MODIFICATION OF CRATERS IN MARE NECTARIS ON THE MOON. Sharini K.S.[1], Kimi K.B.[2,3], Harish[4], Tuhi S.[5], R.K.S. Priya[1], Vijayan S.[2]. [1]College of Engineering, Guindy, Anna University, Chennai, India, [2]Physical Research Laboratory, Ahmedabad, India, [3]Indian Institute of Technology, Gandhinagar, India, [4]Space and Planetary Science Center, Department of Earth Sciences, Khalifa University, Abu Dhabi, UAE, [5]Department of Geosciences, Auburn University, Auburn, AL, USA. (shariniks@gmail.com and vijayan@prl.res.in)

Introduction: Impact craters are the most common feature on the Moon. After the crater formation, it can undergo modification by intrusion [1,2], lava infilling [3], and through the reactivation of existing impact fractures [4]. In this study, we aim to understand the modification processes of deformed craters located at the mare-highland boundary in Mare Nectaris on the Moon. Overall, this study will help to understand the different modification processes shaping the Mare Nectaris basin.

We have chosen four craters located at the Mare Nectaris basin (16°S 34°E) (diameter ~340 km) (Fig. 1). 1) The Fracastorius (21.2°S 33.0°E) crater of diameter ~124 km is the larger crater among the four, which is located in the southern region of the basin. 2) The Beaumont (18.0°S 28.8°E) crater of ~53 km diameter located in the south-western edge of the basin near the Fracastorius crater. 3) The Bohnenberger (16.2°S 40.0°E) crater of ~33 km diameter located on the basin's eastern edge. 4) The Daguerre (11.9°S 33.6°E) crater of ~46 km diameter located in the northern part of the basin.

Dataset used: We used high-resolution imagery from Lunar Reconnaissance Orbiter's (LRO)-Narrow Angle Camera (NAC) of spatial resolution ~0.5 m/pixel [5] and Chandrayaan-2's Terrain Mapping Camera-2 of spatial resolution ~5 m/pixel [6] for mapping. We also used LRO's Wide Angle Camera (WAC) of ~100 meters/pixel [5] for mapping. For topography analysis, SLDEM2015 of spatial resolution ~59 m/pixel with vertical resolution ~3-4 m is used [7].

Modification of the craters in Mare Nectaris: We observed that the impact craters located at the Mare Nectaris basin has undergone extensive modifications. We observed mare-flooded floors, breached rims by lava, fractures, wrinkle ridges and uplifted floor. The observations of the interested craters are in the following sections:

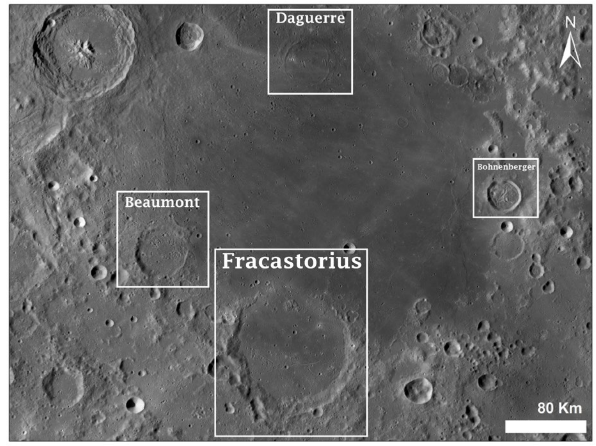

Fig 1: Locations of interested craters at the boundary of Mare Nectaris are shown in the WAC image.

Fracastorius crater: Fracastorius is a class 6 floor-fractured crater (FFC) [2] with a mare-flooded interior, and it has fractures that run across the crater dividing into two sections (Fig. 2a). The crater floor north of the fracture has a higher elevation than the floor south of the fracture (Fig. 2a, profile). The fracture that runs through the center of the crater's floor is seen extending beyond the crater floor, which indicates that the fracture is possibly associated with the regional fractures, possibly with the underlying Mare Nectaris basin fractures, which possibly reactivated after mare-flooding. The central peak of the crater is visible, even though the crater's floor is flooded with lava. Highland material/ ejecta from the Theophilus crater (11.42°S, 26.33°E) has mantled the southern portion of the crater floor. Fracastorius has formed in the southern rim of the basin and its northern region lies on the basin floor, resulting in low elevation compared to the southern region which formed on the rim. Due to the lower elevation of the northern rim, lava breached the crater rim. Compressional feature such as wrinkle ridges is also seen in the northern part of the crater.

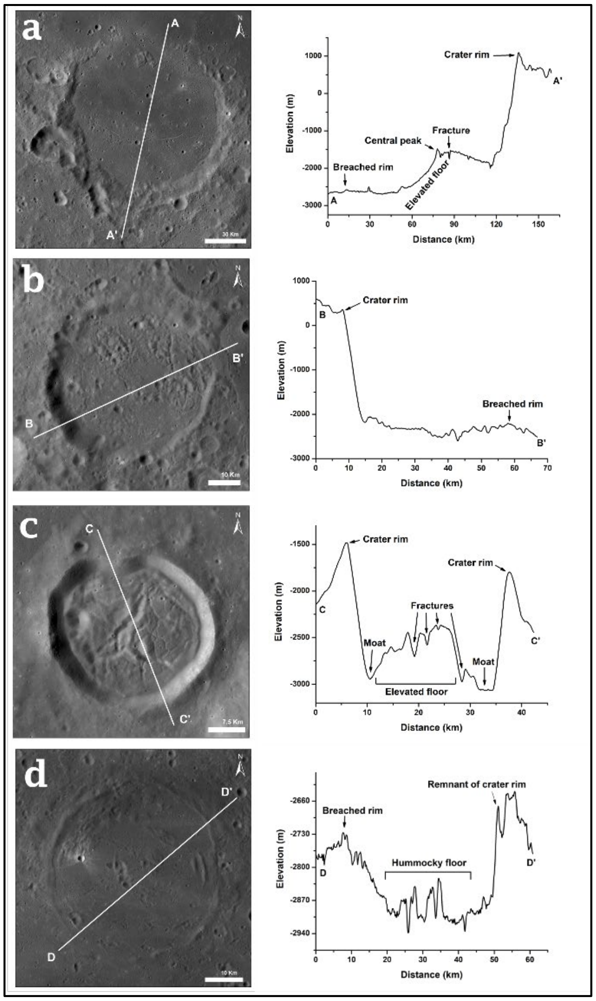

Fig 2: LROC WAC imagery of the craters and its profile **(a)** Fracastorius crater **(b)** Beaumont crater **(c)** Bohnenberger crater **(d)** Daguerre crater.

Beaumont crater: Beaumont has its rim breached at the northeastern part of the crater (Fig. 2b). Mare possibly flooded the entire crater floor, but ejecta mantled the floor. The crater floor has hummocky terrain due to ejecta cover from crater Theophilus (11.42°S, 26.33°E) located north-west of Beaumont, and multiple fractures are seen on the floor of the crater that crosscuts the hummocky terrain. A wrinkle ridge is observed near the northern rim of the crater.

Bohnenberger crater: Bohnenberger is a class 4a floor-fractured crater (FFC) [2]. The crater floor is uplifted and heavily modified with fractures. It has polygonal and radial fractures (Fig. 2c). The crater floor has a concave down shape/ dome with a moat along the edge of the floor. Mare possibly flooded the crater floor, followed by floor fracturing due to intrusion [2].

Daguerre crater: Daguerre is a ghost crater as it has been completely buried by lava (Fig. 2d) [8]. The southern rim of the crater is breached or completely buried. The northern rim and floor of the crater are visible, but it is covered by lava. The floor of this crater is also covered in the ejecta of the Theophilus crater. Two other ghost craters, Gaudibert H (13.83°S, 36.72°E) and an unnamed crater (17.29°S, 35.39°E), are also seen located within the basin.

Discussions: The craters located in the Mare Nectaris basin are modified by intrusion, volcanism, fractures and wrinkle ridges. In Fracastorius, Beaumont and Daguerre craters, lava breached the rim. Lava can breach the rim from the basin to the crater or vice-versa. Fractures are observed on the floor of the Fracastorius, Bohnenberger and Beaumont craters indicating that mare infilling intrusion occurred in these craters. We have observed wrinkle ridges in a concentric pattern on the basin floor. In this study, we observed many different features associated with different geological processes, which suggest multiple localized activities at the Mare Nectaris basin.

References: [1] Schultz, P. H. (1976). [2] Jozwiak, L.M. et al. (2012) Journal of Geophysical Research: Planets 117. [3] Kimi KB et al. (2023) Icarus, v390 115298. [4] Nypaver, C. A. and Thomson, B. J. (2022) v49, e(17) [5] Robinson, M. S. et al. (2010) Space science reviews 150, 81–124. [6] Chowdhury A.R. et al. (2020) Current Science 118(4):566. [7] Barker, M. K. et al. (2016) Icarus 273, 346–355. [8] Cruikshank D. P. et al (1973) The Moon 7, p440-452.
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