



Varnish desert developed on granitic rocks in Sonora, Mexico

Elizabeth Solleiro-Rebolledo (1), Sergey Sedov (1), Marina Lebedeva-Verba (2), Cesar Villalobos (3), and Rocio Alcantara (1)

(1) Universidad Nacional Autonoma de Mexico/Instituto de Geologia, Mexico (solleiro@geologia.unam.mx), (2) Russian Academy of Science/Dokuchaev Soil Institute, (3) Universidad Nacional Autonoma de Mexico/Instituto de Investigaciones Antropológicas

The varnish desert is intensively studied as a phenomenon of microbial community development and its interaction with the rock surface in extreme environments. It is also known to present microstratigraphic arrangement that records environmental changes. Rock surfaces with desert varnish are one of the most common materials for rock paintings (petroglyphs) that attains archaeological and cultural significance to them. Geochemical and mineralogical characteristics related to iron and manganese components have drawn major attention in the rock varnish research, whereas the composition of the silicate phase (which often comprises major part of the film) is less known. We started the multidisciplinary investigation of the desert varnish developed on the granitic rocks in the northern Sonora, at the famous petroglyph site Proveedora. Although the petroglyphs are several thousand years old, they are clearly visible and demonstrate sharp colour contrast with the background surface. This means that rather little varnish development took place after the engravings were made. Preliminary microbiological studies detected bacteria species, typical for early rock surface colonization. Observations under scanning electron microscope revealed sharp contrast between the coarse-grain granite base and the varnish film. EDS microanalysis demonstrated relatively high contents of Fe and Mn with strong microscale variations. At the same time major quantities of Si and Al were detected; together with the thin platy morphology it points to clay minerals as major varnish component. The ratio of Si to Al is indicative of the kaolinite group minerals. Biotite and feldspars of granite show only incipient signs of weathering and could hardly account for the development of iron-clay film on the rock surface. We suppose that airborne material generated by the far-distance eolian material, fixed and transformed by the bacterial community on the granite surface, contributed to desert varnish development in Sonora.