



Growth of Microorganisms at Martian Subsurface Conditions: Laboratory Modeling

A. K. Pavlov (1,3), V. N. Shelegedin (2), M. A. Vdovina (1), A. V. Tretyakov (1)

(1) Ioffe Physico-Technical Institute, St. Petersburg, Russia, (2) St. Petersburg Polytechnical State University, St. Petersburg, Russia, (3) Russian Astrobiology Center, St. Petersburg, Russia

Modern environmental conditions on Mars prohibit liquid water existence in surface layer of martian soil because of extremely low atmospheric pressure. But according to observational data large amount of water ice presents in subsurface layers of Mars. In this case ice is able to intensive sublimation if the surface is heated enough by sunlight. According to TES data temperature of some areas of martian surface can be heated up to 300 K at daytime. Under such conditions vapors diffuse through the porous surface layer. As a result the “wet layer” appears under sand’s surface. In our experiment we used special vacuum chamber for modeling process of ice sublimation and vapor diffusion while heating. In order to model it we used water ice sample covered by several centimeters of sand with weight fraction of organic matter (glucose) $\sim 10^{-5}$ – 10^{-4} . Ice sublimation was provided by radiation heating of sand’s surface.

We studied possibility of growth of microorganisms in the “wet layer” under three different temperatures of sand’s surface: 280 K, 300 K and 200 K. Bacteria *Vibrio sp. X* were added to the sand. We carried on several three days experimental runs of the intensive sublimation of ice. As a result, we have discovered the increase of bacterial population in the “wet layer” after runs at temperature 280 K and 300 K. These results confirm that shallow ground ice and a few hours of heating per day could provide sufficient conditions for growth of bacterial population under martian surface. Environments of some areas of modern Mars are close to that we have modeled in our experiments.