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Ionospheric environment of Ganymede during the Galileo flybys

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The Galileo spacecraft flew by Ganymede, down to 0.1 R_G from the surface for the closest, six times giving us insight into its plasma environment. Its ionosphere, made of ions born from the ionisation of neutrals present in Ganymede's exosphere, represents the bulk of the plasma near the moon around closest approach. As it has been revealed by Galileo and Juno, near closest approach the ion population is dominated by low-energy ions from the water ion group (O^+, HO^+, H_2O^+) and O_2^+. However, little is known about their density, spatial distribution, and effect on the surface weathering of the moon itself. Galileo G2 flyby has been extensively studied. Based on a comparison between observations and 3D test-particle simulations, Carnielli et al. (2020a and 2020b) confirmed the ion composition (debated at the time), highlighted the inconsistency between the assumed exospheric densities and the observed ionospheric densities, and derived the contribution of ionospheric ions as an exospheric source. However, other flybys of Ganymede are also available (e.g. G1, G7, G8, G28, and G29) providing in-situ measurements at different phases of Ganymede around Jupiter or jovian magnetospheric conditions at the moon. We extend the original study by Carnielli et al. to other flybys, and compare our modelled ion moments (ion number density, velocity, and energy distribution) with Galileo in-situ data. We discuss our results and contrast them with those obtained for the G2 flyby.