GEOLOGICAL MAP OF THE RIMA BODE REGION: A POSSIBLE LANDING SITE FOR FUTURE LUNAR EXPLORATION. S. Mikolajewski[1], H. Hiesinger[1], C. H. van der Bogert[1], and N. Schmedemann[1]
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Introduction: Studies of the nearly 400 kg of lunar samples retrieved by the Apollo, Luna, and Chang'e-5 missions or delivered in the form of lunar meteorites have enabled significant advances in our understanding of the lunar geologic and volcanologic evolution. Hence, new carefully selected lunar samples from unexplored sites will offer additional opportunites to further develop both our scientific and technical knowledge. This study presents a new preliminary geological map of the Rima Bode region in preparation for potential future missions [1, 2]. The Rima Bode region is located south of Mare Imbrium at 12°N, 4°W. The region is characterized by an extensive rille in the northern part of the area and various mare and pyroclastic deposits of different ages distributed over the area. The pyroclastic deposits are of particular interest for in situ resource utilization (ISRU) studies [e.g., 3].

Data/Methods: Multispectral data and mosaics from several studies [4-15] have been used to explore the Rima Bode region (**Fig. 1**). We used recent Lunar Reconnaissance Orbiter Camera (LROC) datasets to create a detailed geologic map of the region and investigate possible landing sites for future missions (**Fig. 1A, C, D**). In ArcGIS, we used the Clementine FeO and TiO_2 [4, 5] (**Fig. 1 B**) as well as Kaguya mineral maps [6], and LROC images and mosaics [7] to define morphological and compositional geologic units in the Rima Bode region. Using digital terrain models [9] (**Fig. 1 C**), and slope maps (**Fig. 1 D**), we examined the topography and rock distribution.

Results: The presumably oldest units in the study area are the Fra Mauro Formation (*If*) and the Montes Appenin (*Iap*). In the northern part of the study area, the foothills of the Montes Apenninus (**Fig. 2**; *Iap*) are exposed. This unit is characterized by a rough knobby surface compared to the mare unit *Im*. In the eastern part of the study area the Fra Mauro formation (*If*) is exposed (**Fig. 2**). The unit is characterized by a smoother surface compared to unit *Iap* but not as smooth than unit *Im*. The albedo of this unit is brighter than *Im* and the surface is also covered with several

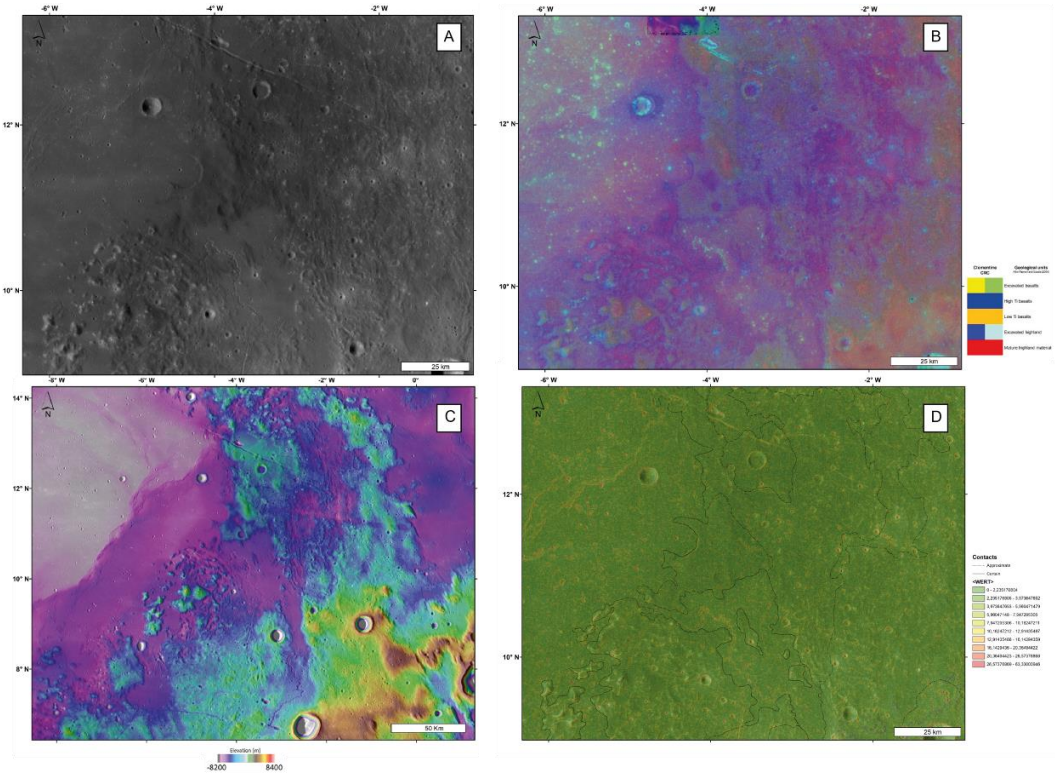

Figure 1*: Overview of the study area: WAC mosacic showing the region of interest (A) [modified after 9], the Clementine CRC mosaic (B)[modified after 3], the LOLA Kaguya merged DEM (C),and the slope derived from the hillshade outlined are the geological contacts (D).*

small craters ranging from 100 m up to 5 km. The dark mare unit *Im* in the west (**Fig. 2**) is slightly younger than the aforementionend units. *Im* is characterized by a smooth, dark surface with sparse craters ranging from several 100 m up to the 7 km large Bode C crater. There are also several wrinkle ridges and ray material from Copernicus crater in the western part of unit *Im* (**Fig. 2**). Located in the eastern part of the map area and west of unit *If* is unit *Ip* which is smoother compared to *If* and its albedo is also brighter. A rugged, darker unit (*Ir*) is located in the southern part of the study area (Fig. 2). Compared to *Im* it has few large craters ranging from one up to five kilometer. *Idp1* is located (**Fig. 2**). The surface is smoother compared to units *Iap* and *Ir*. The albedo of unit *Idp1* is darker compared to unit *Im*. In the northern part of this unit is Rima Bode located. This graben runs across unit *Idp1*, *Im* and an Im brian crater (**Fig. 2**; *Ic*). Unit *Idp1* is also characterized by several graben running across its surface mostly in the northern parts (**Fig. 2**). Southwest of unit *Idp1*, unit *Idp2* is located (**Fig. 2**). The albedo of this unit is darker and also smoother compared to unit *Idp1*. Across the whole study area are crater unit of different age located (*Ic*, *Cc*; **Fig. 2**).

Discussion: The area north of unit *Ic* (red star) close to Rima Bode would be interesting to study as suggested by [2] because it permits access to a crater and also the investingation of volcanic material. Nevertheless, we favor the area south of Bode C (green star) as described by [1]. There we would have access to ray material from Copernicus crater, could investigate pyroclastic material from *Idp1* and *Idp2*, and could investigate the wrinkle ridge north of Bode C. Therefore, with one landing site multiple goals could be achieved. Compared to [15] we mapped at a scale of 1:250,000, which allowed a more detailed investigation of the area. To make it more clear that the dark plains units are older than crater Copernicus we renamed them from unit *CId* [15] to *Idp1* and *Idp2*.

Conclusion/Future work: We identified at least three pyroclastic units in the study area. Two of them are in close proximity to Bode C and are within reach of a mission targeted to this area. Getting more samples from lunar pyroclastic material would increase our knowledge of the timing and evolution of volcanism in that specific area. In the future mapping process we will further specify the different mare units from which are hrere mapped as unit *Im*.

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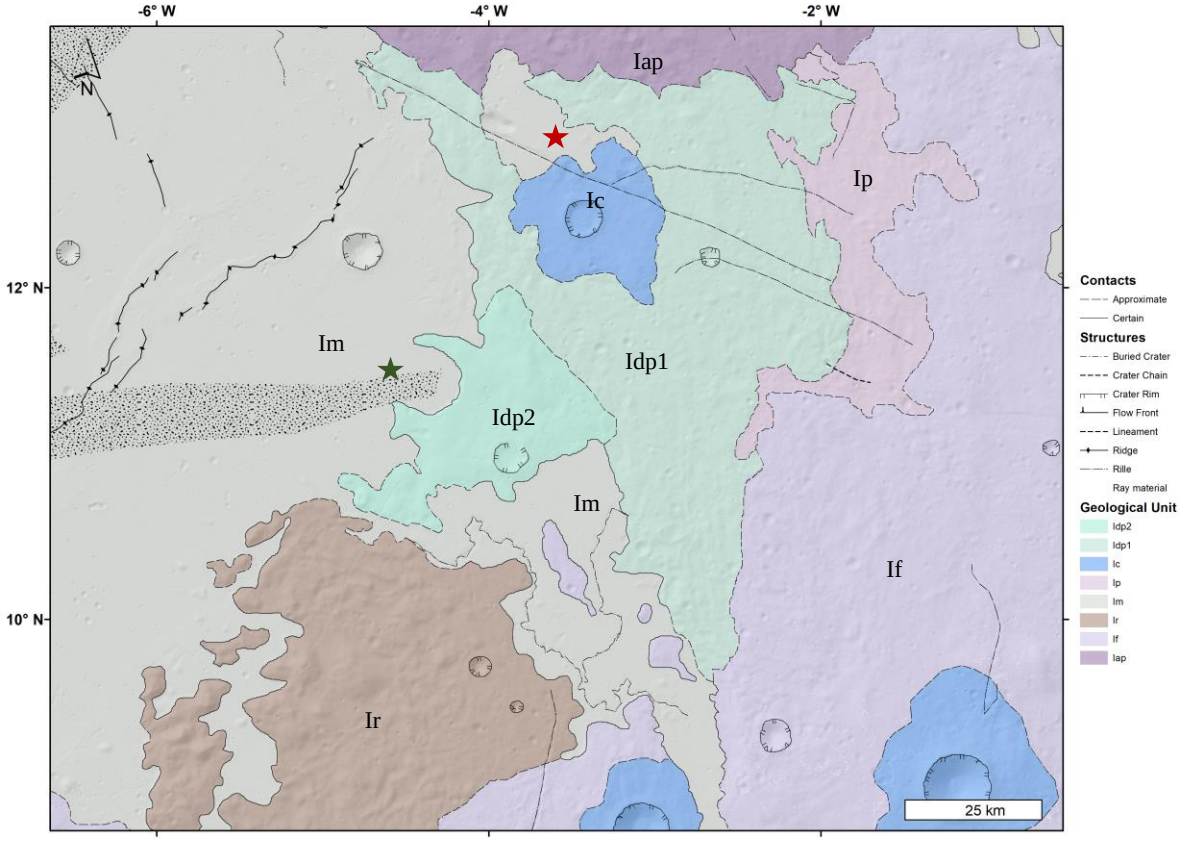

Figure 2:*Excerpt of the geological map of the Rima Bode region located at the southern limb of Mare Imbrium. The colored stars mark the two possible landing sites in the study region.*