Evolution of aqueous environment on Early Mars inferred from reconstructed water chemistry at Gale

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There is a wealth of geomorphological and mineralogical evidence indicating the presence of liquid water on early Mars. The NASA rover Curiosity has conducted a geological survey of the successive lacustrine and eolian sediments from Gale crater, a former lake on Mars, and provided mineralogical and geochemical data of the sediments. We developed a methodology for quantitative estimation of the water chemistry of the pore water in the sediments based on exchangeable cation compositions in the smectite and the salt mineralogy (Fukushi et al 2019). We applied the methodology to the lacustrine sediments from Yellowknife Bay formation, the lowermost layer of Gale crater observed by Curiosity, and found that the water chemistry was of Na-Cl type with moderate salinity (0.1-0.5 mol/kg) and circumneutral pH (Fukushi et al 2019). The Curiosity has obtained the mineralogical and geochemical data from the several lacustrine sediments from Murray formation, the upper layer of Gale crater, and showed the presence of smectite and some authigenic minerals in the sediments. In present study, we applied the methodology to the sediments from the Murray formation. The environmental condition to produce the water chemistry in the Murray formation and the evolution of water environment at Gale will be discussed in this presentation.

Reference:
Fukushi, K., Sekine, Y., Sakuma, H., Morida, K. and Wordsworth, R., 2019, Semiarid climate and hyposaline lake on early Mars inferred from reconstructed water chemistry at Gale. *Nature Communications*, **10;** 4896; doi:10.1038/s41467-019-12871-6.

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