Gas pockets in the shallow Martian subsurface – a new environmental niche for hypothesized Mars extant life. A. A. Pavlov[1], J. Davis[2], J, Johnson[3], A. K. Pavlov[4] [1]Planetary Environment Laboratory, Code 699, NASA Goddard Space Flight Center, Greenbelt MD 20771 (alexander.pavlov@nasa.gov); [2]University of Maryland, College Park; [3]Howard University; [4]Ioffe Physico-Technical Institute, St. Petersburg, Russia

Recent discoveries of the abrupt and seasonal changes in the atmospheric methane require presence of some local methane sources which have not been identified. Such sources should be able to release significant amounts of methane on a short timescale. We propose that the pockets of methane can form just several cm below Martian surface. The mechanism of gas pockets formation involve migration of salts in the Martian soil due to sublimation of shallow subsurface ice or evaporation of briny water during RSL events. As water evaporates and ice sublimates from the top of the soil, salts remains in the top layer of soil causing soil cementation and formation of the gas diffusion barrier in the soil.

Our laboratory studies show that it is possible to form a potential habitat in the shallow subsurface (just several cm below the surface) over vast regions of Mars. Those pockets can accumulate enough additional gas pressure to keep the water in the liquid form below the salty soil seal even though pressures above the seal could be well below the triple point of water. Furthermore, salty seal precludes water vapor to be lost to the atmosphere. Hypothetical Martian microorganisms would benefit from UV and atmospheric oxidants protection provided by the salty seal as well. Gas pockets formed so close to the surface are sensitive to the seasonal temperature oscillations and can abruptly release biogenic gases when cracks in the salty soil seal occur. Detection of such abrupt releases from the near surface gas pockets can be a useful strategy for the future extant life detection missions.