Lunar domes in the easternmost regions of the Moon: preliminary note
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Lunar mare domes formed during the later stages of volcanic episode on the Moon, characterized by a decreasing rate of lava extrusion and comparably low eruption temperatures, resulted in the formation of effusive domes [1-3].
Such studies may help to gain more insight into regional geological processes and mare basin dome evolution.
Andrea Vanoni, from Italy, has imaged possible domes located near the crater Dubyago V, in Mare Undarum (Fig. 1).

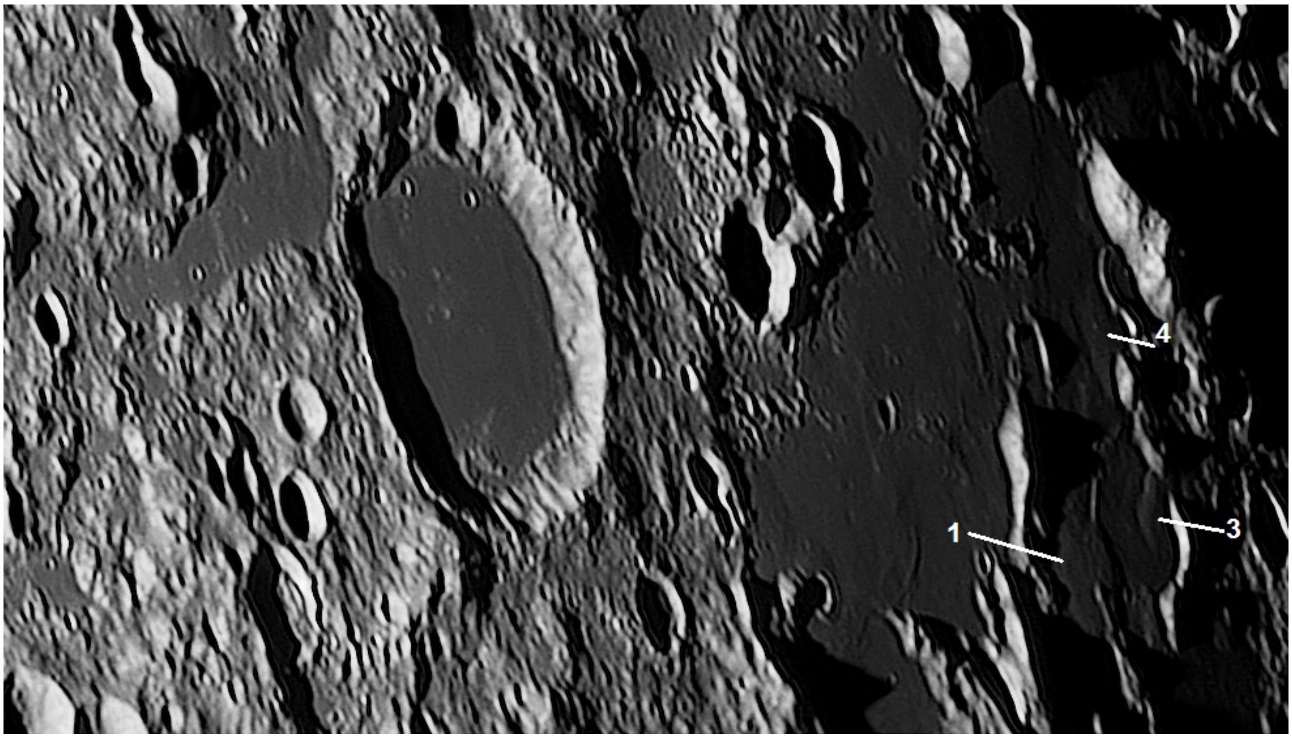

Figure 1: Telescopic image made on October 12, 2022 at 00:31 UT by Vanoni. The identified domes are marked with white lines. Mare Undarum, for its location close to the limb, is strongly foreshortened. The dome named Dubyago V 2 is emerging from the terminator and is not clearly detectable (bottom right). Newton 400 mm of diameter.

The examined domes described in the current preliminary note are reported in Table 1.
In the LRO WAC imagery they are not as prominent as in the telescopic terrestrial image taken under lower solar illumination angle and with telescope of large diameter.
Based on ACT react quick map and the Tool *Terrain Hill shade* the examined domes are detectable as shown in Figs. 2-3.

Some domes have already been measured in previous studies [3-4] and are reported in brackets.

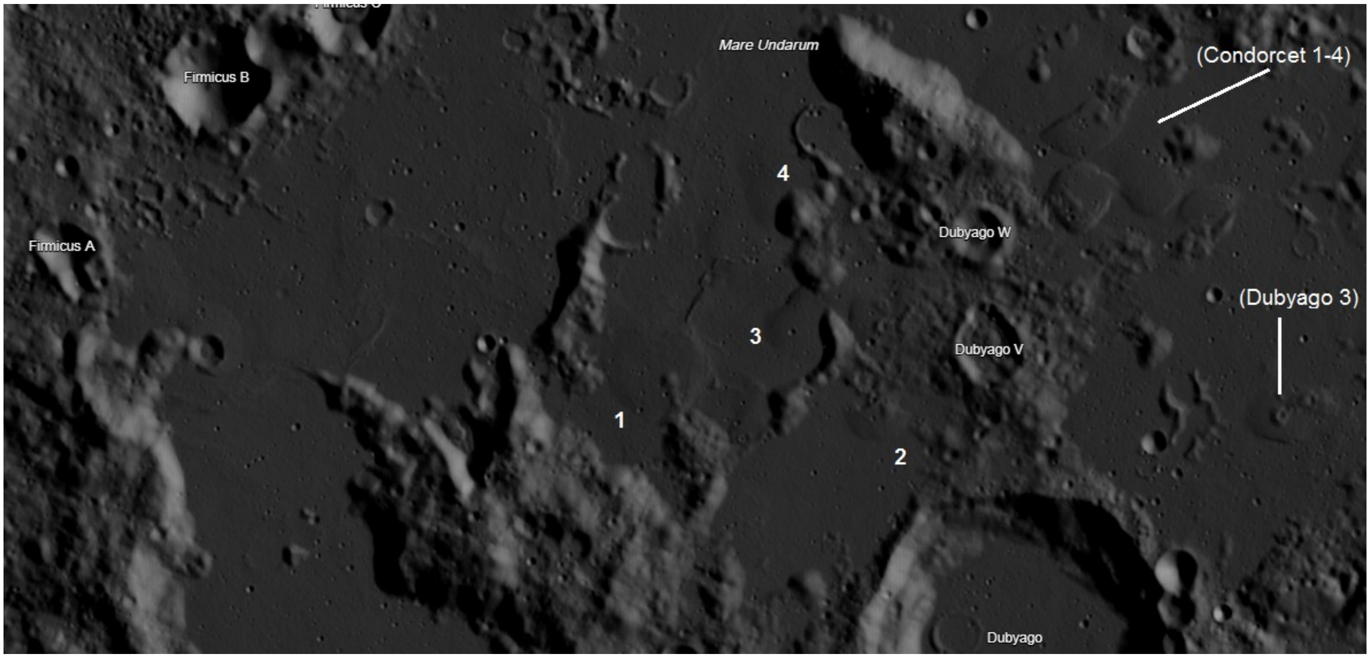

Figure 2: ACT react quick map. Mare Undarum around the craters Dubyago W and Dubyago V.Some domes have already been measured in previous studies by the author and are reported in brackets. The current study describes four domes named as Dubyago V 1-4.

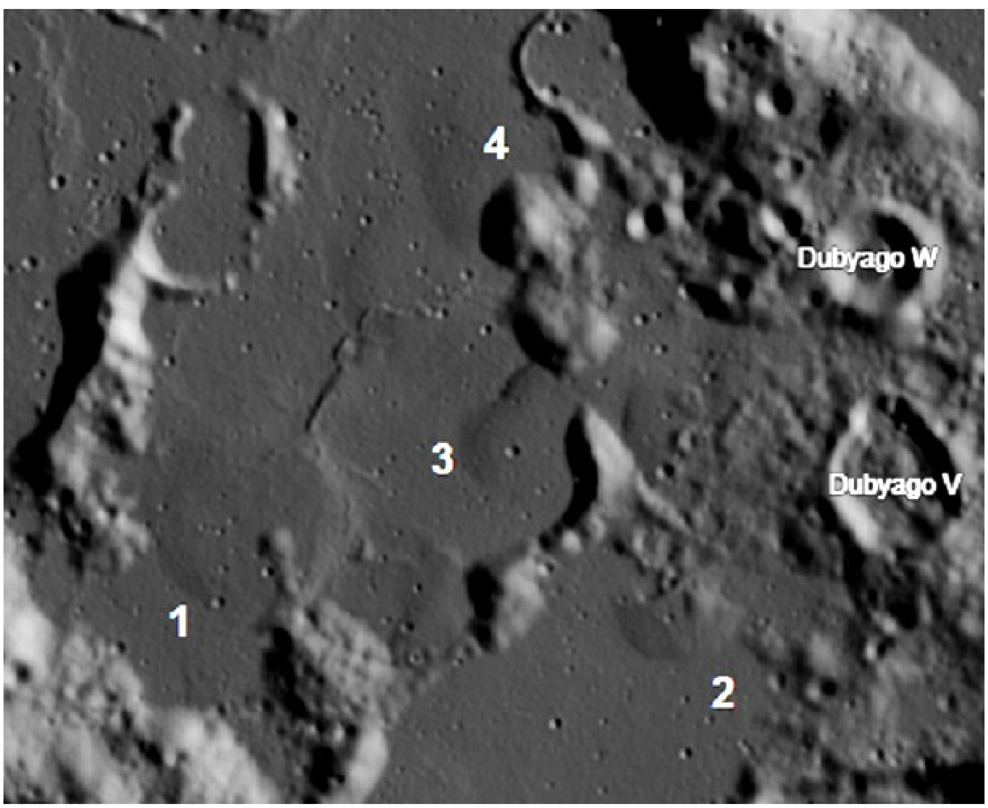

Figure 3: ACT react quick map Terrain Hill shade of the examined domes. Enlarged image.

	Long [°]	Lat [°]	D [Km]	h [m]	Slope [°]	Volume [Km^3]
Dubyago V 1	68.03	5.82	17	170	1.13	19.0
Dubyago V 2	69.21	5.52	11.2	90	0.89	4.0
Dubyago V 3	68.80	6.03	12	170	1.6	11.0
Dubyago V 4	68.70	6.80	18	130	0.8	14.5

Table 1. Morphometric properties and coordinates of the domes under analysis.

The 3D reconstruction of the domes, named as Dub V 1-4, obtained using WAC mosaic draped on top of the global WAC-derived elevation model GLD100, is shown in Figs. 4-7.

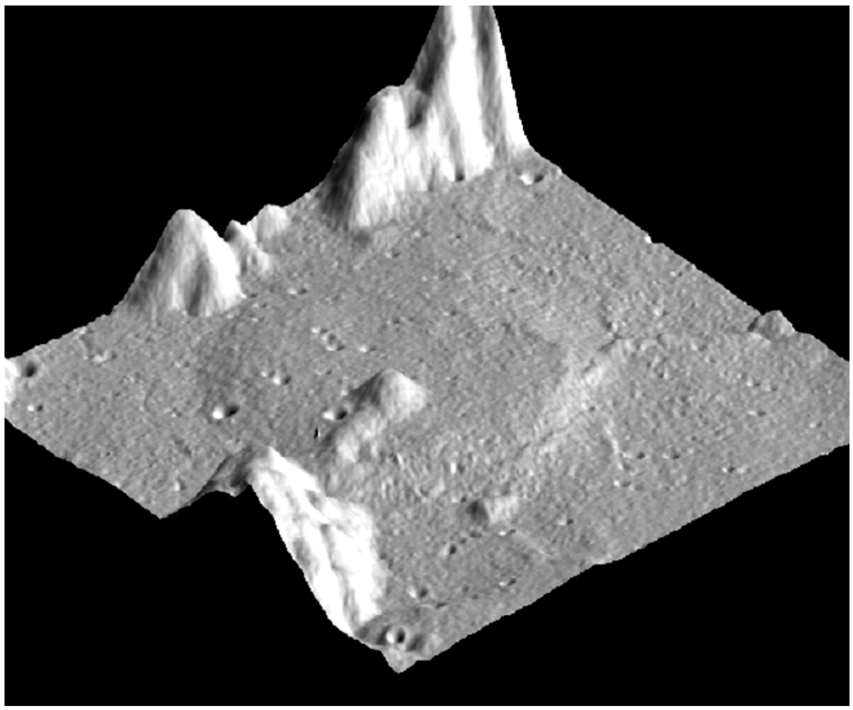

Figure 4: 3D reconstruction of Dub V 1. The vertical axis is 10 times exaggerated.

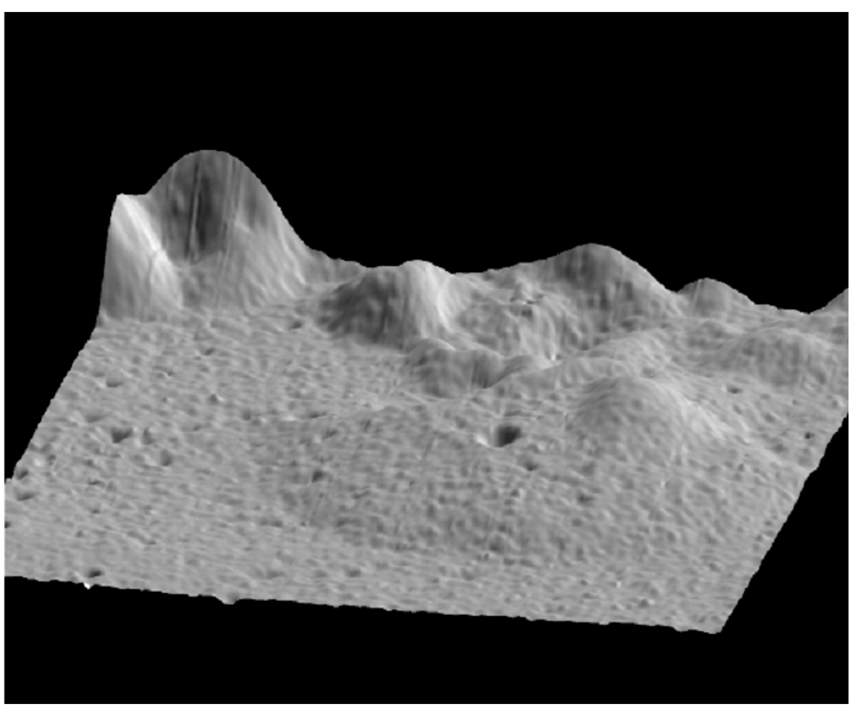

Figure 5: 3D reconstruction of Dub V 2. The vertical axis is 7 times exaggerated.

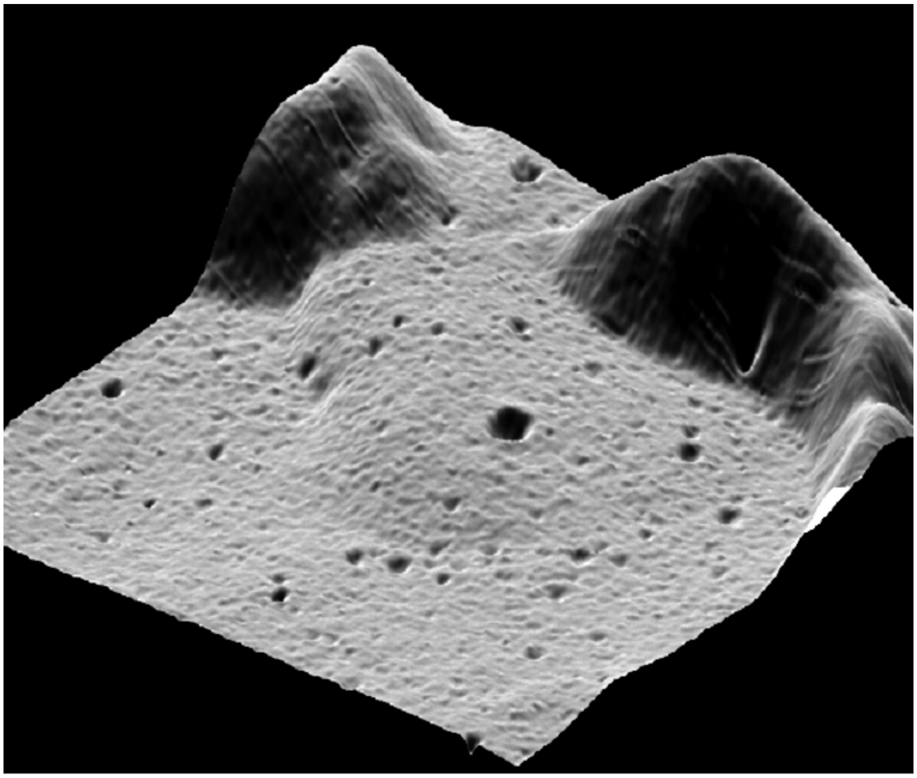
Figure 6: 3D reconstruction of Dub V 3. The vertical axis is 7 times exaggerated.

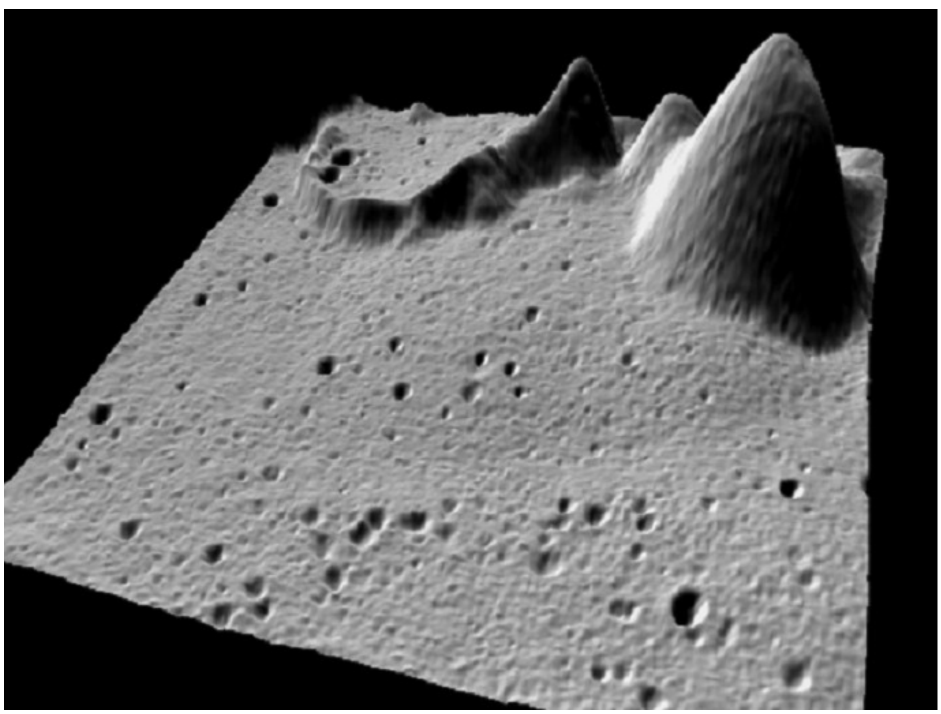
Figure 7: 3D reconstruction of Dub V 4. The vertical axis is 10 times exaggerated.

Wöhler and Lena [5] studied some intrusive domes on lunar surface based on telescope observations and proposed that intrusive domes have low flank slopes (less than 1°), large diameters (usually 10–20 km and can be larger than 30 km), regular but noncircular outline, and lack summit pits. Besides, tensional features such as faults and linear rilles could be found near the intrusive domes of class In1 [5].

The domes Dub V 1, 3 and 4 are not consistent with most of these criteria and may not be intrusive domes, although this possibility cannot be ruled out. It is more likely that these domes are effusive volcanic constructs formed by lava eruptions. 7
Only Dub V 2 displays an elongated shape with a circularity (c=minor axis/major axis) of about 0.7.
A reliable discriminative criterion in the dome classification is the circularity of the dome outline: the putative intrusive domes are elongated and with low slopes (< 0.9°). Class In1 comprises large domes with diameters above 25 km and flank slopes of 0.2°–0.6° and have linear or curvilinear rilles traversing the summit. Class In2 is made up by smaller and slightly steeper domes with diameters of 10–15 km and flank slopes between 0.4° and 0.9°. Class In3 comprises low domes with diameters of 13-20 km and flank slopes below 0.3° [3, 5].
Hence the dome Dub V 2 would match the properties derived for putative intrusive dome belonging to class In2 and could imply on origin due to a subsurface intrusion of a magmatic body. A similar construct in Mare Undarum (see Fig. 3) named Dubyago 3, has similar morphometric properties as described in [3,4].

The derived abundance maps in wt% of plagioclase, olivine, clinopyroxene and orthopyroxene created from topographically-corrected Mineral Mapper reflectance data acquired by the JAXA Selene/Kaguya are reported in Table 2 and Fig. 8.

Feature	TiO_2 % wt	FeO % wt	CPX % wt	OPX % wt	Oliv % wt	Plag % wt
Dub V 1	1.1	18.9	30.5	24.4	6.8	39.1
Dub V 2	1	16.4	27.2	16.1	10.4	46.0
Dub V 3	1.1	15.9	18.6	23.8	10.1	47.2
Dub V 4	2.2	16.3	16.2	27.0	10.0	46.0

Table 2. Derived abundance in wt% of the examined domes derived from topographically-corrected Mineral Mapper reflectance data

The TiO_2 content of the examined lunar domes is 1–2.2 wt %, while the FeO content varies from 15.9 wt % to 18.9 wt %.

The derived abundance maps in wt% of olivine and plagioclase are shown in Fig. 9.

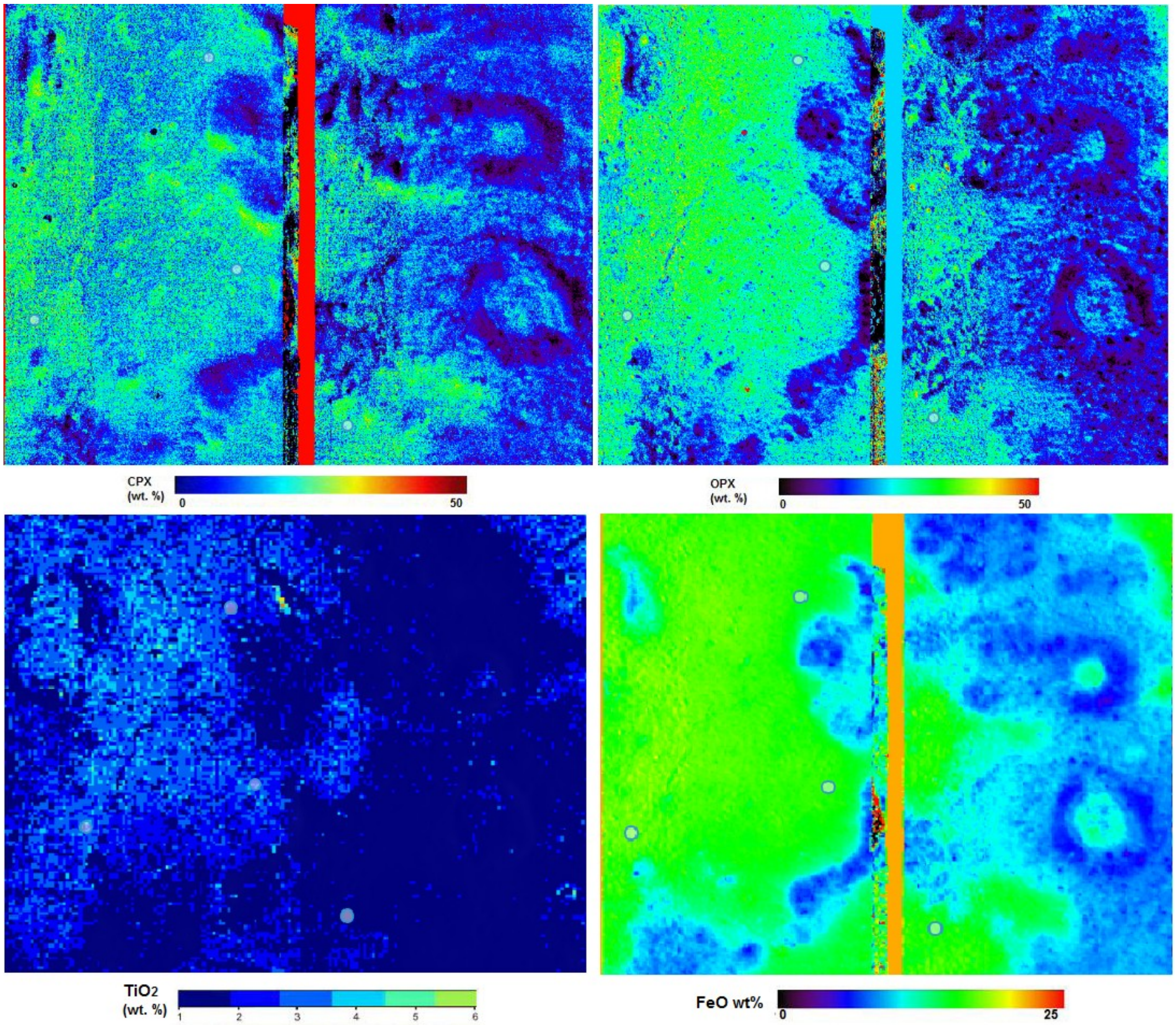

Figure 8: Mineral Mapper reflectance data acquired by the JAXA Selene/Kaguya. Top abundance in wt% of clinopyroxene (CPX), orthopyroxene (OPX), TiO_2, FeO.

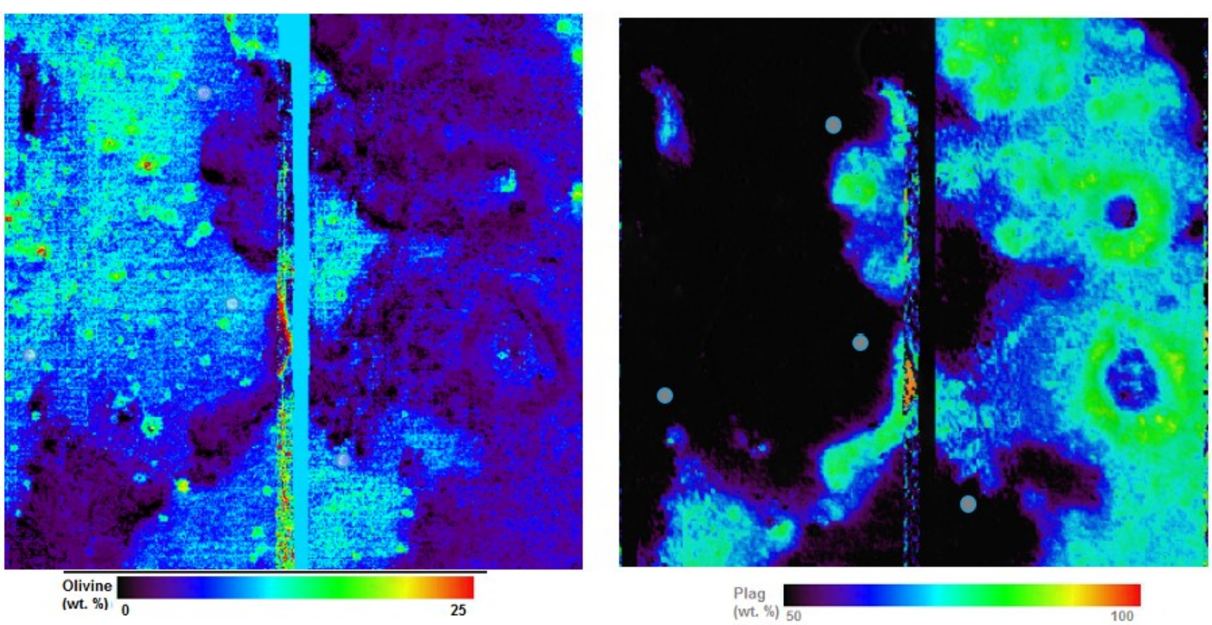

Figure 9: Abundance in wt% of olivine and plagioclase (PLAG).

I encourage more high-resolution imagery of these domes, which has been not characterized in the morphometric and spectral properties yet. Further analyses are in progress for a future article. Please check also your past imagery and send them to us for the ongoing study (email: lunar-domes@alpo-astronomy.org).

References

[1] Basaltic Volcanism Study Project. 1981. Basaltic Volcanism on the Terrestrial Planets. New York: Pergamon Press.
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