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Airflow modelling over aeolian bedforms, Proctor Crater, Mars

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The presence of multiple dune forms inside Martian craters is evident on much of the recent HiRISE imagery available. Typically multiple length scales are present with progressively smaller bedform features superimposed on larger dunes, giving rise to complex but regular topographical patterns. There is a need to understand the airflow behaviour over these features to investigate if the formational pattern and orientation of the bedforms correspond to localised wind flow forcing.

Using computational fluid dynamics (OpenFoam) we present preliminary findings within Mars' Proctor Crater, examining a dune area of 4.5km x 5.0km running with a computational cell resolution of 5m x 5m. A range of wind speed and directions are investigated and results are compared to bedform orientation and length scale. Superimposed over recent HiRISE imagery, results reveal a distinctive relationship between steered airflow and localised bedform orientation, mapping orthogonally onto the crestal ridges and dune troughs present.

This work has important implications for the reconstruction of aeolian dunes within craters on Mars and can help lend further support to studies examining recent activity of Martian dune migration.