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Measurement of the dielectric properties of Martian soil analogue materials with a mutual impedance probe

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Although water ice has already been found on Mars, it is not yet known whether or not liquid water is also present. A prototype of a Mole-type Permittivity Probe instrument has been developed by ESA to investigate this question. This instrument measures the complex permittivity (permittivity and conductivity) of materials. The permittivity of water is quite different from the permittivity of the usual soil and rock material, therefore this method can be used to localize liquid water. However, before such a permittivity probe can be used on the Martian surface, a lot of laboratory experiments have to be done to test the instrument and to obtain enough information for a correct interpretation of measurement data that may be collected during a Mars mission.

This presentation will discuss results of such laboratory measurements, which have been done with the permittivity probe and also reference measurements which were done by a high performance frequency analyzer and a two-channel oscilloscope in combination with a plate capacitor. The permittivity probe gives also some information about the structure of the subsurface, like stratigraphy, cavities and inclusions. Also measurements of different Martian analogue materials will be presented.