Extraterrestrial (per)chlorate

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Perchlorate (ClO_4^-) and chlorate (ClO_3^-) are ubiquitous on Earth and ClO_4^- has also been found on Mars. They can play important roles in geochemical processes such as oxidation of organic matter and as biological electron acceptors, and are also indicators of photochemical reactions involving oxyanions; on Mars they could be relevant for human habitability both in terms of *in situ* resource utilization and potential human health effects.

We detected and quantified ClO_4^- and ClO_3^- in regolith and rock samples from the Moon, and two chondrite meteorites (Murchison and Fayetteville) [1]. ClO_3^- was detected in lunar samples at concentrations between 0.06 and 0.5 μg/kg. ClO_4^- was detected at a concetration of 0.03 μg/kg in one lunar sample, but was below the limit of detection (<0.01 μg/kg) in a second regolith sample. ClO_4^- and ClO_3^- were also detected in all subsamples analyzed of the Murchison meteorite and the Fayetteville meteorite at concentrations of up to two orders of magnitude higher than in lunar samples. Lunar samples were collected by astronauts during the Apollo program, and meteorite samples were recovered immediately after their fall. This fact, together with the heterogeneous distribution of ClO_4^- and ClO_3^- within some of the samples, and their relative abundance with respect to other soluble species (e.g., NO_3^-) are consistent with an extraterrestrial origin of the oxychlorine species.

Our results, combined with the previously reported widespread occurrence on Earth and Mars, indicate that $ClO_4^-$and ClO_3^- could be present throughout the Solar System and possibly beyond.

[1] Jackson et al (2015) EPSL, 430, 470–476