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Using a scoop to derive soil mechanical parameters on the surface of Mars

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We will report on the possibility of using the scoop attached to the instrument deployment arm to perform soil mechanical experiments directly on the surface of Mars. The Phoenix mission flown 2009 had an instrument deployment arm which was also used to sample surface material indo instruments mounted on the lander deck. The flight spare of this arm will again be flown to Mars on board the InSight mission. Although, the primary purpose of the arm and the attached scoop was not soil mechanical investigations it was already demonstrated by the Phoenix mission that the arm can be used to perform auxiliary investigations of the surface materials. We will report on modelling efforts using a Discrete Element Software package to demonstrate that simple soil mechanical experiments can be used to derive essential material parameters like e.g. angle of repose and others. This is of particular interest since it would be possible to implement experiments using the hardware of the InSight mission.

Cross section cut through a trench dug out by the scoop and the pile of the deposed material which both can be used to derive soil mechanical parameters.