Oxychlorine detections on Mars: Implications for Cl cycling.

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The Sample Analysis at Mars (SAM) instrument has detected evolved O_2 and HCl indicating the presence of perchlorate and/or chlorate (oxychlorine) in all 11 sediments analyzed to date [1]. The hyperarid martian climate is believed to have allowed accumulation of oxychlorine and assumed chloride contents similar to those in hyperarid terrestrial settings (Fig. 1). The linear correlation of oxychlorine and chloride of Gale Crater sediments is low (r^2=0.64). Correlations present in hyperarid Antarctica and the Atacama Desert are attributed to unaltered atmospheric source coupled with minimal redox cycling by biological activity [2]. Terrestrial semi-arid to arid settings have low correlations similar to Gale Crater and are attributed to additional inputs of Cl^- from sea salt, dust, and/or proximal playa settings, and possible reduction of oxychlorine phases during wetter periods [2]. While microbiological processes could contribute to low oxychlorine/chloride correlations on Mars, several abiotic mechanisms are more likely, such as changing oxychlorine production rates with time and/or post-depositional geochemical redox processes that altered the Gale Crater oxychlorine and chloride contents.

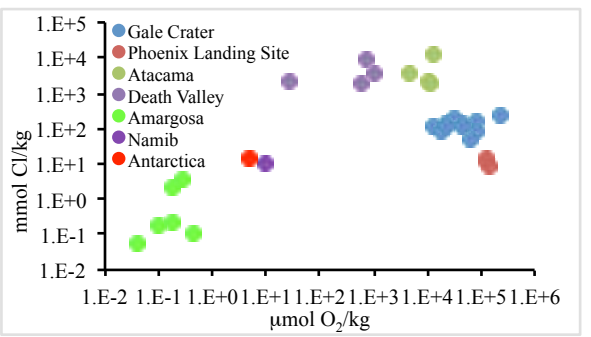

Fig. 1. Cl^- versus O_2 content in terrestrial [3] and martian [1,4] soil and sediments.

[1]Ming et al., 2014, Science, 343. [2]Jackson et al. 2015, GCA, 164,502. [3]Rao et al. 2010,EST,44,8429. [4]Fang et al., 2015 ArXiv, [cs.AI], 1510.01291.