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# In situ analysis of Mars soil sample with the sam gcms instrumentation onboard Curiosity : interpretation and comparison of measurements done at Rocknest and Yelloknife bay sites

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The characterisation of the chemical and mineralogical composition of regolith samples collected with the Curiosity rover is a primary objective of the SAM experiment. These data should provide essential clues on the past habitability of Gale crater. Amongst the SAM suite of instruments [1], SAM-GC (Gas Chromatograph) is devoted to identify and quantify volatiles evolved from the thermal (heating up to about 900°C)/chemical (derivatization procedure) treatment of any soil sample collected by the Curiosity rover. With the aim to search for potential organic molecules outgassed from the samples, a SAM-GC analytical channel composed of thermal-desorption injector and a MXT-CLP chromatographic column was chosen to achieve all the measurements done up today, as it was designed for the separation of a wide range of volatile organic molecules. Three solid samples have been analyzed with GCMS, one sand sample collected at the Rocknest site, and two rock samples (John Klein and Cumberland respectively) collected at the Yellowknife Bay site using the Curiosity driller.

All the measurements were successful and they produced complex chromatograms with both detectors used for SAM GC, i.e. a thermal conductivity detector and the SAM quandrupole mass spectrometer. Their interpretation already revealed the presence of an oxychlorine phase present in the sample which is at the origin of chlorohydrocarbons clearly identified [2] but this represents only a fraction of the GCMS signal recorded [3,4]. This work presents a systematic comparison of the GCMS measurements done for the different samples collected, supported by reference data obtained in laboratory with different spare models of the gas chromatograph, with the aim to bring new elements of interpretation of the SAM measurements.

References: [1] Mahaffy, P. et al. (2012) Space Sci Rev, 170, 401-478. [2] Glavin, D. et al. (2013), JGR. [3] Leshin L. et al. (2013), Science, [4] Ming D. et al. (2013), Science, 32, 64–67.

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