INVESTIGATION OF THE FORMATION AND HABITABILITY OF RECURRING SLOPE LINEAE (RSL) LIKE ENVIRONMENTS. J. Heinz[1], J. Schirmack[1], D. Maus[1], S. P. Kounaves[2,3], D. Wagner[4], and D. Schulze-Makuch[1,5]. [1]Center of Astronomy and Astrophysics, Technical University of Berlin, Germany (j.heinz@tu-berlin.de; dirksm@astro.physik.tu-berlin.de); [2]Department of Chemistry, Tufts University, Medford, MA, USA (Samuel.Kounaves@tufts.edu); [3]Department of Earth Science & Engineering, Imperial College London, UK; [4]GFZ German Research Centre for Geosciences, Potsdam, Germany (dirk.wagner@gfz-potsdam.de); [5]School of the Environment, Washington State University, Pullman, WA, USA (dirksm@wsu.edu).

Introduction: One of the most critical aspects regarding the habitability of Mars is the requirement for liquid water. One possible mechanism for its formation may be through the deliquescence of salts present in the Martian regolith [1]. This water would then be available for the metabolism of halophilic microorganisms, as is the case for example in the Atacama Desert, one of the most arid areas on Earth [2]. A potential location for deliquescence processes on Mars are the Recurring Slope Lineae (RSL) [3].

We have previously investigated the deliquescence process and the resulting darkening of Mars analogue soil/salt mixtures via electrical conductivity (EC) measurements and visible observations [4].

Experimental setup: The deliquescence process was investigated in samples containing a dry mixture of Mars analogue soil (JSC Mars-1a) and Mars relevant salts (chlorides and perchlorates). The samples were initially dried for 2 days in a desiccator. To increase the relative humidity (RH) in the system, up to 85% of the desiccant in the lower part of the desiccator was replaced by water. The darkening effect that occurs when the soil becomes wet through the deliquescence of the salts was investigated visually and was also monitored by EC measurements that were performed with two parallel 1mm diameter copper wire electrodes inserted 25 mm apart into the soil samples and connected to a CR 10 data logger (Campbell Scientific) [4].

For exploring the habitability of the soil/salt samples that provide water via deliquescence, we designed sample vessels as shown in Figure 1. A mixture of 10 g soil, salt, growth medium, and microorganisms, was placed in a vessel with a septum cap. Embedded in this mixture was a smaller vial containing 5 ml of a saturated KCl solution that provided a RH of about 83%, which would avoid water condensation effects, but support deliquescence of salts with a Deliquescence Relative Humidity (DRH) lower than 83%. For the first test runs we used quartz sand as soil component, 10 and 20 wt% NaCl as salt, DSMZ growth medium #92 and the aerobic, halo- and cryophilic bacteria *Planococcus halocryophilus*. Experiments were carried out at room temperature and also at 4°C. In addition, experimental parameters were changed for various test runs. Metabolism was monitored by CO_2 quantification via mass spectrometry and viability was confirmed by colony forming unit (CFU) counts at the beginning and end of each experiment. Since methanogenic archaea are regarded as relevant model organisms for life on Mars due to their unique physiology and multi-stress tolerance, methanogens such as *Methanosarcina soligelidi* [5] are also investigated in further experiments.

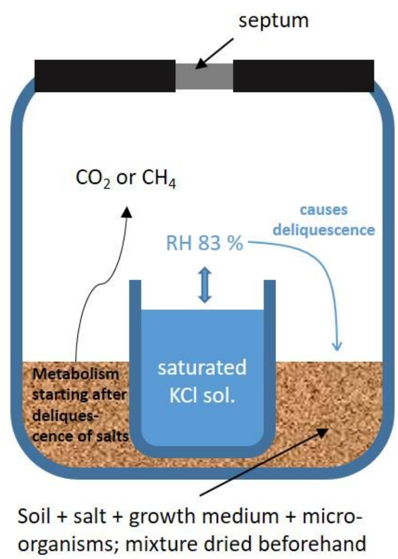

Figure 1: Experimental setup for investigation of metabolism rates of halophilic microorganisms in soil/salt samples that provide water by deliquescence only.

Results: Results of the visible observations and the EC measurements were published recently [4] and indicate that the typical darkening as seen with RSL can easily occur with only a small amount of water present and short time periods under high RH conditions, while bulk deliquescence appears to be a slow process. The resulting consequences for habitability under such RSL-like conditions, investigated in our current experiments, will be presented.

References: [1] Jänchen J. et al. (2016) *Int. J. Astrobiol, 15*, 107-118. [2] Davila A. F. and Schulze-Makuch D. (2016) *Astrobiology, 16*, 159-168. [3] McEwen A. S. et al. (2011), *Science, 333*, 740–743. [4] Heinz J. et al. (2016), *Geophys. Res. Lett., 43*, 4880–4884. [5] Wagner D. et al. (2013), *IJSEM* 63, 2986–2991.