Preferential sorption of dissolved organic matter onto mineral soils due to soil type

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B and C horizons of Oxisols, Mollisols, Alfisols, and Mollisols have high capacities for sorption of dissolved organic matter (DOM) [1], a largely irreversible process that helps stabilize carbon in soils [2]. It has been shown before that soils preferentially adsorb dissolved organic matter (DOM) depending on the composition of the DOM [3]. However, few studies have investigated whether or not all soils are created equal in this preferential sorption. A recent collection of isotherm data from Mollisols, Ultisols, and Alfisols using a natural source of DOM has revealed that although DOM sorption capacity on the B and C horizons of these soils is significant, the composition of the adsorbed DOM differs between soils.

Samples of B and C horizons of a Mollisol, Ultisol, and Alfisol exhibiting similar overall DOM sorption capacity will be analyzed by FTIR and HPLC. Both qualitative and quantitative data will be collected and reviewed. We expect results to demonstrate that compositional fractions of DOM are adsorbed to different degrees by the three soils.

[1] Jardine, Weber, & McCarthy, (1989) *Soil Science Society of America Journal* **53,** 1378-1385. [2] Gu, Schmitt, Chen, Liang, & McCarthy (1995*) Environmental Science & Technology* **28,** (38-46). [3] Kalbitz, Schwesig, Rethemeyer, & Matzner, (2005) *Soil Biology & Biochemistry* **37**, (1319-1331)

Aqueous chemistry on Mars

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In the summer of 2008, a Wet Chemistry Laboratory on the Phoenix lander (part of the Microscopy, Electrochemistry, and Conductivity Analyzer, MECA) performed the first aqueous electrochemical analysis of martian soil (Fig. 1). The results were largely unexpected. The soil was found to be slightly alkaline and pH buffered (the TEGA instrument determined that calcium carbonate was the buffering agent [1]), and chlorine was found to be predominantly in the form of perchlorate [2]. Soluble sulfate was identified, but in smaller quantities than might have been expected from prior elemental assays [3]. Perchlorate is likely a photochemical product and its prevalence suggests the absence of reducing mechanisms, biological or otherwise.

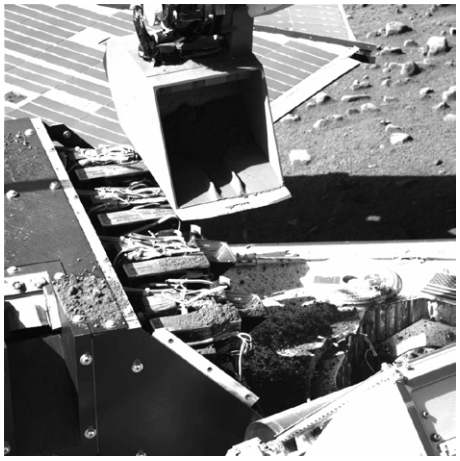

Figure 1: The Phoenix robot arm delivers soil to the first of four MECA wet chemistry laboratory cells (photo JPL/NASA)

Armed with soluble chemistry data that we believe to be representative of Mars as a whole, we are currently developing more capable experiments. These use techniques such as ion chromatography and capillary electropheresis, emphasizing extraction, microfluidics, and integration of inorganic and organic detection.

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[1] Boynton *et al*. (2009), *Science* **325**, 61-64. [2] Hecht *et al*. (2009), *Science* **325**, 64-67. [3] Kounaves *et al*. (2010), *Geophys. Res. Lett*., submitted.