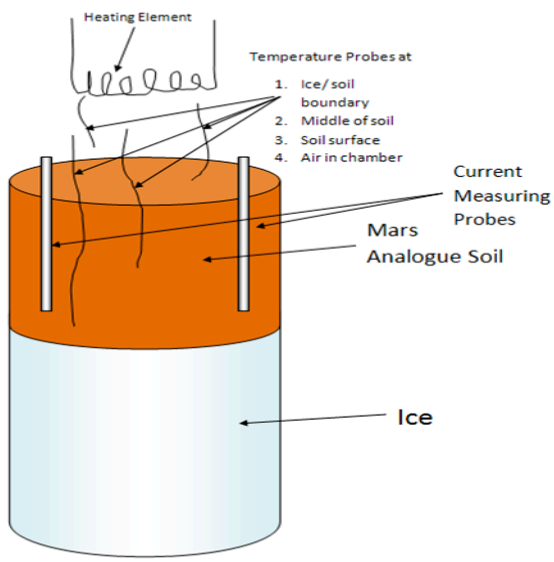
FORMATION OF LIQUID WATER IN THE SHALLOW SUBSURFACE UNDER SIMULATED MARTIAN CONDITIONS. A. A. Pavlov[1], M. Caffrey[2], S. Getty[1], C. S. Johnson[3], [1]NASA Goddard Space Flight Center, Code 699, Greenbelt, MD 20771 (alexader.pavlov@nasa.gov), [2]University of Connecticut (melinda.caffrey@huskymail.uconn.edu), [3]Bastion Technologies, 7515 Mission Drive, Suite A-110, Lanham MD 20706 (christopher.s.johnson@nasa.gov).

Introduction: Availability of liquid water is one of the major constraints for the potential Martian biosphere. Although liquid water is unstable on the surface of Mars due to low atmospheric pressures, it has been suggested that liquid films of water could be present in the Martian soil.

Here we explored a possibility of the liquid water formation in the extremely shallow (1-3 cm) subsurface layer under low atmospheric pressures (0.1-10 mbar) and low ("Martian") surface temperatures (~-50 C- 0 C). We hypothesize that during brief periods of simulated daylight warming the shallow subsurface ice sublimates, the water vapor diffuses through porous surface layer of soil temporarily producing supersaturated conditions in the soil, which leads to the formation of liquid films.

Experimental Setup: To test our hypothesis we measured the electrical conductivity of a simulated portion of Martian subsurface at different frequencies as a means of liquid water detection (Fig 1).



Measurements were performed in the Goddard's Martian simulation chamber, which allows varying atmospheric pressure, gas composition and temperature of the subsurface ice. Dry JSC-Mars-1 soil analogue was placed on the layer of ice in the vacuum chamber. The surface of the soil was then periodically heated with the heating element to simulate Martian day-night conditions.

Results/Conclusions: 1) we found a clear correlation between the conductivity of ice–soil sample and the surface temperature. The higher the temperature, the higher the conductivity of the sample. During heating cycle conductivity of soil exceeded conductivity of ice (at the same temperatures) therefore indicating the presence of liquid/mobile water in the soil even though the surface pressures were kept below triple point of water.

2) "Cementation" of a subsurface layer of soil was observed in each of the simulated day cycles. The top cm of soil remained dry and loose.

3) ¨The addition of perchlorates surprisingly *decreased* the conductivity of the soil sample. We speculate that $Mg(ClO_4)_2$ works as a desiccant in this scenario, absorbing the sublimating water and precluding formation of water films.

4) The lack of variability in surface conductivity observed by the Phoenix rover is likely due to a combination of conducting pins that were unable to penetrate past the extremely dry top surface layer and a lack of sensitivity.