 (-0.121, 0.392)*	***good***	***good***	*reasonable*
CanESM5 (r5i1p2f1)	*0.557*	*0.557 (0.431, 0.643)*	*0.246 (0.0062, 0.487)*	***good***	***good***	*reasonable*
CanESM5 (r6i1p1f1)	*0.501*	*0.501 (0.392, 0.589)*	***-0.0611 (-0.662, 0.403)***	***good***	***good***	*reasonable*
CanESM5 (r6i1p2f1)	*0.53*	*0.53 (0.405, 0.629)*	***0.0475 (-0.141, 0.274)***	***good***	***good***	*reasonable*
CanESM5 (r7i1p1f1)	*0.552*	*0.552 (0.423, 0.625)*	*0.174 (-0.213, 0.505)*	***good***	***good***	*reasonable*
CanESM5 (r7i1p2f1)	*0.603*	*0.603 (0.462, 0.71)*	***0.0404 (-0.346, 0.259)***	***good***	***good***	*reasonable*
CanESM5 (r8i1p1f1)	*0.567*	*0.567 (0.441, 0.645)*	*0.346 (-0.104, 0.672)*	***good***	***good***	*reasonable*
CanESM5 (r8i1p2f1)	*0.521*	*0.521 (0.38, 0.58)*	*0.369 (-0.167, 1.18)*	***good***	***good***	*reasonable*
CanESM5 (r9i1p1f1)	*0.605*	*0.605 (0.486, 0.68)*	*0.211 (-0.0678, 0.537)*	***good***	***good***	*bad*
CanESM5 (r9i1p2f1)	*0.574*	*0.574 (0.398, 0.691)*	*0.184 (-0.0769, 0.518)*	***good***	***good***	*reasonable*
EC-Earth3 (r1i1p1f1)	*0.518*	*0.518 (0.395, 0.604)*	*0.13 (-0.149, 0.384)*	***good***	***good***	*reasonable*
GFDL-ESM4 (r1i1p1f1)	*0.527*	*0.527 (0.389, 0.607)*	*0.405 (0.143, 0.722)*	*bad*	***good***	*bad*
HadGEM3-GC31-LL (r1i1p1f3)	*0.51*	*0.51 (0.401, 0.583)*	*0.149 (-0.116, 0.424)*	*reasonable*	***good***	*reasonable*
INM-CM4-8 (r1i1p1f1)	*0.462*	***0.462 (0.357, 0.539)***	*0.33 (0.00623, 0.629)*	*reasonable*	***good***	*reasonable*
IPSL-CM6A-LR (r10i1p1f1)	*0.394*	***0.394 (0.291, 0.472)***	*0.149 (-0.261, 0.503)*	***good***	*reasonable*	*reasonable*

IPSL-CM6A-LR (r11i1p1f1)	*0.414*	***0.414 (0.318, 0.477)***	***-0.0104 (-0.499, 0.42)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r14i1p1f1)	*0.419*	***0.419 (0.305, 0.487)***	***-0.052 (-0.388, 0.462)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r1i1p1f1)	*0.436*	***0.436 (0.313, 0.513)***	*0.118 (-0.184, 0.497)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r22i1p1f1)	*0.42*	***0.42 (0.334, 0.461)***	***0.0132 (-0.329, 0.427)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r25i1p1f1)	*0.384*	***0.384 (0.313, 0.442)***	*0.182 (-0.168, 0.478)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	*0.345*	***0.345 (0.256, 0.408)***	*0.228 (-0.036, 0.576)*	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r3i1p1f1)	*0.443*	***0.443 (0.352, 0.516)***	***0.0517 (-0.209, 0.247)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r4i1p1f1)	*0.386*	***0.386 (0.296, 0.446)***	***-0.0863 (-0.384, 0.125)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r5i1p1f1)	*0.4*	***0.4 (0.299, 0.455)***	***0.0872 (-0.274, 0.642)***	***good***	*reasonable*	*reasonable*
IPSL-CM6A-LR (r6i1p1f1)	*0.399*	***0.399 (0.296, 0.469)***	***0.0277 (-0.186, 0.335)***	***good***	*reasonable*	*reasonable*
MIROC6 (r10i1p1f1)	*0.36*	***0.36 (0.264, 0.43)***	***-0.0496 (-0.28, 0.153)***	***good***	***good***	***good***
MIROC6 (r11i1p1f1)	*0.419*	***0.419 (0.321, 0.488)***	***-0.0964 (-0.498, 0.144)***	***good***	***good***	***good***
MIROC6 (r12i1p1f1)	*0.365*	***0.365 (0.274, 0.44)***	***-0.166 (-0.38, 0.00974)***	***good***	***good***	***good***
MIROC6 (r13i1p1f1)	*0.408*	***0.408 (0.322, 0.464)***	***-0.0427 (-0.311, 0.229)***	***good***	***good***	***good***
MIROC6 (r14i1p1f1)	*0.396*	***0.396 (0.299, 0.471)***	***-0.278 (-0.666, 0.0474)***	***good***	***good***	***good***
MIROC6 (r15i1p1f1)	*0.369*	***0.369 (0.264, 0.435)***	***0.102 (-0.128, 0.481)***	***good***	***good***	***good***
MIROC6 (r16i1p1f1)	*0.319*	***0.319 (0.222, 0.392)***	***-0.164 (-0.542, 0.171)***	***good***	***good***	***good***
MIROC6 (r17i1p1f1)	*0.423*	***0.423 (0.337, 0.484)***	***0.0109 (-0.361, 0.266)***	***good***	***good***	***good***
MIROC6 (r18i1p1f1)	*0.388*	***0.388 (0.3, 0.446)***	*-0.337 (-0.651, -0.0542)*	***good***	***good***	*bad*
MIROC6 (r19i1p1f1)	*0.389*	***0.389 (0.307, 0.458)***	***-0.158 (-0.458, 0.00745)***	***good***	***good***	***good***
MIROC6 (r1i1p1f1)	*0.394*	***0.394 (0.304, 0.461)***	***-0.0762 (-0.296, 0.169)***	***good***	***good***	***good***

MIROC6 (r20i1p1f1)	*0.339*	***0.339 (0.267, 0.394)***	***0.0438 (-0.307, 0.341)***	***good***	***good***	***good***
MIROC6 (r21i1p1f1)	*0.407*	***0.407 (0.318, 0.465)***	***-0.101 (-0.339, 0.447)***	***good***	***good***	***good***
MIROC6 (r22i1p1f1)	*0.33*	***0.33 (0.246, 0.399)***	*-0.383 (-0.655, -0.186)*	***good***	***good***	*bad*
MIROC6 (r23i1p1f1)	*0.427*	***0.427 (0.335, 0.49)***	***-0.0852 (-0.47, 0.289)***	***good***	***good***	***good***
MIROC6 (r24i1p1f1)	*0.38*	***0.38 (0.271, 0.456)***	***-0.123 (-0.41, 0.0709)***	***good***	***good***	***good***
MIROC6 (r25i1p1f1)	*0.328*	***0.328 (0.23, 0.393)***	***-0.161 (-0.392, 0.0506)***	***good***	***good***	***good***
MIROC6 (r26i1p1f1)	*0.395*	***0.395 (0.309, 0.452)***	***-0.0672 (-0.399, 0.274)***	***good***	***good***	***good***
MIROC6 (r27i1p1f1)	*0.362*	***0.362 (0.265, 0.429)***	***-0.198 (-0.455, 0.0324)***	***good***	***good***	***good***
MIROC6 (r28i1p1f1)	*0.37*	***0.37 (0.274, 0.432)***	***-0.0352 (-0.265, 0.282)***	***good***	***good***	***good***
MIROC6 (r29i1p1f1)	*0.39*	***0.39 (0.306, 0.442)***	***0.0352 (-0.285, 0.311)***	***good***	***good***	***good***
MIROC6 (r2i1p1f1)	*0.326*	***0.326 (0.241, 0.391)***	***-0.157 (-0.608, 0.000472)***	***good***	***good***	***good***
MIROC6 (r30i1p1f1)	*0.378*	***0.378 (0.292, 0.433)***	***-0.0503 (-0.613, 0.281)***	***good***	***good***	***good***
MIROC6 (r31i1p1f1)	*0.293*	***0.293 (0.23, 0.343)***	***-0.234 (-0.507, -0.00561)***	***good***	***good***	***good***
MIROC6 (r32i1p1f1)	*0.343*	***0.343 (0.266, 0.392)***	***0.0519 (-0.18, 0.475)***	***good***	***good***	***good***
MIROC6 (r33i1p1f1)	*0.389*	***0.389 (0.301, 0.452)***	***-0.0739 (-0.365, 0.175)***	***good***	***good***	***good***
MIROC6 (r34i1p1f1)	*0.301*	***0.301 (0.236, 0.354)***	***-0.25 (-0.611, -0.0197)***	***good***	***good***	***good***
MIROC6 (r35i1p1f1)	*0.382*	***0.382 (0.274, 0.461)***	***-0.142 (-0.462, 0.156)***	***good***	***good***	***good***
MIROC6 (r36i1p1f1)	*0.389*	***0.389 (0.304, 0.445)***	***0.0242 (-0.314, 0.359)***	***good***	***good***	***good***
MIROC6 (r37i1p1f1)	*0.319*	***0.319 (0.247, 0.372)***	***-0.163 (-0.473, 0.0532)***	***good***	***good***	***good***
MIROC6 (r38i1p1f1)	*0.383*	***0.383 (0.307, 0.439)***	***-0.00869 (-0.256, 0.267)***	***good***	***good***	***good***
MIROC6 (r39i1p1f1)	*0.408*	***0.408 (0.318, 0.475)***	***-0.0427 (-0.447, 0.353)***	***good***	***good***	***good***

MIROC6 (r3i1p1f1)	*0.418*	***0.418 (0.314, 0.494)***	***-0.133 (-0.468, 0.164)***	***good***	***good***	***good***
MIROC6 (r40i1p1f1)	*0.406*	***0.406 (0.309, 0.474)***	***-0.0664 (-0.322, 0.149)***	***good***	***good***	***good***
MIROC6 (r41i1p1f1)	*0.371*	***0.371 (0.281, 0.445)***	***-0.142 (-0.499, 0.051)***	***good***	***good***	***good***
MIROC6 (r42i1p1f1)	*0.332*	***0.332 (0.234, 0.401)***	***-0.117 (-0.395, 0.107)***	***good***	***good***	***good***
MIROC6 (r43i1p1f1)	*0.464*	***0.464 (0.343, 0.535)***	*-0.355 (-0.64, 0.346)*	***good***	***good***	*reasonable*
MIROC6 (r44i1p1f1)	*0.376*	***0.376 (0.283, 0.441)***	***-0.272 (-0.545, -0.0475)***	***good***	***good***	***good***
MIROC6 (r45i1p1f1)	*0.359*	***0.359 (0.276, 0.418)***	***-0.103 (-0.403, 0.226)***	***good***	***good***	***good***
MIROC6 (r46i1p1f1)	*0.398*	***0.398 (0.301, 0.468)***	***-0.204 (-0.643, -0.0553)***	***good***	***good***	***good***
MIROC6 (r47i1p1f1)	*0.363*	***0.363 (0.264, 0.434)***	***-0.136 (-0.333, 0.0638)***	***good***	***good***	***good***
MIROC6 (r48i1p1f1)	*0.351*	***0.351 (0.262, 0.413)***	***-0.0186 (-0.419, 0.174)***	***good***	***good***	***good***
MIROC6 (r4i1p1f1)	*0.362*	***0.362 (0.222, 0.446)***	***-0.0542 (-0.264, 0.334)***	***good***	***good***	***good***
MIROC6 (r50i1p1f1)	*0.346*	***0.346 (0.273, 0.39)***	***-0.0174 (-0.328, 0.329)***	***good***	***good***	***good***
MIROC6 (r5i1p1f1)	*0.347*	***0.347 (0.264, 0.424)***	***-0.16 (-0.79, 0.118)***	***good***	***good***	***good***
MIROC6 (r6i1p1f1)	*0.372*	***0.372 (0.294, 0.433)***	***-0.257 (-0.548, 0.0554)***	***good***	***good***	***good***
MIROC6 (r7i1p1f1)	*0.336*	***0.336 (0.236, 0.393)***	***0.0999 (-0.243, 0.542)***	***good***	***good***	***good***
MIROC6 (r8i1p1f1)	*0.43*	***0.43 (0.313, 0.516)***	***0.0301 (-0.475, 0.28)***	***good***	***good***	***good***
MIROC6 (r9i1p1f1)	*0.336*	***0.336 (0.23, 0.404)***	***-0.194 (-0.465, 0.141)***	***good***	***good***	***good***
MPI-ESM1-2-LR (r1i1p1f1)	*0.61*	*0.61 (0.468, 0.687)*	*0.409 (0.0239, 1.23)*	*bad*	***good***	*bad*
MPI-ESM1-2-LR (r2i1p1f1)	*0.627*	*0.627 (0.514, 0.699)*	*0.153 (-0.378, 0.589)*	*bad*	***good***	*bad*
NorESM2-MM (r1i1p1f1)	*0.409*	***0.409 (0.298, 0.487)***	***-0.036 (-0.225, 0.221)***	***good***	***good***	***good***
NorESM2-MM (r2i1p1f1)	*0.38*	***0.38 (0.306, 0.441)***	***-0.153 (-0.693, 0.0796)***	***good***	***good***	***good***

TaiESM1 (r1i1p1f1)	0.266	*0.266 (0.181, 0.311)*	***-0.0591 (-0.346, 0.263)***	*reasonable*	***good***	*reasonable*

Table A2.5 Evaluation results of the climate models considered for attribution analysis of eff-pr-25 (Ontario Region). For each model, the best estimates of the Sigma parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	***Threshold for return period 4 yr***	***Sigma Parameter***	***Seasonal Cycle***	***Spatial Pattern***	***Conclusion***
ACCESS-CM2 (r1i1p1f1)	120	***120. (91.1, 149.)***	***good***	***good***	***good***
ACCESS-ESM1-5 (r1i1p1f1)	156	***156. (123., 181.)***	***good***	***good***	***good***
AWI-ESM-1-REcoM (r1i1p1f1)	155	***155. (128., 177.)***	***good***	***good***	***good***
BCC-CSM2-MR (r1i1p1f1)	144	***144. (109., 176.)***	***good***	***good***	***good***
CanESM5 (r1i1p1f1)	150	***150. (113., 184.)***	***good***	***good***	***good***
CanESM5 (r6i1p1f1)	187	***187. (140., 226.)***	***good***	***good***	***good***
EC-Earth3 (r1i1p1f1)	120	***120. (93.3, 140.)***	***good***	***good***	***good***
EC-Earth3-CC (r1i1p1f1)	121	***121. (99.5, 138.)***	***good***	***good***	***good***
EC-Earth3-Veg (r1i1p1f1)	159	***159. (117., 194.)***	***good***	***good***	***good***
EC-Earth3-Veg-LR (r1i1p1f1)	144	***144. (112., 168.)***	***good***	***good***	***good***
GFDL-ESM4 (r1i1p1f1)	127	***127. (96.5, 153.)***	***good***	***good***	***good***
HadGEM3-GC31-LL (r1i1p1f3)	174	***174. (136., 206.)***	***good***	***good***	***good***
HadGEM3-GC31-MM (r1i1p1f3)	153	***153. (109., 185.)***	***good***	***good***	***good***
INM-CM4-8 (r1i1p1f1)	134	***134. (102., 159.)***	*reasonable*	***good***	*reasonable*
INM-CM5-0 (r1i1p1f1)	119	***119. (99.3, 136.)***	*reasonable*	***good***	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	132	***132. (99.6, 159.)***	***good***	***good***	***good***
IPSL-CM6A-LR (r3i1p1f1)	115	***115. (78., 139.)***	***good***	***good***	***good***

KACE-1-0-G (r1i1p1f1)	188	***188. (147., 219.)***	*reasonable*	***good***	*reasonable*

Table A2.6 Evaluation results of the climate models considered for attribution analysis of eff-pr-25 (NWT Region). For each model, the best estimates of the Sigma parameters are shown, along with 95% confidence intervals. Furthermore evaluation of the seasonal cycle and spatial pattern are shown.

Model	***Threshold for return period 10 yr***	***Sigma Parameter***	***Seasonal Cycle***	***Spatial Pattern***	***Conclusion***
ACCESS-CM2 (r1i1p1f1)	65.5	*65.5 (49.8, 78.3)*	***good***	***good***	*reasonable*
ACCESS-ESM1-5 (r1i1p1f1)	90.8	***90.8 (68.7, 108.)***	***good***	***good***	***good***
AWI-ESM-1-REcoM (r1i1p1f1)	82	***82. (60.9, 98.9)***	***good***	***good***	***good***
BCC-CSM2-MR (r1i1p1f1)	64.3	*64.3 (51.7, 74.1)*	***good***	***good***	*reasonable*
CanESM5 (r1i1p1f1)	103	***103. (73.9, 130.)***	***good***	***good***	***good***
CanESM5 (r6i1p1f1)	87.6	***87.6 (68.4, 104.)***	***good***	***good***	***good***
EC-Earth3 (r1i1p1f1)	115	***115. (82.6, 139.)***	***good***	***good***	***good***
EC-Earth3-CC (r1i1p1f1)	90.6	***90.6 (71.7, 105.)***	***good***	***good***	***good***
EC-Earth3-Veg (r1i1p1f1)	77.4	***77.4 (58.8, 91.8)***	***good***	***good***	***good***
EC-Earth3-Veg-LR (r1i1p1f1)	97.8	***97.8 (69., 121.)***	***good***	***good***	***good***
GFDL-ESM4 (r1i1p1f1)	85.2	***85.2 (69., 97.8)***	***good***	***good***	***good***
HadGEM3-GC31-LL (r1i1p1f3)	84.6	***84.6 (67.3, 97.)***	***good***	***good***	***good***
HadGEM3-GC31-MM (r1i1p1f3)	82.8	***82.8 (67.7, 94.2)***	***good***	***good***	***good***
INM-CM4-8 (r1i1p1f1)	92.5	***92.5 (73.6, 108.)***	*reasonable*	***good***	*reasonable*
INM-CM5-0 (r1i1p1f1)	69.7	***69.7 (53.4, 80.7)***	*reasonable*	***good***	*reasonable*
IPSL-CM6A-LR (r2i1p1f1)	87	***87. (68.6, 102.)***	***good***	***good***	***good***

IPSL-CM6A-LR (r3i1p1f1)	97.1	***97.1 (80.8, 111.)***	***good***	***good***	***good***
KACE-1-0-G (r1i1p1f1)	104	***104. (70.5, 130.)***	***good***	***good***	***good***

A3 Estimated trends in climate models

This section shows Probability Ratios and change in intensity ΔI for models that passed model evaluation and also includes the values calculated from the fits with observations.

Table A3.1. Event magnitude, probability ratio and change in intensity for 15-year return period for DSR7x in Ontario for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2,8℃ above pre-industrial climate.

	0°C to 1.4°C		**1.4°C to 2.8°C**	
Model	**PR**	**dI**	**PR**	**dI**
ACCESS-CM2 (r1i1p1f1)	1.93 (0.596, 9.24)	0.84 (-0.607, 2.71)	3.12 (1.88, 4.96)	2.79 (1.17, 4.93)
ACCESS-CM2 (r2i1p1f1)	13.3 (2.69, 338.)	3.46 (1.37, 5.9)	3.87 (2.65, 5.82)	3.51 (2.07, 5.56)
CanESM5 (r10i1p1f1)	1.46 (0.745, 2.98)	0.565 (-0.433, 1.67)	2.22 (1.56, 3.06)	2.08 (0.909, 3.43)
CanESM5 (r10i1p2f1)	2.03 (1.05, 5.11)	1.4 (0.0866, 3.03)	1.81 (1.31, 2.63)	1.47 (0.58, 2.72)
CanESM5 (r12i1p2f1)	1.03 (0.5, 2.44)	0.0442 (-1.08, 1.56)	1.28 (0.792, 1.99)	0.545 (-0.36, 1.91)
CanESM5 (r13i1p2f1)	1.51 (0.807, 3.08)	0.598 (-0.277, 1.67)	1.94 (1.37, 2.89)	1.51 (0.586, 2.78)
CanESM5 (r14i1p1f1)	0.981 (0.512, 1.71)	-0.034 (-1.07, 1.08)	1.4 (1.01, 1.86)	0.726 (0.0191, 1.67)
CanESM5 (r14i1p2f1)	1.97 (0.946, 5.)	1.08 (-0.0971, 2.58)	1.97 (1.39, 2.71)	1.49 (0.516, 2.55)
CanESM5 (r17i1p1f1)	1.55 (0.672, 4.26)	0.621 (-0.514, 2.)	1.39 (0.902, 2.09)	0.532 (-0.134, 1.41)
CanESM5 (r17i1p2f1)	1.72 (0.871, 4.59)	0.918 (-0.226, 2.34)	1.7 (1.23, 2.28)	1.08 (0.349, 2.04)
CanESM5 (r18i1p1f1)	1.22 (0.628, 2.32)	0.32 (-0.678, 1.48)	1.99 (1.42, 2.74)	1.62 (0.673, 2.7)
CanESM5 (r18i1p2f1)	2.76 (1.23, 7.3)	1.79 (0.281, 3.72)	2.12 (1.58, 2.79)	1.8 (0.827, 3.08)
CanESM5 (r19i1p2f1)	0.91 (0.522, 1.65)	-0.211 (-1.26, 1.13)	1.51 (1.08, 2.14)	1.19 (0.194, 2.44)

CanESM5 (r20i1p2f1)	1.52 (0.751, 3.15)	0.647 (-0.375, 1.86)	2.06 (1.43, 3.08)	1.72 (0.677, 3.07)
CanESM5 (r21i1p1f1)	0.73 (0.361, 1.63)	-0.447 (-1.32, 0.676)	1.12 (0.729, 1.69)	0.174 (-0.384, 0.897)
CanESM5 (r21i1p2f1)	1.61 (0.782, 3.21)	0.988 (-0.457, 2.54)	1.91 (1.4, 2.6)	1.91 (0.804, 3.26)
CanESM5 (r22i1p2f1)	1.96 (1.18, 3.49)	1.45 (0.321, 2.85)	1.78 (1.37, 2.4)	1.56 (0.73, 2.75)
CanESM5 (r24i1p1f1)	1.69 (0.813, 4.16)	0.922 (-0.332, 2.56)	1.99 (1.39, 2.86)	1.76 (0.689, 3.3)
CanESM5 (r25i1p1f1)	2.62 (1.17, 7.75)	1.87 (0.286, 3.69)	2.09 (1.51, 2.96)	1.86 (0.869, 3.14)
CanESM5 (r25i1p2f1)	1.28 (0.646, 2.99)	0.446 (-0.701, 2.03)	1.49 (1.04, 2.08)	0.832 (0.0666, 1.87)
CanESM5 (r2i1p1f1)	2.19 (0.879, 9.01)	1.23 (-0.19, 3.23)	1.61 (1.07, 2.57)	0.906 (0.114, 1.94)
CanESM5 (r3i1p2f1)	3.13 (1.39, 9.56)	2.12 (0.588, 4.08)	2.13 (1.55, 3.13)	1.92 (0.939, 3.31)
CanESM5 (r4i1p1f1)	1.05 (0.538, 2.26)	0.0537 (-0.605, 0.868)	1.36 (0.876, 2.03)	0.397 (-0.149, 1.12)
CanESM5 (r4i1p2f1)	0.929 (0.544, 1.64)	-0.119 (-0.907, 0.852)	1.26 (0.878, 1.84)	0.433 (-0.209, 1.3)
CanESM5 (r6i1p1f1)	2.36 (1.03, 7.)	1.61 (0.0432, 3.6)	1.81 (1.3, 2.64)	1.45 (0.545, 2.79)
CanESM5 (r6i1p2f1)	1.46 (0.704, 3.88)	0.64 (-0.572, 2.29)	1.41 (1.01, 2.04)	0.665 (0.0139, 1.52)
CanESM5 (r7i1p1f1)	3.63 (1.51, 13.4)	1.83 (0.537, 3.58)	2.16 (1.5, 3.16)	1.68 (0.716, 2.88)
CanESM5 (r7i1p2f1)	0.689 (0.394, 1.28)	-0.634 (-1.44, 0.472)	1.14 (0.729, 1.63)	0.23 (-0.463, 1.03)
CanESM5 (r8i1p1f1)	2.08 (1.06, 4.47)	1.32 (0.103, 2.73)	1.5 (1.06, 2.13)	0.841 (0.0912, 1.89)
CanESM5 (r9i1p1f1)	2.04 (0.925, 4.92)	0.81 (-0.0836, 1.84)	2.44 (1.65, 3.5)	1.61 (0.758, 2.59)
CanESM5 (r9i1p2f1)	2.09 (1.09, 4.46)	1.29 (0.14, 2.57)	1.75 (1.23, 2.5)	1.21 (0.376, 2.24)
EC-Earth3 (r1i1p1f1)	0.577 (0.351, 1.01)	-1.19 (-2.17, 0.0185)	0.814 (0.518, 1.24)	-0.447 (-1.1, 0.58)
MIROC6 (r21i1p1f1)	1.62 (0.338, 16.5)	0.481 (-1.46, 1.95)	1.7 (0.449, 3.82)	0.699 (-0.709, 2.47)
MIROC6 (r27i1p1f1)	1.08 (0.297, 16.5)	0.0823 (-1.66, 1.9)	0.818 (0.179, 3.15)	-0.231 (-1.34, 1.98)

MIROC6 (r29i1p1f1)	7.06 (1.3, 89.5)	2.71 (0.434, 5.21)	2.83 (1.32, 5.66)	2.4 (0.484, 5.43)
MIROC6 (r2i1p1f1)	3.06 (0.45, 75.4)	1.35 (-1.19, 3.63)	2.3 (1.13, 4.32)	1.47 (0.159, 3.35)
MIROC6 (r38i1p1f1)	0.973 (0.23, 10.6)	-0.0349 (-2.39, 2.13)	0.716 (0.13, 2.18)	-0.384 (-1.54, 1.33)
MIROC6 (r39i1p1f1)	2.53 (0.472, 32.9)	1.35 (-1.28, 3.72)	4.37 (1.79, 8.08)	4.11 (1.09, 8.04)
MIROC6 (r44i1p1f1)	1.79 (0.353, 18.4)	0.805 (-1.59, 3.22)	1.72 (0.653, 3.81)	0.919 (-0.486, 3.16)
MIROC6 (r5i1p1f1)	6.85 (0.944, 877.)	2.53 (-0.07, 5.55)	3.43 (1.51, 6.45)	3.17 (0.706, 7.12)
MIROC6 (r7i1p1f1)	3.83 (0.701, 62.9)	1.48 (-0.46, 3.47)	3.66 (1.33, 7.95)	2.77 (0.427, 6.64)
NorESM2-MM (r2i1p1f1)	0.458 (0.183, 1.43)	-2.24 (-5.6, 0.974)	1.34 (0.531, 2.5)	0.871 (-1.3, 3.55)

Table A3.2. Event magnitude, probability ratio and change in intensity for 2-year return period for DSR7x in NWT for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2.8℃ above pre-industrial climate.

	0°C to 1.4°C		**1.4°C to 2.8°C**	
Model	**PR**	**dI**	**PR**	**dI**
CanESM5 (r11i1p2f1)	0.916 (0.74, 1.26)	-0.326 (-1.23, 0.804)	0.954 (0.743, 1.16)	-0.162 (-0.747, 0.709)
CanESM5 (r16i1p2f1)	1.08 (0.845, 1.46)	0.296 (-0.655, 1.37)	1.05 (0.834, 1.22)	0.192 (-0.544, 1.07)
CanESM5 (r23i1p2f1)	1.37 (0.99, 2.1)	1.07 (-0.036, 2.44)	1.1 (0.916, 1.27)	0.407 (-0.265, 1.36)
CanESM5 (r3i1p1f1)	0.768 (0.636, 1.01)	-1.08 (-1.95, 0.0216)	0.861 (0.673, 1.03)	-0.471 (-0.933, 0.111)
MIROC6 (r10i1p1f1)	1.73 (0.855, 7.37)	1.4 (-0.528, 3.72)	1.29 (0.799, 1.68)	1.09 (-0.568, 3.76)
MIROC6 (r13i1p1f1)	2.66 (1.05, 18.9)	2.44 (0.181, 5.19)	0.941 (0.472, 1.47)	-0.207 (-1.53, 2.52)
MIROC6 (r15i1p1f1)	2.94 (1.12, 24.7)	2.63 (0.365, 5.71)	1.34 (0.932, 1.7)	1.42 (-0.217, 4.32)
MIROC6 (r17i1p1f1)	3.93 (1.36, 24.8)	2.99 (0.849, 5.52)	1.5 (1.13, 1.79)	2.23 (0.426, 5.39)
MIROC6 (r19i1p1f1)	9.04 (2.29, 139.)	4.25 (2.06, 7.06)	1.78 (1.52, 1.94)	4.85 (2.34, 8.67)
MIROC6 (r20i1p1f1)	9.82 (2.25, 59900.)	3.6 (1.68, 5.87)	1.75 (1.48, 1.9)	4.63 (2., 9.06)

MIROC6 (r21i1p1f1)	3. (1.09, 12.5)	2.54 (0.259, 4.51)	1.43 (0.991, 1.74)	1.84 (-0.0297, 4.86)
MIROC6 (r24i1p1f1)	33.9 (3.39, 861000.)	4.95 (2.49, 7.76)	1.69 (1.3, 1.91)	3.84 (1.08, 8.93)
MIROC6 (r26i1p1f1)	6.2 (1.79, 96.5)	3.62 (1.52, 6.01)	1.5 (1.11, 1.77)	2.61 (0.377, 5.92)
MIROC6 (r28i1p1f1)	1.19 (0.695, 3.15)	0.519 (-1.54, 2.54)	1.37 (0.976, 1.66)	1.54 (-0.0782, 3.65)
MIROC6 (r29i1p1f1)	2.42 (0.992, 12.)	2.32 (-0.0299, 4.81)	1.62 (1.31, 1.8)	4.15 (1.44, 7.43)
MIROC6 (r2i1p1f1)	1.83 (0.876, 7.35)	1.59 (-0.52, 3.79)	1.46 (1.15, 1.7)	2.23 (0.553, 4.41)
MIROC6 (r30i1p1f1)	3.1 (1.16, 23.3)	2.58 (0.429, 5.17)	1.55 (1.11, 1.82)	2.74 (0.385, 6.28)
MIROC6 (r32i1p1f1)	3.95 (1.5, 26.7)	2.75 (1.06, 4.71)	1.64 (1.28, 1.84)	3.34 (1., 5.93)
MIROC6 (r33i1p1f1)	1.44 (0.767, 4.65)	1.02 (-1.01, 3.12)	1.22 (0.769, 1.6)	0.799 (-0.684, 2.92)
MIROC6 (r36i1p1f1)	1.41 (0.803, 3.76)	1.02 (-0.8, 3.13)	1.38 (1.01, 1.65)	1.62 (0.0294, 3.68)
MIROC6 (r37i1p1f1)	1.67 (0.798, 5.65)	1.29 (-0.74, 3.29)	1.33 (0.901, 1.69)	1.19 (-0.28, 3.47)
MIROC6 (r38i1p1f1)	5.62 (1.29, 143.)	2.98 (0.689, 4.94)	1.53 (1.14, 1.78)	2.48 (0.462, 5.52)
MIROC6 (r39i1p1f1)	1.64 (0.809, 9.43)	1.36 (-0.822, 4.)	1.28 (0.855, 1.62)	1.11 (-0.462, 3.52)
MIROC6 (r40i1p1f1)	6.38 (1.96, 71.3)	3.56 (1.58, 5.95)	1.73 (1.46, 1.9)	4.42 (1.91, 8.17)
MIROC6 (r42i1p1f1)	5.23 (2.14, 21.3)	3.57 (1.91, 5.47)	1.61 (1.32, 1.84)	3.06 (1.25, 6.11)
MIROC6 (r44i1p1f1)	5.37 (1.39, 47.7)	3.46 (0.926, 5.98)	1.4 (0.983, 1.77)	1.59 (-0.0529, 4.71)
MIROC6 (r45i1p1f1)	1.35 (0.828, 3.27)	0.872 (-0.725, 2.51)	1.17 (0.844, 1.48)	0.622 (-0.478, 2.12)
MIROC6 (r47i1p1f1)	3.89 (1.51, 19.7)	2.79 (1.09, 4.58)	1.44 (1.06, 1.75)	1.88 (0.205, 4.4)
MIROC6 (r48i1p1f1)	4.71 (1.78, 22.7)	3.28 (1.39, 5.33)	1.64 (1.26, 1.87)	3.26 (0.944, 6.85)
MIROC6 (r4i1p1f1)	1.68 (0.88, 6.)	1.41 (-0.437, 3.51)	1.17 (0.758, 1.56)	0.634 (-0.752, 2.91)
MIROC6 (r50i1p1f1)	1.92 (0.911, 6.76)	1.59 (-0.291, 3.55)	1.65 (1.29, 1.85)	3.48 (1.03, 6.99)
MIROC6 (r7i1p1f1)	4.1 (1.56, 22.)	3.08 (1.19, 5.28)	1.54 (1.22, 1.8)	2.63 (0.743, 5.27)

MIROC6 (r8i1p1f1)	2.78 (1.06, 13.2)	2.4 (0.171, 4.75)	1.54 (1.16, 1.82)	2.61 (0.563, 6.02)
MIROC6 (r9i1p1f1)	3.94 (1.6, 14.6)	2.84 (1.21, 4.46)	1.54 (1.22, 1.77)	2.6 (0.84, 5.06)
NorESM2-MM (r1i1p1f1)	3.33 (1.28, 11.6)	0.793 (0.212, 1.29)	1.75 (1.53, 1.91)	1.36 (0.731, 2.1)
NorESM2-MM (r2i1p1f1)	5.48 (1.99, 21.5)	1.16 (0.523, 1.81)	1.57 (1.25, 1.82)	0.83 (0.296, 1.62)

Table A3.3. Event magnitude, probability ratio and change in intensity for 6-year return period for DSR30x in Ontario for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2.8℃ above pre-industrial climate.

	0°C to 1.4°C		**1.4°C to 2.8°C**	
Model	**PR**	**dI**	**PR**	**dI**
ACCESS-CM2 (r2i1p1f1)	14. (3.32, 258.)	2.13 (0.988, 3.39)	4.08 (2.81, 6.37)	2.16 (1.34, 3.42)
CanESM5 (r10i1p2f1)	2.27 (1.17, 5.44)	1.08 (0.174, 2.21)	1.98 (1.44, 2.81)	1.18 (0.525, 2.13)
CanESM5 (r13i1p2f1)	1.67 (0.895, 3.68)	0.443 (-0.0962, 1.14)	2.07 (1.4, 3.24)	1. (0.383, 1.81)
CanESM5 (r16i1p1f1)	2.66 (1.3, 5.75)	1.11 (0.271, 2.11)	1.95 (1.41, 2.73)	1. (0.436, 1.76)
CanESM5 (r17i1p1f1)	1.52 (0.728, 4.09)	0.348 (-0.245, 1.11)	1.41 (0.955, 2.1)	0.347 (-0.0329, 0.855)
CanESM5 (r18i1p1f1)	1.19 (0.658, 2.2)	0.189 (-0.404, 0.912)	2.03 (1.46, 2.79)	1.05 (0.472, 1.71)
CanESM5 (r18i1p2f1)	3.92 (1.58, 19.3)	1.29 (0.39, 2.6)	2.36 (1.77, 3.16)	1.17 (0.6, 1.87)
CanESM5 (r19i1p1f1)	0.945 (0.387, 2.66)	-0.0424 (-0.633, 0.719)	1.98 (1.23, 2.97)	0.791 (0.203, 1.51)
CanESM5 (r19i1p2f1)	1.16 (0.643, 2.15)	0.176 (-0.47, 0.964)	1.66 (1.14, 2.37)	0.8 (0.186, 1.5)
CanESM5 (r20i1p2f1)	1.74 (0.84, 3.74)	0.563 (-0.154, 1.38)	2.06 (1.51, 2.86)	1.1 (0.525, 1.92)
CanESM5 (r21i1p2f1)	1.38 (0.704, 2.5)	0.473 (-0.471, 1.44)	1.84 (1.36, 2.53)	1.27 (0.543, 2.21)
CanESM5 (r22i1p1f1)	2.52 (1.35, 5.94)	1.02 (0.272, 1.94)	2.18 (1.64, 3.02)	1.22 (0.645, 2.02)
CanESM5 (r23i1p2f1)	3.51 (1.81, 7.44)	1.54 (0.702, 2.56)	1.84 (1.36, 2.48)	0.89 (0.366, 1.56)
CanESM5 (r24i1p1f1)	2.4 (0.998, 8.51)	0.925 (-0.00182, 2.06)	2.39 (1.57, 3.63)	1.44 (0.634, 2.5)

CanESM5 (r25i1p1f1)	2.29 (1.09, 5.11)	1.09 (0.122, 2.18)	2.23 (1.66, 3.04)	1.39 (0.734, 2.21)
CanESM5 (r2i1p1f1)	2.79 (0.964, 10.6)	0.892 (-0.0229, 2.07)	1.89 (1.19, 2.98)	0.748 (0.173, 1.51)
CanESM5 (r2i1p2f1)	6.55 (2.58, 25.4)	2.05 (1.04, 3.12)	2.71 (1.87, 4.23)	1.73 (0.993, 2.82)
CanESM5 (r3i1p1f1)	3.67 (1.59, 11.1)	1.32 (0.457, 2.29)	2.14 (1.47, 3.21)	1.16 (0.511, 2.11)
CanESM5 (r3i1p2f1)	2.87 (1.35, 8.44)	1.23 (0.318, 2.46)	2.15 (1.61, 3.16)	1.25 (0.664, 2.12)
CanESM5 (r4i1p1f1)	0.906 (0.498, 1.66)	-0.0637 (-0.432, 0.352)	1.26 (0.834, 1.85)	0.184 (-0.114, 0.578)
CanESM5 (r4i1p2f1)	1.16 (0.727, 1.84)	0.169 (-0.327, 0.737)	1.38 (1., 1.92)	0.429 (0.00314, 0.988)
CanESM5 (r5i1p1f1)	1.32 (0.647, 2.84)	0.23 (-0.313, 0.912)	1.45 (0.962, 2.07)	0.394 (-0.0322, 0.98)
CanESM5 (r6i1p1f1)	3.4 (1.29, 17.4)	1.16 (0.233, 2.28)	1.89 (1.29, 2.99)	0.857 (0.285, 1.69)
CanESM5 (r6i1p2f1)	1.34 (0.625, 3.47)	0.26 (-0.365, 1.1)	1.47 (1., 2.19)	0.418 (0.00164, 0.974)
CanESM5 (r7i1p1f1)	2.42 (0.971, 7.2)	0.745 (-0.0225, 1.75)	2.16 (1.53, 3.03)	0.989 (0.443, 1.68)
CanESM5 (r9i1p1f1)	2.06 (0.927, 5.93)	0.494 (-0.0497, 1.17)	2.37 (1.65, 3.58)	0.988 (0.452, 1.71)
CanESM5 (r9i1p2f1)	2. (1.09, 4.37)	0.931 (0.117, 1.84)	1.89 (1.36, 2.72)	1.08 (0.436, 1.93)
MIROC6 (r19i1p1f1)	2.31 (0.449, 88.3)	0.6 (-0.728, 1.93)	1.48 (0.475, 3.59)	0.345 (-0.502, 1.55)
MIROC6 (r20i1p1f1)	4.48 (0.964, 198.)	1.21 (-0.0378, 2.68)	3.24 (1.68, 6.17)	1.58 (0.584, 3.27)
MIROC6 (r21i1p1f1)	2.68 (0.365, 86.1)	0.548 (-0.828, 1.57)	2.72 (0.776, 5.28)	0.961 (-0.152, 2.21)
MIROC6 (r24i1p1f1)	1.46 (0.423, 7.45)	0.39 (-1., 1.84)	2.52 (0.976, 5.22)	1.33 (-0.0286, 3.27)
MIROC6 (r2i1p1f1)	3.56 (0.449, 167.)	0.986 (-0.774, 2.67)	2.66 (1.28, 4.97)	1.23 (0.217, 2.72)
MIROC6 (r32i1p1f1)	0.705 (0.188, 6.74)	-0.3 (-1.68, 1.18)	1.74 (0.459, 4.81)	0.597 (-0.527, 2.55)
MIROC6 (r38i1p1f1)	0.812 (0.214, 5.32)	-0.187 (-1.72, 1.22)	0.804 (0.171, 2.17)	-0.173 (-0.955, 0.833)
MIROC6 (r39i1p1f1)	1.9 (0.415, 16.8)	0.641 (-1.02, 2.22)	3.62 (1.28, 7.97)	2.33 (0.306, 5.49)

MIROC6 (r43i1p1f1)	0.581 (0.2, 2.18)	-0.542 (-1.88, 0.705)	0.903 (0.244, 2.3)	-0.094 (-0.903, 0.988)
MIROC6 (r44i1p1f1)	1.75 (0.393, 13.2)	0.499 (-0.939, 1.98)	1.88 (0.661, 4.25)	0.72 (-0.324, 2.41)
MIROC6 (r5i1p1f1)	4.1 (0.639, 65.5)	1.24 (-0.397, 3.07)	3.51 (1.45, 6.44)	2.13 (0.392, 4.67)
MIROC6 (r7i1p1f1)	2.94 (0.728, 22.)	0.965 (-0.343, 2.36)	2.92 (1.21, 6.97)	1.65 (0.201, 4.44)

Table A3.4. Event magnitude, probability ratio and change in intensity for 6-year return period for DSR30x in NWT for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2.8℃ above pre-industrial climate.

	0°C to 1.4°C		1.4°C to 2.8°C	
Model	PR	dI	PR	dI
CanESM5 (r16i1p2f1)	1.1 (0.849, 1.5)	0.233 (-0.406, 0.973)	1.04 (0.833, 1.22)	0.115 (-0.348, 0.736)
CanESM5 (r24i1p1f1)	0.856 (0.679, 1.19)	-0.342 (-0.841, 0.363)	0.963 (0.754, 1.16)	-0.0785 (-0.412, 0.428)
CanESM5 (r25i1p1f1)	0.939 (0.736, 1.3)	-0.158 (-0.79, 0.6)	0.822 (0.62, 1.02)	-0.361 (-0.634, 0.0499)
MIROC6 (r10i1p1f1)	1.6 (0.781, 7.78)	0.881 (-0.575, 2.74)	1.34 (0.857, 1.72)	0.938 (-0.297, 3.18)
MIROC6 (r11i1p1f1)	3.9 (1.28, 24.9)	2.18 (0.532, 3.95)	1.45 (1.02, 1.76)	1.55 (0.0584, 4.)
MIROC6 (r12i1p1f1)	1.69 (0.922, 5.31)	1. (-0.199, 2.34)	1.53 (1.17, 1.73)	2.18 (0.444, 4.28)
MIROC6 (r13i1p1f1)	2.47 (0.969, 15.5)	1.64 (-0.0805, 3.61)	0.981 (0.475, 1.51)	-0.0485 (-1.03, 2.07)
MIROC6 (r14i1p1f1)	8.81 (1.85, 426.)	2.9 (1.15, 4.79)	1.7 (1.43, 1.88)	3.46 (1.42, 6.99)
MIROC6 (r15i1p1f1)	3.19 (1.2, 16.1)	2.09 (0.437, 4.11)	1.34 (0.903, 1.71)	1.03 (-0.231, 3.22)
MIROC6 (r16i1p1f1)	0.888 (0.637, 1.78)	-0.273 (-1.36, 0.983)	1.07 (0.641, 1.46)	0.152 (-0.655, 1.29)
MIROC6 (r17i1p1f1)	4.06 (1.36, 24.4)	2.22 (0.621, 4.02)	1.48 (1.05, 1.77)	1.53 (0.124, 3.83)
MIROC6 (r19i1p1f1)	7.26 (2., 95.5)	2.93 (1.35, 5.05)	1.74 (1.45, 1.92)	3.52 (1.54, 6.57)
MIROC6 (r1i1p1f1)	0.689 (0.553, 1.13)	-1.17 (-2.64, 0.283)	1.23 (0.92, 1.49)	0.663 (-0.199, 1.69)
MIROC6 (r20i1p1f1)	6.84 (1.64, 493.)	2.32 (0.81, 4.04)	1.74 (1.46, 1.89)	3.16 (1.26, 6.52)

MIROC6 (r21i1p1f1)	3.37 (1.09, 20.)	1.98 (0.182, 3.66)	1.43 (0.958, 1.78)	1.36 (-0.0961, 4.03)
MIROC6 (r23i1p1f1)	1.05 (0.649, 2.47)	0.123 (-1.36, 1.66)	1.15 (0.668, 1.57)	0.411 (-0.689, 2.19)
MIROC6 (r24i1p1f1)	22.9 (3.77, 455.)	3.74 (2.05, 5.65)	1.73 (1.4, 1.92)	3.38 (1.17, 7.6)
MIROC6 (r25i1p1f1)	1.5 (0.81, 4.13)	0.801 (-0.526, 2.21)	1.42 (1.04, 1.71)	1.31 (0.0904, 2.97)
MIROC6 (r26i1p1f1)	5.01 (1.71, 38.1)	2.58 (1.05, 4.34)	1.48 (1.04, 1.78)	1.75 (0.089, 4.31)
MIROC6 (r27i1p1f1)	5.25 (1.79, 25.5)	2.28 (0.998, 3.56)	1.75 (1.56, 1.9)	3.49 (1.93, 5.62)
MIROC6 (r28i1p1f1)	1.29 (0.692, 4.1)	0.534 (-1.1, 2.15)	1.41 (1.02, 1.7)	1.27 (0.042, 2.92)
MIROC6 (r29i1p1f1)	2.08 (0.951, 6.98)	1.43 (-0.134, 3.03)	1.63 (1.33, 1.8)	3.02 (1.13, 5.45)
MIROC6 (r2i1p1f1)	1.72 (0.872, 6.57)	1.06 (-0.37, 2.64)	1.43 (1.1, 1.68)	1.49 (0.265, 3.13)
MIROC6 (r30i1p1f1)	6.06 (1.6, 103.)	2.51 (0.852, 4.43)	1.64 (1.3, 1.85)	2.67 (0.857, 5.43)
MIROC6 (r31i1p1f1)	3.77 (1.52, 15.)	2.13 (0.82, 3.5)	1.57 (1.24, 1.83)	1.99 (0.654, 4.01)
MIROC6 (r32i1p1f1)	4.51 (1.77, 24.9)	2.24 (1.03, 3.63)	1.7 (1.4, 1.87)	3.01 (1.16, 5.2)
MIROC6 (r33i1p1f1)	1.34 (0.719, 4.48)	0.598 (-0.958, 2.21)	1.21 (0.768, 1.61)	0.54 (-0.485, 2.13)
MIROC6 (r34i1p1f1)	1.61 (0.869, 4.51)	0.874 (-0.339, 2.13)	1.45 (1.08, 1.71)	1.4 (0.199, 2.92)
MIROC6 (r35i1p1f1)	2.04 (1.07, 5.62)	1.26 (0.157, 2.66)	1.47 (1.11, 1.79)	1.41 (0.26, 3.24)
MIROC6 (r36i1p1f1)	1.76 (0.911, 5.21)	1.18 (-0.241, 2.89)	1.44 (1.12, 1.7)	1.57 (0.334, 3.43)
MIROC6 (r37i1p1f1)	1.91 (0.92, 5.93)	1.13 (-0.191, 2.39)	1.38 (0.985, 1.7)	1.07 (-0.0323, 2.76)
MIROC6 (r38i1p1f1)	4.3 (1.23, 33.7)	2.14 (0.425, 3.71)	1.51 (1.1, 1.8)	1.74 (0.242, 4.21)
MIROC6 (r39i1p1f1)	2.43 (0.961, 25.8)	1.58 (-0.104, 3.57)	1.35 (0.916, 1.67)	1.15 (-0.199, 3.24)
MIROC6 (r3i1p1f1)	13.1 (2.93, 162.)	3.61 (1.92, 5.42)	1.58 (1.28, 1.79)	2.4 (0.878, 4.61)
MIROC6 (r40i1p1f1)	7.17 (1.87, 102.)	2.68 (1.05, 4.66)	1.72 (1.43, 1.9)	3.22 (1.29, 6.36)
MIROC6 (r41i1p1f1)	1.97 (0.846, 10.)	1.13 (-0.409, 2.54)	1.27 (0.813, 1.63)	0.692 (-0.357, 2.36)
MIROC6 (r42i1p1f1)	4.89 (2.09, 18.8)	2.49 (1.31, 3.85)	1.53 (1.22, 1.79)	1.92 (0.595, 4.2)

MIROC6 (r44i1p1f1)	5.33 (1.49, 34.6)	2.57 (0.818, 4.43)	1.4 (0.979, 1.76)	1.25 (-0.0525, 3.77)
MIROC6 (r45i1p1f1)	1.55 (0.863, 4.32)	0.927 (-0.438, 2.27)	1.23 (0.921, 1.55)	0.68 (-0.195, 2.08)
MIROC6 (r46i1p1f1)	23.2 (3.28, 1390.)	3.92 (1.94, 6.01)	1.83 (1.62, 1.94)	5.51 (2.59, 9.99)
MIROC6 (r47i1p1f1)	3.21 (1.4, 14.3)	1.81 (0.672, 3.1)	1.41 (1.04, 1.71)	1.25 (0.0997, 3.)
MIROC6 (r48i1p1f1)	6.52 (2.28, 25.)	2.86 (1.41, 4.34)	1.69 (1.32, 1.93)	2.68 (0.829, 5.75)
MIROC6 (r4i1p1f1)	1.59 (0.854, 5.23)	0.944 (-0.423, 2.65)	1.18 (0.779, 1.58)	0.486 (-0.488, 2.24)
MIROC6 (r50i1p1f1)	1.57 (0.858, 4.08)	0.836 (-0.32, 2.13)	1.63 (1.29, 1.85)	2.31 (0.747, 4.65)
MIROC6 (r5i1p1f1)	5.94 (1.88, 44.8)	2.58 (1.15, 4.06)	1.64 (1.31, 1.83)	2.61 (0.904, 4.96)
MIROC6 (r6i1p1f1)	1.5 (0.835, 4.21)	0.859 (-0.504, 2.4)	1.14 (0.692, 1.51)	0.378 (-0.641, 1.96)
MIROC6 (r7i1p1f1)	4.13 (1.72, 16.5)	2.29 (1.02, 3.85)	1.56 (1.19, 1.84)	1.96 (0.51, 4.27)
MIROC6 (r8i1p1f1)	3.36 (1.15, 15.)	1.94 (0.309, 3.65)	1.63 (1.23, 1.89)	2.39 (0.61, 5.64)
MIROC6 (r9i1p1f1)	4.96 (1.93, 18.5)	2.36 (1.18, 3.58)	1.58 (1.26, 1.82)	2.16 (0.713, 4.25)
NorESM2-MM (r1i1p1f1)	2.95 (1.25, 9.77)	0.445 (0.117, 0.756)	1.73 (1.48, 1.89)	0.787 (0.384, 1.31)
NorESM2-MM (r2i1p1f1)	8.27 (2.58, 87.3)	0.762 (0.387, 1.24)	1.63 (1.38, 1.83)	0.57 (0.259, 1.04)

Table A3.5. Event magnitude, probability ratio and change in intensity for 4-year return period for eff-pr-24 in Ontario for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2.8℃ above pre-industrial climate.

	0°C to 1.4°C		1.4°C to 2.8°C	
Model	PR	dI	PR	dI
ACCESS-CM2 (r1i1p1f1)	5.49 (1., 2.2)	-110. (-56.1, -0.0422)	1.03 (1., 1.42)	-2.91 (-33.4, -0.00708)
ACCESS-ESM1-5 (r1i1p1f1)	1. (1., 1.01)	-0.0383 (-1.36, 0.0674)	1.02 (1., 1.04)	-2.5 (-5.48, -0.0302)
AWI-ESM-1-REcoM (r1i1p1f1)	1.02 (1., 1.06)	-2.03 (-7.52, -0.0215)	1.02 (1., 1.06)	-2.39 (-8.54, 0.00764)
BCC-CSM2-MR (r1i1p1f1)	1.01 (1., 1.04)	-1.22 (-4.55,	1.02 (1., 1.06)	-2.07 (-7.72,

		-0.0061)		-0.0285)
CanESM5 (r1i1p1f1)	1.03 (0.994, 1.06)	-3.64 (-6.2, 0.7)	1.06 (1.03, 1.14)	-7.22 (-15.9, -3.07)
CanESM5 (r6i1p1f1)	0.985 (0.962, 1.)	1.93 (-0.0658, 5.2)	1.03 (1., 1.06)	-3.57 (-8.09, 0.019)
EC-Earth3 (r1i1p1f1)	0.486 (0.365, 0.768)	93.9 (30.4, 149.)	0.392 (0.237, 0.595)	81.8 (49.2, 115.)
EC-Earth3-CC (r1i1p1f1)	0.984 (0.937, 1.)	1.92 (0.0525, 7.24)	0.957 (0.894, 0.979)	5.18 (2.48, 13.)
EC-Earth3-Veg (r1i1p1f1)	0.989 (0.937, 1.)	1.19 (-0.0257, 7.31)	0.948 (0.898, 0.982)	5.92 (1.97, 11.9)
EC-Earth3-Veg-LR (r1i1p1f1)	0.779 (0.939, 1.)	27. (0.0278, 6.86)	0.996 (0.933, 1.)	0.426 (-0.0245, 6.73)
GFDL-ESM4 (r1i1p1f1)	1. (1., 1.01)	-0.0351 (-1.55, 0.0343)	1. (0.986, 1.02)	-0.00261 (-2.1, 1.64)
HadGEM3-GC31-LL (r1i1p1f3)	1.02 (1.01, 1.05)	-3.12 (-6.25, -1.34)	1.08 (1.04, 1.19)	-11.8 (-27.7, -6.17)
HadGEM3-GC31-MM (r1i1p1f3)	1.01 (1.01, 1.06)	-1.77 (-6.98, -0.826)	1.08 (1.05, 1.16)	-10.9 (-18.9, -6.6)
IPSL-CM6A-LR (r2i1p1f1)	1. (0.96, 1.01)	0.0207 (-1.41, 4.27)	0.993 (0.933, 1.02)	0.695 (-1.91, 7.19)
IPSL-CM6A-LR (r3i1p1f1)	1. (0.98, 1.01)	0.00293 (-1.57, 2.22)	0.989 (0.922, 1.)	1.15 (-0.0479, 8.66)

Table A3.1. Event magnitude, probability ratio and change in intensity for 10-year return period for eff-pr-24 in NWT for observational datasets and each model that passed the evaluation tests. (a) from pre-industrial climate to the present and (b) from the present to 2.8℃ above pre-industrial climate.

	0°C to 1.4°C		1.4°C to 2.8°C	
Model	PR	dI	PR	dI
ACCESS-ESM1-5 (r1i1p1f1)	1. (0.884, 1.26)	-0.00362 (-9.94, 5.78)	1. (0.937, 1.37)	-0.0346 (-14.5, 3.01)
AWI-ESM-1-REcoM (r1i1p1f1)	1. (0.839, 1.06)	0.0184 (-3.01, 9.21)	0.968 (0.526, 1.)	1.65 (0.00969, 28.1)
CanESM5 (r1i1p1f1)	0.934 (0.446, 1.)	3.87 (0.0158, 49.8)	0.938 (0.58, 0.979)	3.54 (1.1, 27.7)
CanESM5 (r6i1p1f1)	0.986 (0.673, 1.05)	0.69 (-1.94, 19.1)	0.636 (0.447, 0.945)	21. (2.96, 33.9)
EC-Earth3 (r1i1p1f1)	0.53 (0.267, 1.33)	37.9 (-15.2, 87.)	0.377 (0.201, 0.606)	46.3 (25., 68.3)

EC-Earth3-CC (r1i1p1f1)	1. (0.766, 1.14)	0.0141 (-6.43, 13.1)	0.934 (0.448, 1.)	3.66 (-0.00407, 36.6)
EC-Earth3-Veg (r1i1p1f1)	1. (0.836, 1.07)	0.00837 (-3.38, 9.05)	0.944 (0.445, 0.99)	3.03 (0.541, 36.2)
EC-Earth3-Veg-LR (r1i1p1f1)	0.951 (0.345, 0.999)	2.8 (0.0759, 69.2)	0.966 (0.43, 0.994)	1.89 (0.345, 39.5)
GFDL-ESM4 (r1i1p1f1)	1. (0.999, 1.04)	-0.00733 (-2.42, 0.0329)	1. (0.885, 1.05)	0.0155 (-2.6, 6.9)
HadGEM3-GC31-LL (r1i1p1f3)	1. (0.908, 1.23)	-0.00566 (-9.41, 4.58)	1.07 (1., 1.7)	-3.14 (-26.4, -0.0146)
HadGEM3-GC31-MM (r1i1p1f3)	1.01 (1., 1.59)	-0.516 (-19.8, 0.0158)	1.06 (1., 1.98)	-2.87 (-35.3, -0.0115)
IPSL-CM6A-LR (r2i1p1f1)	1.02 (0.987, 1.23)	-1.26 (-10.6, 0.688)	0.778 (0.462, 0.982)	13.4 (0.961, 38.4)
IPSL-CM6A-LR (r3i1p1f1)	0.934 (0.339, 0.998)	3.82 (0.116, 69.8)	0.948 (0.483, 0.999)	2.88 (0.0484, 36.4)
KACE-1-0-G (r1i1p1f1)	1.15 (1.04, 6.28)	-7.29 (-68.2, -2.01)	1.33 (1.14, 2.03)	-16.8 (-41.7, -7.75)

WILL BE ADDED BEFORE PUBLICATION OF THE REPORT – AVAILABLE ON REQUEST.

A4 Synthesis figures for change in intensity

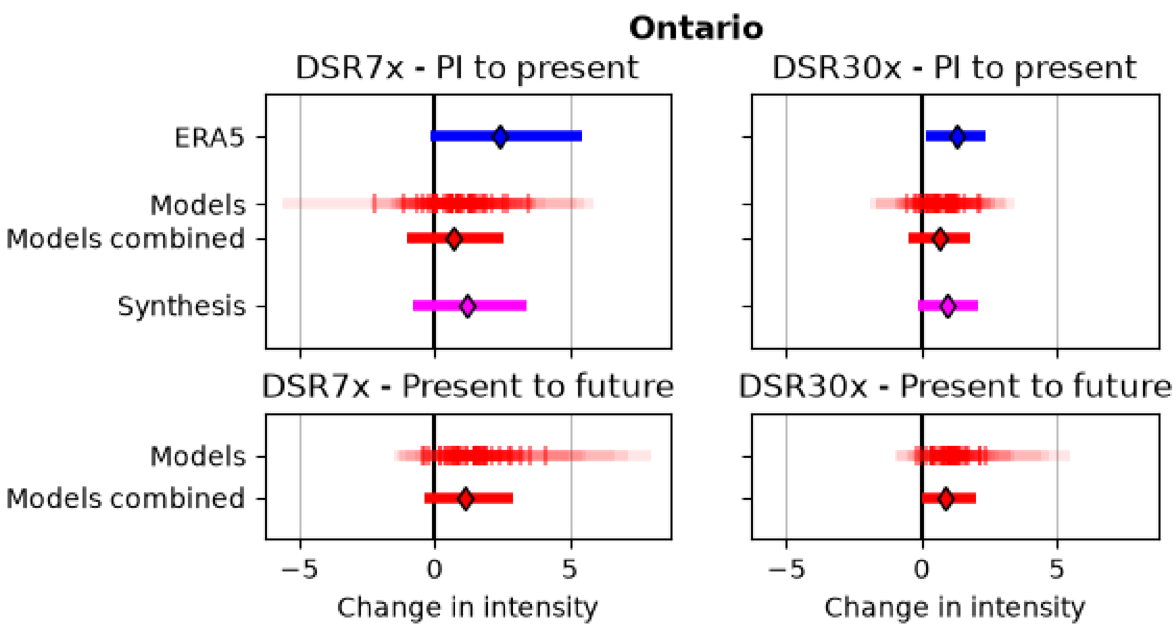

Figure A4.1: *As Figure 3.2.1, but for absolute change in intensity.*

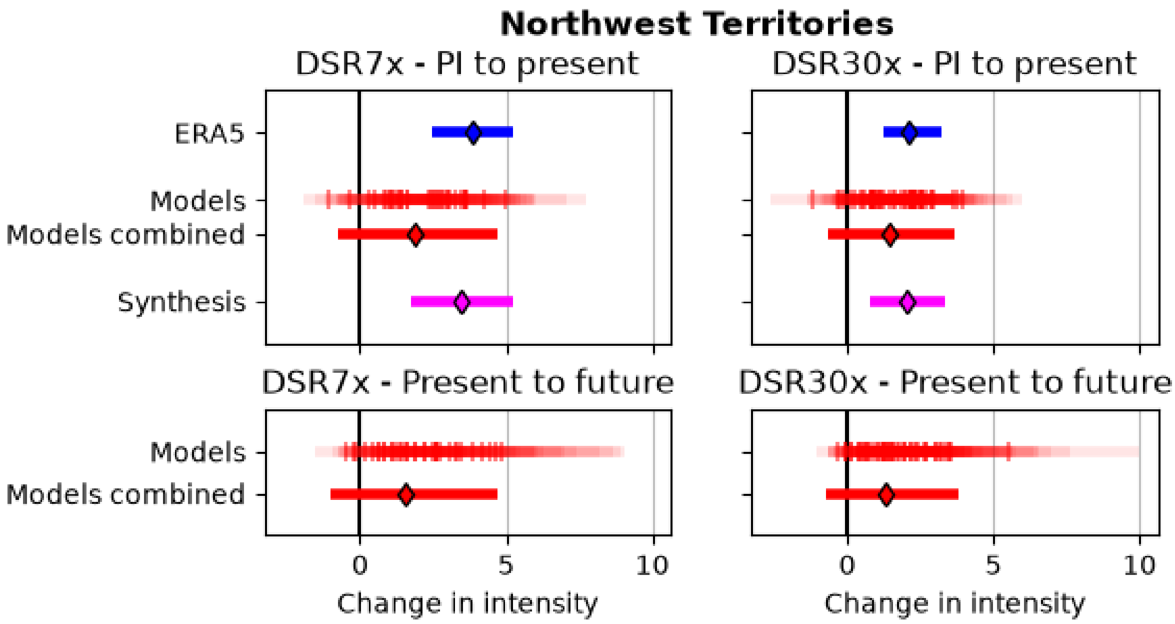

Figure A4.2: *As Figure 3.2.2, but for absolute change in intensity.*

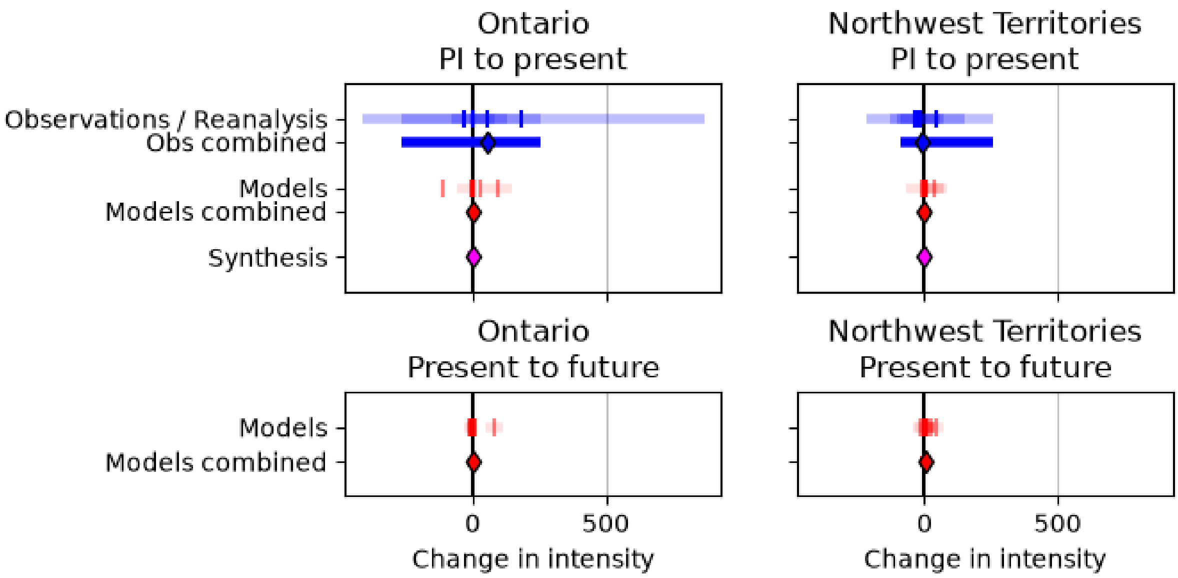

Figure A4.3: *As Figure 3.2.3, but for absolute change in intensity.*

A5 Emissions modelling

We used the Canadian Land Surface Scheme Including Biogeochemical Cycles (CLASSIC) land surface model to assess both historical and year-to-date Canadian wildfire emissions. The spin-up and model run procedures followed Kirchmeier-Young et al. (2024), employing the updated parameterization extensively validated by Curasi et al. (2025). Unlike these prior studies, dynamic tiling was deactivated so the model could be driven by the Fire M3 daily progression product. This allowed us to prescribe daily per-grid-cell burned area fractions and estimate daily wildfire emissions. Reanalysis-based climate forcing was available through 2023, while looped historical climate data were used to force the model from 2024 to 2026.