

Parabolic flights as Earth analogue for surface processes on Mars

Nikolaus J. Kuhn

University of Basel, Physical Geography and Environmental Change, Basel, Switzerland (nikolaus.kuhn@unibas.ch)

The interpretation of landforms and environmental archives on Mars with regards to habitability and preservation of traces of life requires a quantitative understanding of the processes that shaped them. Commonly, qualitative similarities in sedimentary rocks between Earth and Mars are used as an analogue to reconstruct the environments in which they formed on Mars. However, flow hydraulics and sedimentation differ between Earth and Mars, requiring a recalibration of models describing runoff, erosion, transport and deposition. Simulation of these processes on Earth is limited because gravity cannot be changed and the trade-off between adjusting e.g. fluid or particle density generates other mismatches, such as fluid viscosity. Computational Fluid Dynamics offer an alternative, but would also require a certain degree of calibration or testing. Parabolic flights offer a possibility to amend the shortcomings of these approaches. Parabolas with reduced gravity last up to 30 seconds, which allows the simulation of sedimentation processes and the measurement of flow hydraulics. This study summarizes the experience gathered during four campaigns of parabolic flights, aimed at identifying potential and limitations of their use as an Earth analogue for surface processes on Mars.