Biologically-induced elemental variations in Antarctic sandstones: A potential test for Martian microorganisms

Conference or Workshop Item

BIOLOGICALLY-INDUCED ELEMENTAL VARIATIONS IN ANTARCTIC SANDSTONES: A POTENTIAL TEST FOR MARTIAN MICROORGANISMS. R. L. Blackhurst[1], K. Jarvis[1] and M. M. Grady[2], [1]Dept. of Geological Sciences, Kingston University, Kingston, Surrey KT1 2EE, U.K. (K0019383@kingston.ac.uk), [2]Dept. of Mineralogy, The Natural History Museum, Cromwell Road, London SW7 5BD, U.K. (mmg@nhm.ac.uk).

Introduction: Evidence from satellite observations suggests that the Martian surface is cold, dry and wind-swept; the thin atmosphere also results in exposure of the surface soils and rocks to high u.v. fluxes. Any organisms able to survive in such an hostile environment must be well-adapted and hardy. On Earth, an analogous habitat (although with lower surface u.v. flux) occurs in the Dry Valleys of Antarctica, and rather than being biologically barren, is home to microbial communities that colonize the rocks [1]. The stress tolerant nature of the microbes has resulted in the suggestion that a similar type of micro-organism could flourish at the Martian surface. The cryptoendoliths occur in the interstitial spaces of translucent sandstones [2, 3] and extend down to 10mm below the rock surface. They primarily consist of symbiotic or free living lichen and cyanobacteria and their presence is identified by three coloured zones [4]. It is clear from these zones that the communities change their host rock. Utilizing ICP-AES and ICP-MS techniques, we are undertaking a major, minor and trace element study of the different layers within the sandstones, to establish how the microbes affect the chemical composition of the rocks.

Samples: Cryptoendolith-bearing rocks were collected by a British Antarctic Survey expedition to Terra Nova Bay, from the Battleship Promontory (BP) region; non-endolithic sandstones were also collected at the same time from neighbouring regions, for comparison. The sandstones are reddish in colour, medium- to coarse-grained, dominantly quartz, with minor biotite and feldspar. Where endoliths are present, the colour has been leached from the sandstone, and the different layers of the colonies can readily be distinguished. Quartz grains from the different layers were hand-picked for elemental analysis.

Discussion: Our preliminary results show that the microorganisms have a significant effect on major and minor element contents, with concentrations depleted in the layers that host the microorganisms [5]. If a characteristic suite of elemental or isotopic variations is detected, then the nature and extent of this effect would add value to the potential role of cryptoendolithic communities as biomarkers when considering future *in situ* analysis of Martian surface materials and Mars sample return rocks.

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