

Authors reply on the discussion submitted 22/06/2018 by: **M. O. Ciantia, M. Arroyo and A. Gens**

Paper title: Effects of particle breakage and stress reversal on the behaviour of sand around displacement piles”

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The authors would like to express their appreciation to the discussers for their interest in our work and for extending their DEM modelling to reproduce the CSP that we examined in our physical experiments. We are aware of the discussers' CSP plane proposals and are highly encouraged that the reported DEM simulation outcomes fall so close to the experimental findings. The discussers also refer to particle crushing and changes of soil grading during shearing at high pressures, which raises the question as to whether their simulation was also able to recover the measured changes in soil grading accurately? In addition, were they able to match the experimentally observed dilation rates? The discussers also raise the interesting question of how the non-spherical particle shapes may have led to disparities between their results and the tests. It is interesting that they report that the restrictions they placed on grain rotation in their DEM analysis appear to have made at least partial allowance for the impact of the non-spherical grain shapes developed through particle breakage by Fontainebleau sand.