

Master Thesis (MA, 30 ECTS)

Tools of geotechnical investigation on Mars

Description

A crewed mission to Mars is one of the most ambitious challenges of the 21st century. Besides the search for traces of life, Mars missions shall characterize the (paleo-)environment, including geotechnical investigations that consolidate our understanding about the planet's (sub)surface. They also serve as a basis for future construction projects on Mars, also in hindsight of future settlements. Despite the search for traces of life, Mars missions aim at gathering as much information about the red planet as possible. Geotechnical investigations that further the knowledge about the planet's surface are not only of scientific interest, but also serve as a basis for future construction projects on Mars.

However, standard tools of geotechnical investigation, like on Earth, are not directly transferrable to Mars, as both the test execution as well as result analysis must be adapted to different boundary conditions (e.g. execution and analysis of a dynamic penetration test with a third of Earth's gravity). The goal of this thesis is to establish a catalogue of geotechnical tools that are suited for an application on Mars including descriptions and guidelines on how the test execution and result analysis should be adapted.

The study provides the opportunity to participate in the "Analog Mission Basic Training Course" of the ÖWF.

Workflow:

1. Literature research concerning standard tools of geotechnical investigation and what their boundary conditions are (is gravity needed?, temperature, availability of liquid water...).
2. Assessing how these boundary conditions differ on Mars.
3. Establishing a catalogue of geotechnical tests including necessary adaptations for a deployment on Mars.
4. Evaluation and interpretation of the results.

The study will be done in close cooperation with the Austrian Space Forum.



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