Epifluorescence Surveys of Extreme Environments Using PanCam Imaging Systems: Antarctica and the Mars Regolith

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ABSTRACT

Rapid discovery of the distribution and relative abundance of organic material without sample destruction or the expenditure of irreplaceable resources is one of the primary requirements for exploration of novel extreme environments both in remote locations on Earth and on the Mars regolith. A wide variety of organic and biogenic molecular targets including polycyclic aromatic hydrocarbons, aromatic amino acids, nucleic acids, photosynthetic pigments, and critical metabolic components such as flavin adenine dinucleotide and nicotinamide adenine dinucleotide exhibit strong, distinctive fluorescent signatures following excitation by ultraviolet (UV) light sources. These fluorescence signatures are easily imaged with camera systems currently employed on Mars rovers and imaging equipment available during human or robotic exploration of remote extreme environments on Earth. In this paper we discuss recent results with epifluorescent imaging of organic and biological targets using filter bands comparable to those available to ExoMars and review plans for epifluorescence surveys of the Dry Valleys of Eastern Antarctica including the Schirmacher Oasis and the perennially ice-covered, merimictic, oligotrophic Lake Untersee.

Keywords: Epifluorescence, PanCam, Mars, Antarctica, Schirmacher Oasis, Lake Untersee

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