Preliminary geologic mapping of Imdr Regio, Venus.

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Where on Venus?

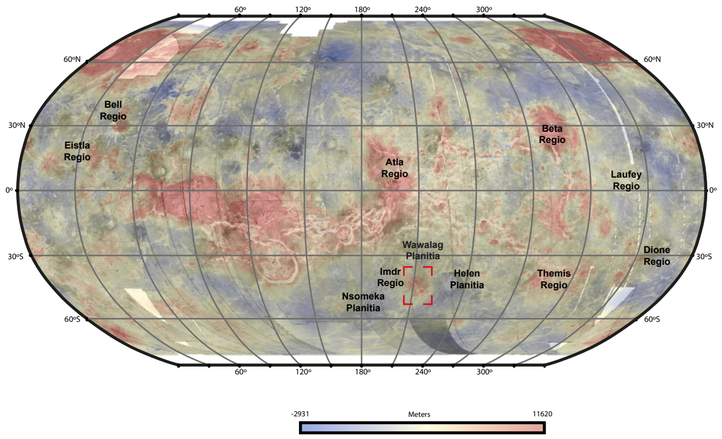


Figure 1. Location of Imdr Regio (composite of Magellan left-looking radar image and altimetry data).

Imdr Regio is a large igneous rise that extends approximately from 35ºS-50ºS and 195ºE-225ºE between the plains of Helen, Nsomeka and Wawalag Planitiae. Imdr Regio is classified as a volcano-dominated igneous rise with a minimum-maximum diameter of 1200-1400 km and a swell height of 1.6 km [1]. The principal volcanic feature in Imdr Regio is Idunn Mons (46.5ºS/214.5ºE), a large shield volcano [2].
Studies on the infrared emissivity of the volcanic flows surrounding Idunn Mons suggest that high emissivity values in some of the volcano flows are related to low weathering and therefore indicative of a recent or even ongoing volcanic activity in Idunn Mons [3-6].

Imdr Regio: volcano or rift-dominated large igneous rise?

Idunn Mons is contemporaneous with the formation of Olapa Chasma, a NW-SE trending rift that extends across the large igneous rise. Our preliminary geologic mapping shows that it has played an important role in the geology of the whole Imdr Regio.

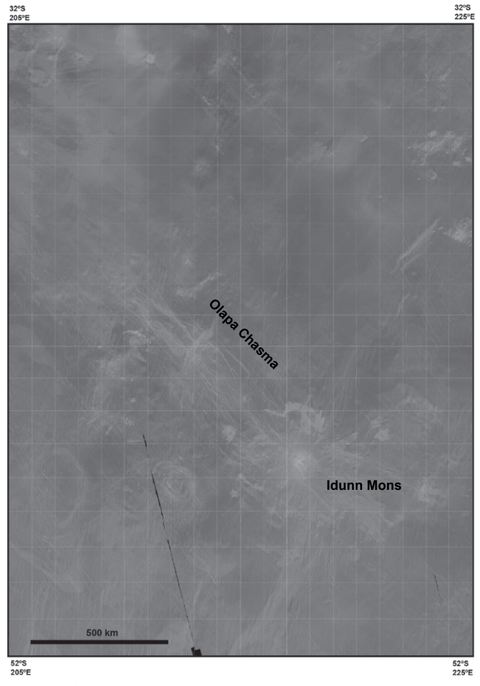
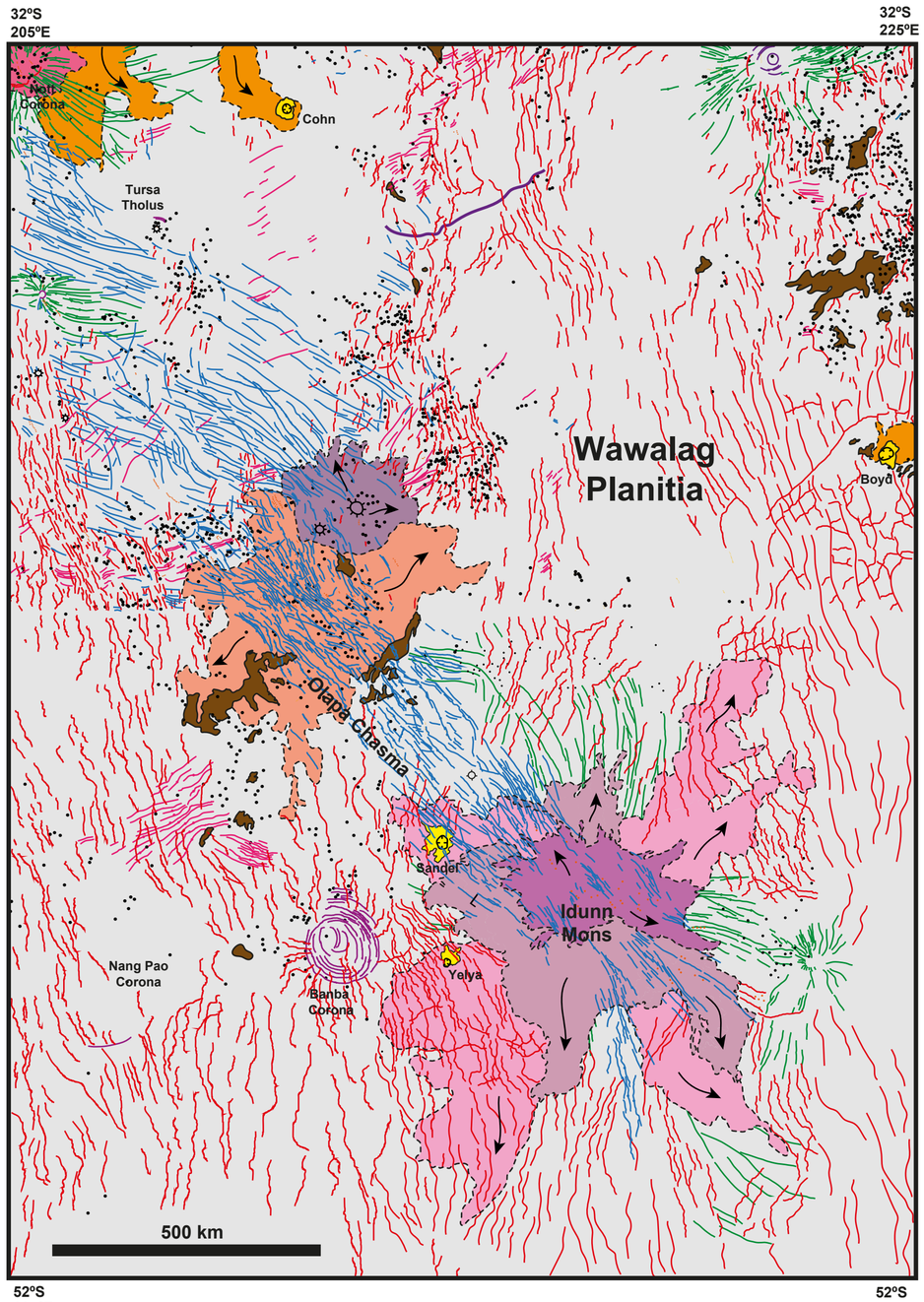


Figure 2. Base image for the geologic mapping of Imdr Regio (Magellan left-looking radar image).



LEGEND

- Crater related flows, undivided.
- Crater material, undivided.
- Flows from Nott Corona.
- Flows from unnamed volcano.
- Flows from Olapa Chasma.
- Flows from Idunn Mons, member 3.
- Flows from Idunn Mons, member 2.
- Flows from Idunn Mons, member 1.
- Volcanic plains and undivided Imdr Regio materials.
- Basement materials.
- Small shields.
- Pits.
- Domes and intermedate volcanoes.
- Crater rim.
- Regional fractures (balled when interpreted as graben).
- Rift fractures (balled when interpreted as graben).
- Concentric fractures (balled when interpreted as graben).
- Radial fractures (balled when interpreted as graben).
- Wrinkle ridges.
- Channels.
- Contacts (dashed when mapped as approximate).

Figure 3. Preliminary geologic mapping of Imdr Regio.

Northwest Imdr Regio

The deformation in this section of Olapa Chasma is more important, and the presence of pits chains with associated lava flows suggests that there is a strong magmatic component in the formation of the rift. Volcanism in this section of Imdr Regio is dominated by large fracture-fed flows together with the formation of several clusters of small shields [7] and some intermediate to large shield volcanoes.

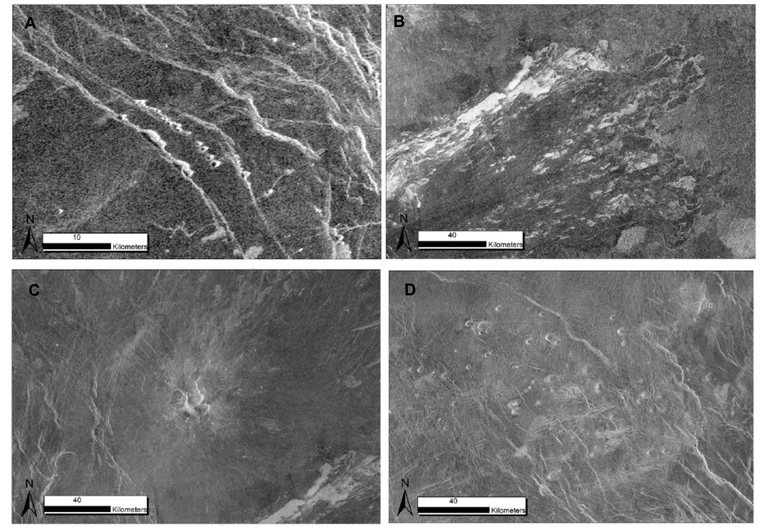


Figure 4. Styles of volcanism in Northwest Imdr Regio. a) Pit chains and associated lava flows, b) Fracture-fed lava flows, c) Intermediate to large shield volcano, d) Cluster of small shields(composite of Magellan left-looking radar image and altimetry data).

Southeast Imdr Regio

The southeast of Imdr Regio is dominated by Idunn Mons. The evolution of the volcano included the formation of multiple flow units that evolve from large sheet flows to digitate flows that are contemporaneous with the formation of Olapa Chasma.

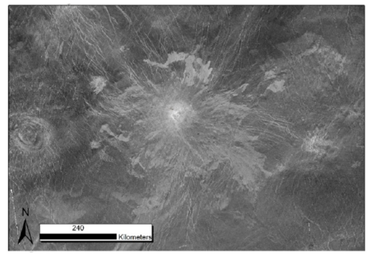


Figure 4. Idunn Mons (Magellan left-looking radar image) .

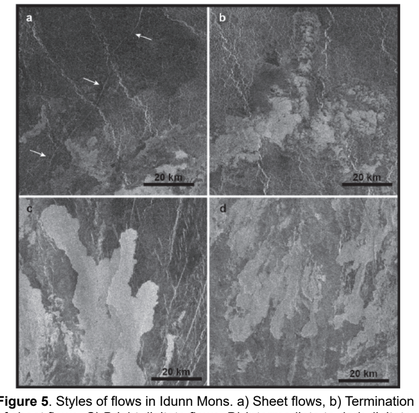


Figure 5. Styles of flows in Idunn Mons. a) Sheet flows, b) Termination of sheet flows, C) Bright digitate flows, D) Intermediate to dark digitate flows (Magellan left-looking radar image) .

Future work

Future work in the area include:
- Completion of the regional geologic mapping.
- Geologic history of the area.
- Study of the geophysical and geological evolution of the area.

References

[1] Smrekar et al., (1997). In Venus II:Geology, Geophysics and Solar wind environment. University of Arizona Press. [2] Crumpler et al., (1997). In Venus II:Geology, Geophysics and Solar wind environment. University of Arizona Press.[3] Smrekar et al. (2010) Science, 328, 605–608. [4] D'Incecco et al. (2017) Planet. Space Sci., 136, 25-33. [5] D'Incecco et al. (2020) Earth Plant. Sci. Lett., 546, 116410.