Analysing Wind Patterns on Mars by Tracking Dust Devils

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**Description:**
The student will:
- identify dust devils in CaSSIS (Colour and Stereo Surface Imaging System aboard ESA ExoMars Trace Gas Orbiter) images; record their size and frequency, and measure their forward motion using time-separated stereo images;
- model the atmospheric circulation and compare these instantaneous dust devil translational velocities and other characteristics with the wind fields derived;
- determine whether dust devil forward motions serve as good proxies for the local wind regime, as has been observed on Earth [1].

Dust devils, which occur on both Mars and the Earth, are convective vortices that carry entrained dust and debris [2]. Dust devils play a vital role in the martian climate, being partially responsible for maintaining the opacity of Mars’ dusty atmosphere [3]. In this project, new CaSSIS observations will be used to measure the ground velocity of dust devils by comparing forward and backward-looking stereo images. CaSSIS data is ideal for this purpose, with good spatial resolution, colour availability, and time separation of just under one minute. These data will be used to examine how dust devils fit into local and regional wind patterns by comparison with high-resolution atmospheric circulation models. One region for particular study will be around the location of the ESA ExoMars 2020 lander and rover, including comparisons of surface evidence of wind directions, in the present and past. At the Open University the student will have the opportunity to work closely with the ExoMars team.

**References:**

**Qualifications required:** Suitable for graduates with a physics, geosciences, mathematics or related numerate undergraduate degree.