

MODELING THERMAL PROFILES OF MERCURY'S SURFACE : INSIGHTS FROM BEPICOLOMBO'S 5TH FLYBY

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MERTIS - MERCURY RADIOMETER AND THERMAL INFRARED IMAGING SPECTROMETER

- Part of the Mercury Planetary Orbiter Payload.
- Infrared Spectrometer (TIS) - with spectral wavelength of 7-14 μm with a 90 nm resolution (Hiesinger et al., 2008).
- Observation will be performed using the space view of the instrument.

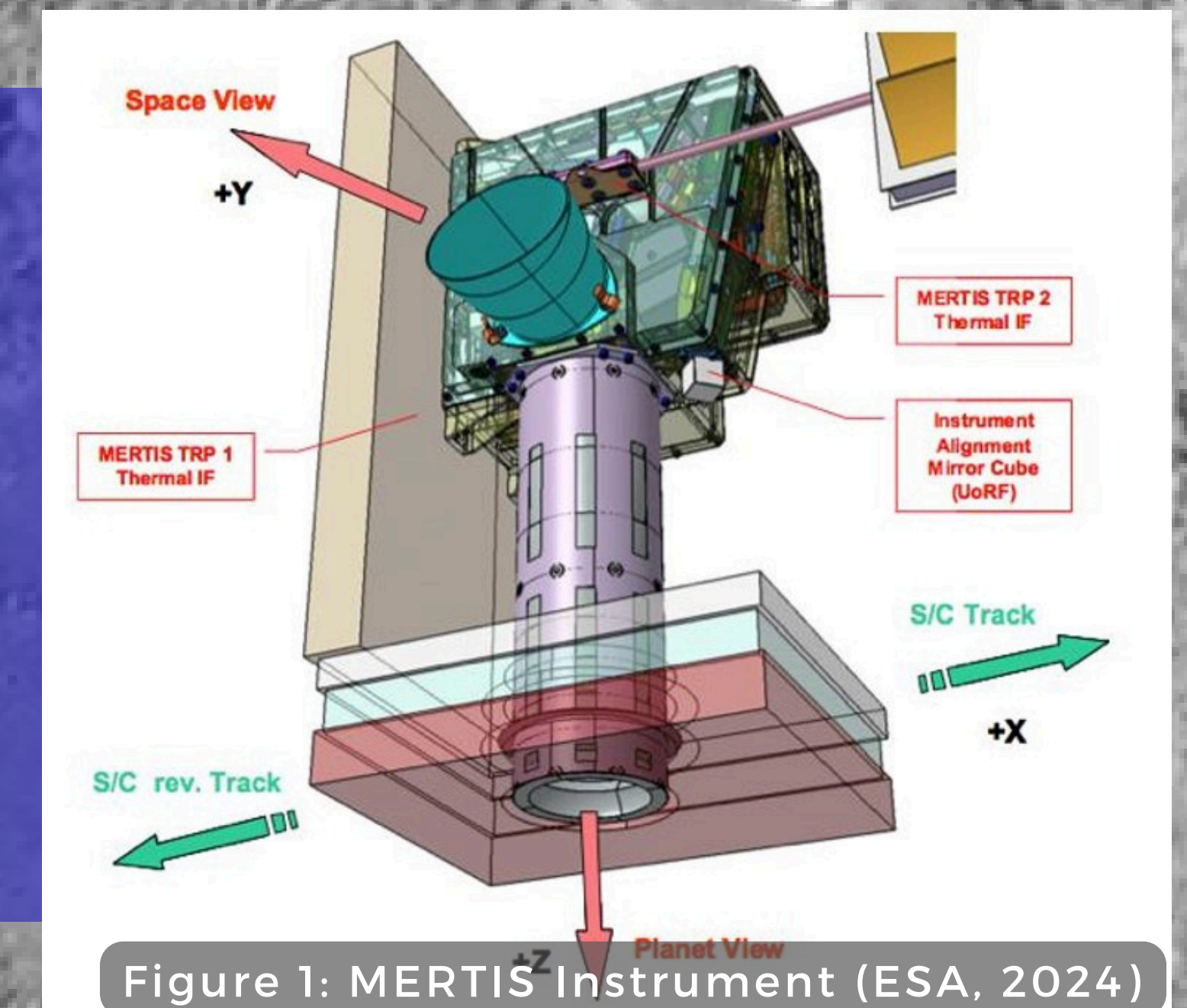


Figure 1: MERTIS Instrument (ESA, 2024)

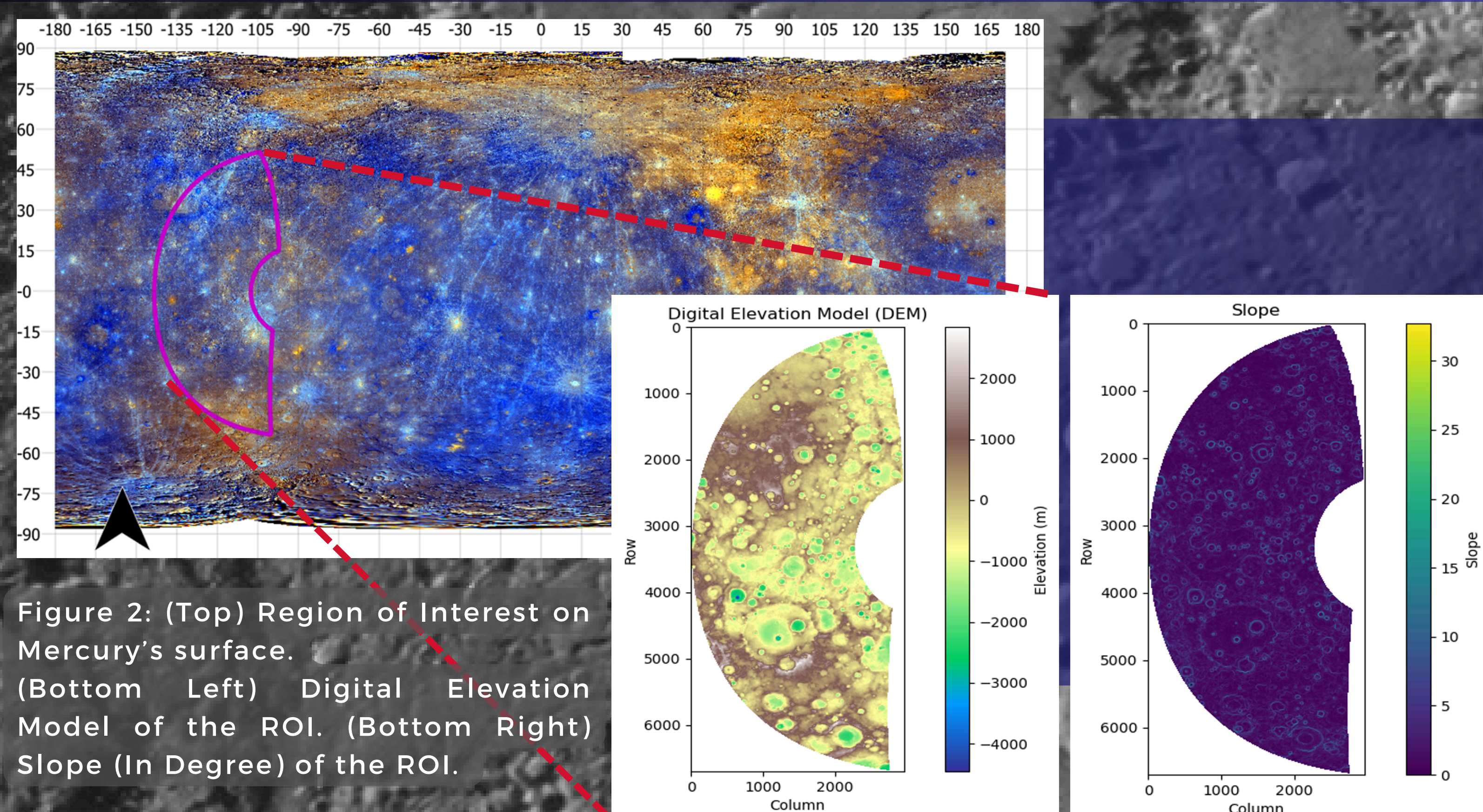


Figure 2: (Top) Region of Interest on Mercury's surface. (Bottom Left) Digital Elevation Model of the ROI. (Bottom Right) Slope (In Degree) of the ROI.

REGION OF INTEREST

- Extent - 51.54° & -53.18° latitude and -97.17° & -143.30° longitude.
- Region - Beethoven Basin.
- Craters - Michelangelo, Durer, Vieira da Silva
- Altitude - Max - 2841 m, min - -4453.5 m

METHODS & RESULTS

- The heat transfer within Mercury's regolith was modeled using a one-dimensional heat conduction.
- The initial study shows variation in subsurface temperature across random longitudes and latitudes, indicating non-uniform heat distribution.
- The surface density is constant, hence no change can be seen on the surface.
- The calculation of temperature on surface and subsurface is based of Aubrite density (2630.8 kg/m^3) and a random density range ($1600 - 2400 \text{ kg/m}^3$).
- Flyby Date - 1st of December, 2024. Region of Interest might still be refined.

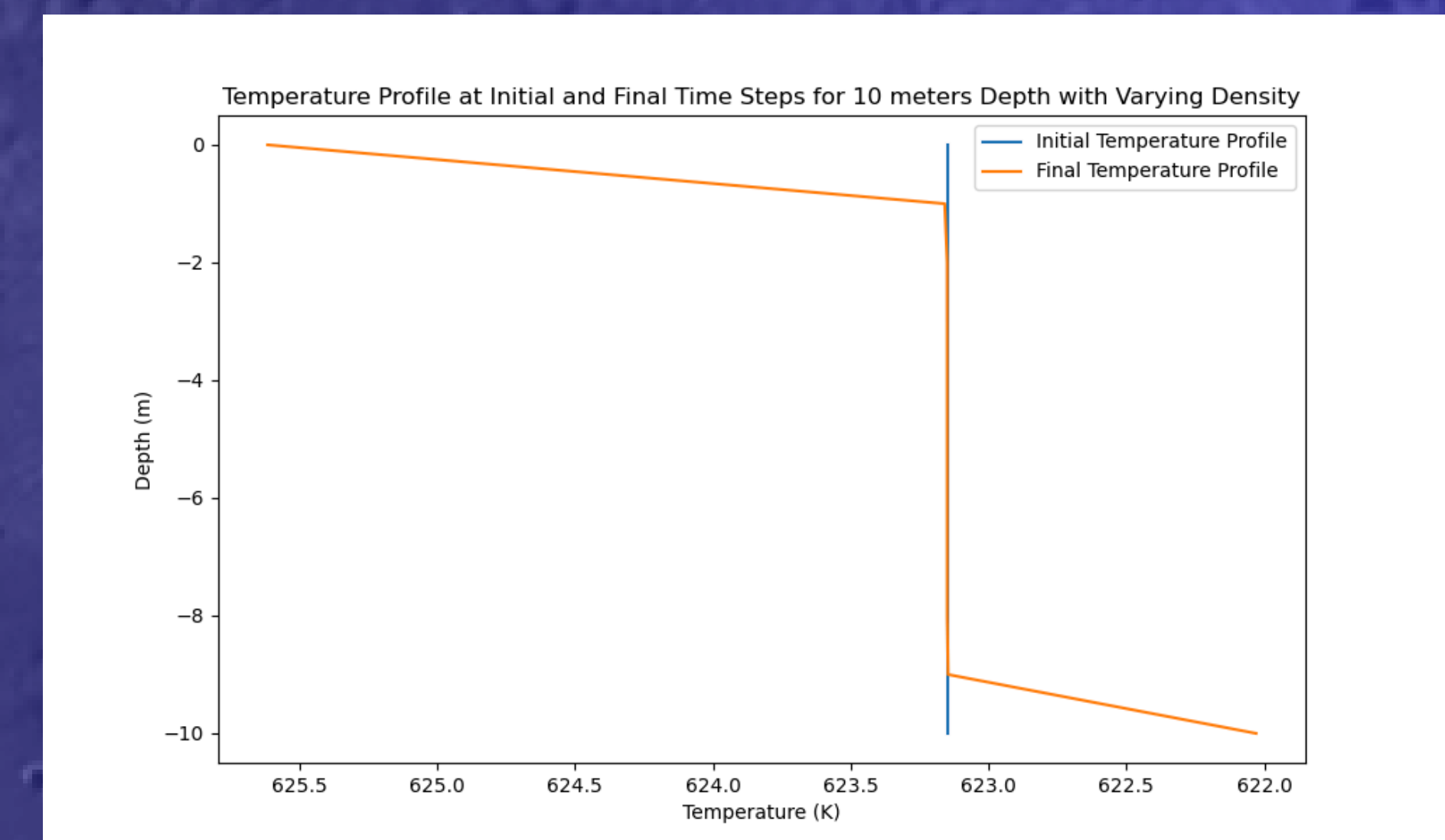
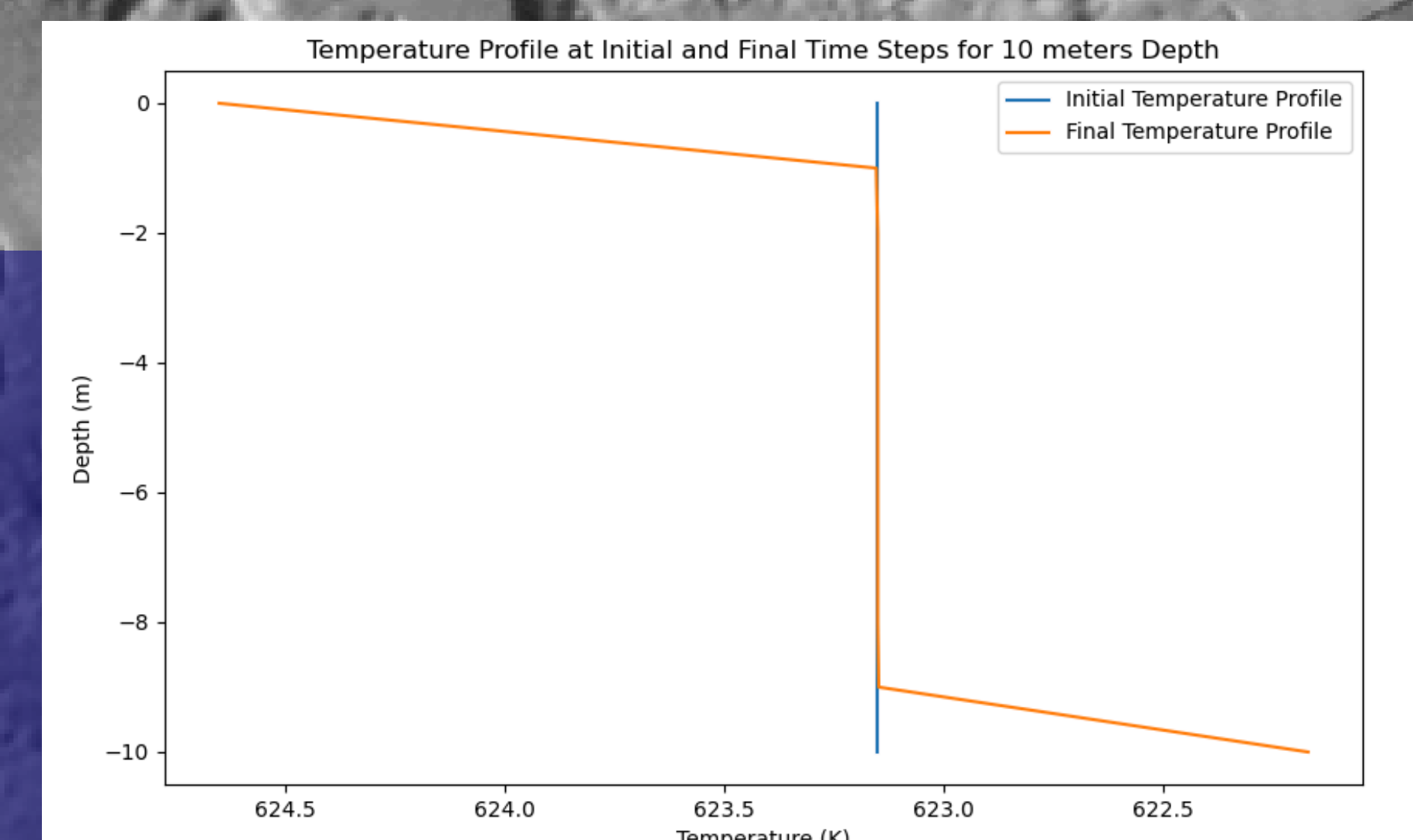
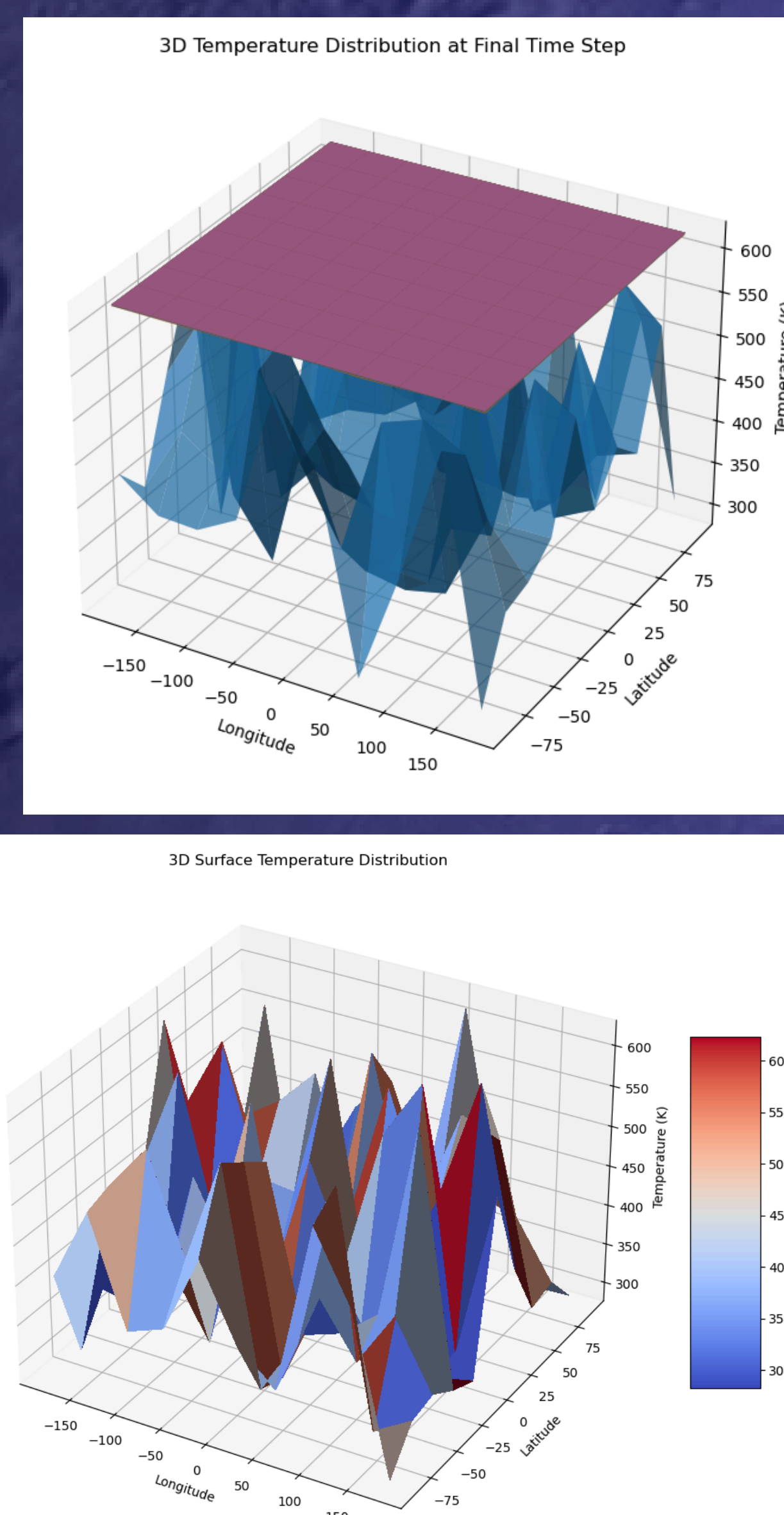


Figure 3 : (Top-left) 3D rendering of the sub-surface temp distribution. (Bottom-left) 3D rendering of sub-surface temperature coloured. (Top-right) Initial temp and final temp profile at 10 m depth. (Bottom-right) Initial temp and final temp profile at 10 m depth using varying density (1600 - 2400)

NEXT STEPS

- Fine tuning the model to make it suitable for the study of ROI for the upcoming 5th flyby.
- A parallel spectral study is being done to compare the data we will collect via BepiColombo Flyby.
- The results from the Temperature study will be used along with the lab results from Planetary Laboratories to prepare for the flyby.

REFERENCES

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