

Possible Earth-like tectonic scenario on Mars; a mineralogical and geochemical perspective

*Trishit Ruj¹, Gene W Schimdt², Goro Komatsu², Kenji Kawai¹

1. Department of Earth and Planetary Science, School of Science, UTokyo, Japan, 2. International Research School of Planetary Sciences, Università d'Annunzio, Italy

The southern highlands of Mars preserve a series of Noachian aged (Eoarchean equivalent to Earth) grabens with multiple orientations and morphologies (Ruj et al., 2018). We have found traces of a 3000 km long succession of grabens (with individual grabens ranging from 30 to 1200 km) in the Noachis Terra and Terra Sabaea region around the western boundary of the massive Hellas basin. However, the origin of these grabens is neither confirmed to be a result of Earth-like plate tectonics or related to giant impacts such as Hellas, Argyre and Isidis. Here, after preparing the geological map, we present our preliminary observation (using remotely sensed datasets) on the mineralogy of the rocks and the geochemistry of the crust associated with the grabens. The hyperspectral analysis of several CRISM (Compact Reconnaissance Imaging Spectrometer, onboard the Mars Reconnaissance Orbiter) observations indicates the presence of olivine, pyroxene (clino), plagioclase, phyllosilicates and hydrated sulfates. GRS (Gamma Ray Spectrometer onboard on Mars Odyssey) observation of the area shows a higher abundance of Potassium (K) and Thorium (Th) than their average global distribution. Plagioclase, olivine and pyroxene are the main constituents of basalts and the GRS derived geochemistry confirms the existence of this alkali basalt type with a higher abundance of Potassium (K). Meanwhile, Thorium (Th) content is higher than the surroundings, indicating the presence of granitic composition rocks which are typically found within continental rift zones on Earth associated with bimodal volcanism.

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