LUNAR MINERALOGY AND THE QUEST FOR THE CO-EVOLUTION OF THE EARTH-MOON SYSTEM. A. Bhagat, S. Durgude*, S. Raj, S. Selvam, and S. Sindagi. Spaceonova *(siddheshdurgude2002@gmail.com).

Introduction: The co-evolution of both the Earth's geosphere and biosphere through a series of stochastic and deterministic events has been the premise of mineral evolution [1]. The different eras of planetary accretion, crust and mantle reworking, and biologically mediated mineralogy all have seen profound changes in the diversity and distribution of Earth's near-surface minerals. As a result, it is now known that different rocky planets and moons would have undergone a different set of mineral evolution processes.

Previous work [2] suggests the Moon's mineralogy is confined to anhydrous species and species formed at low pressure and oxygen fugacity due to conditions related to its origin, size, and thermal history. Recent discovery of *Chang'esite—(Y)* by China's Chang'e 5 robotic mission [3], an anhydrous mineral belonging to the merrillite group of phosphate minerals further confirms this. However, the global distribution, composition, and concentrations of lunar minerals are still far from giving us a complete picture of the co-evolution of the Earth-Moon system.

There is still a need to understand the types and quantities of minerals that were also delivered to the Moon through meteoritic bombardment and the processes by which these minerals undergo modification or evolution over time. Meteorite impacts could have played a key role in the evolution of the lunar minerals. A 2021 study [4] has shown that the rare earth element zircon mineral analysis combined with sophisticated geochronology techniques and imaging has turned out to be valuable for establishing a relationship between dated zircon development and current magmatic conditions or metamorphic events on Earth.

Therefore, to find a further correlation between the shared co-evolution of the Earth-Moon system, we also study the role of meteorites and impacts in the mineral evolution process to further help elucidate the processes of lunar mineralogy and have analyzed the available mineralogical data from sites such as Mare Nectaris (Latitude 15.0°S, longitude 35.0°E), Von Kármán crater (diameter ≅186 km) within the South Pole-Atiken basin, and Mare Moscoviense (27°N 148°E) regions[5].

As such, we worked on the tabulation and cataloging of the lunar minerals which could serve as a database in similar ways to the ongoing Earth mineral ecology project [6] where statistical techniques and mineralogical databases are applied to study the mineral diversity-distribution relationship. With this lunar mineral database in place, it could further assist or complement the lunar, earth and planetary science community in their quest for unlocking the co-evolution of the Earth-Moon system.

References:
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