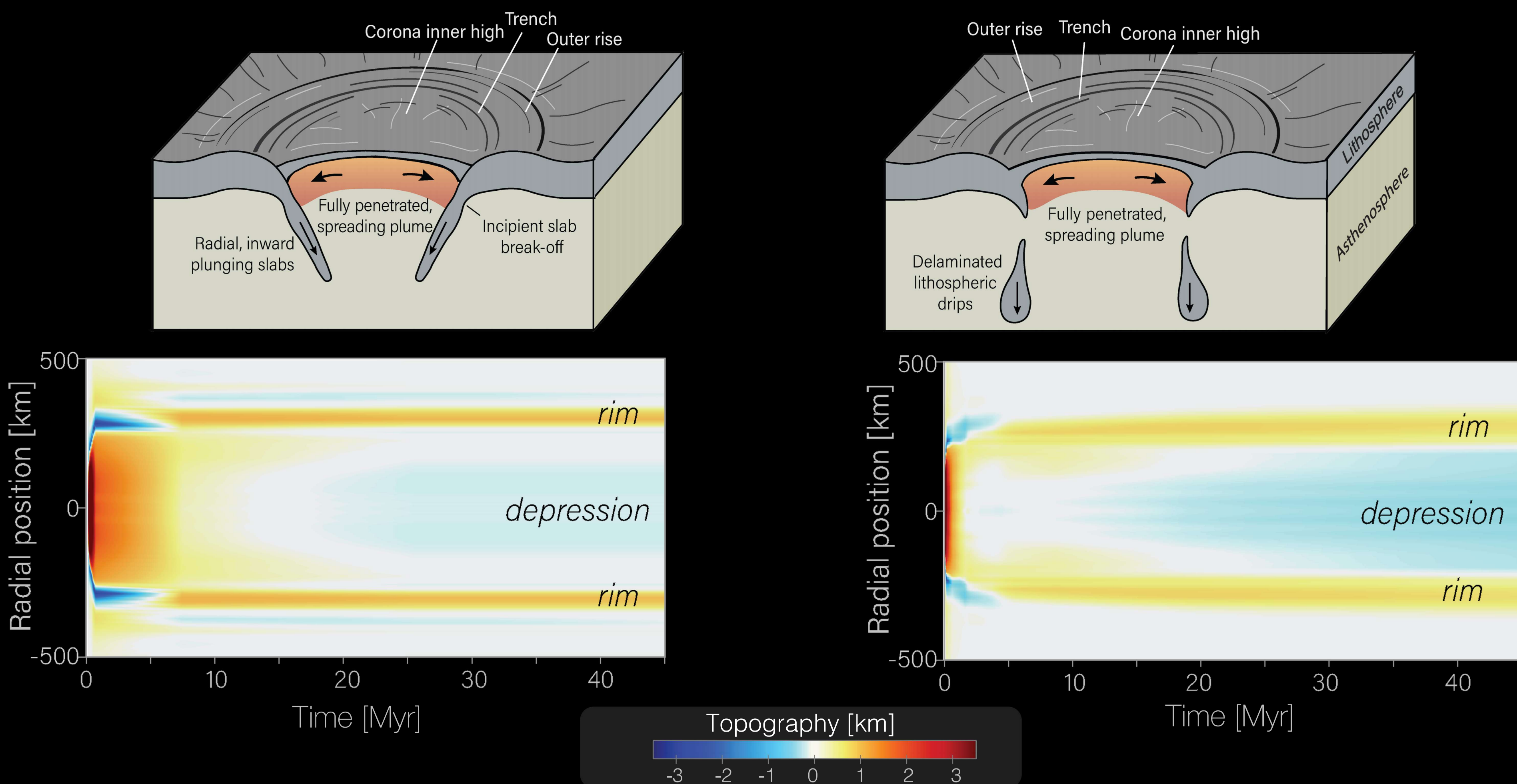
# Temporal evolution of corona topography



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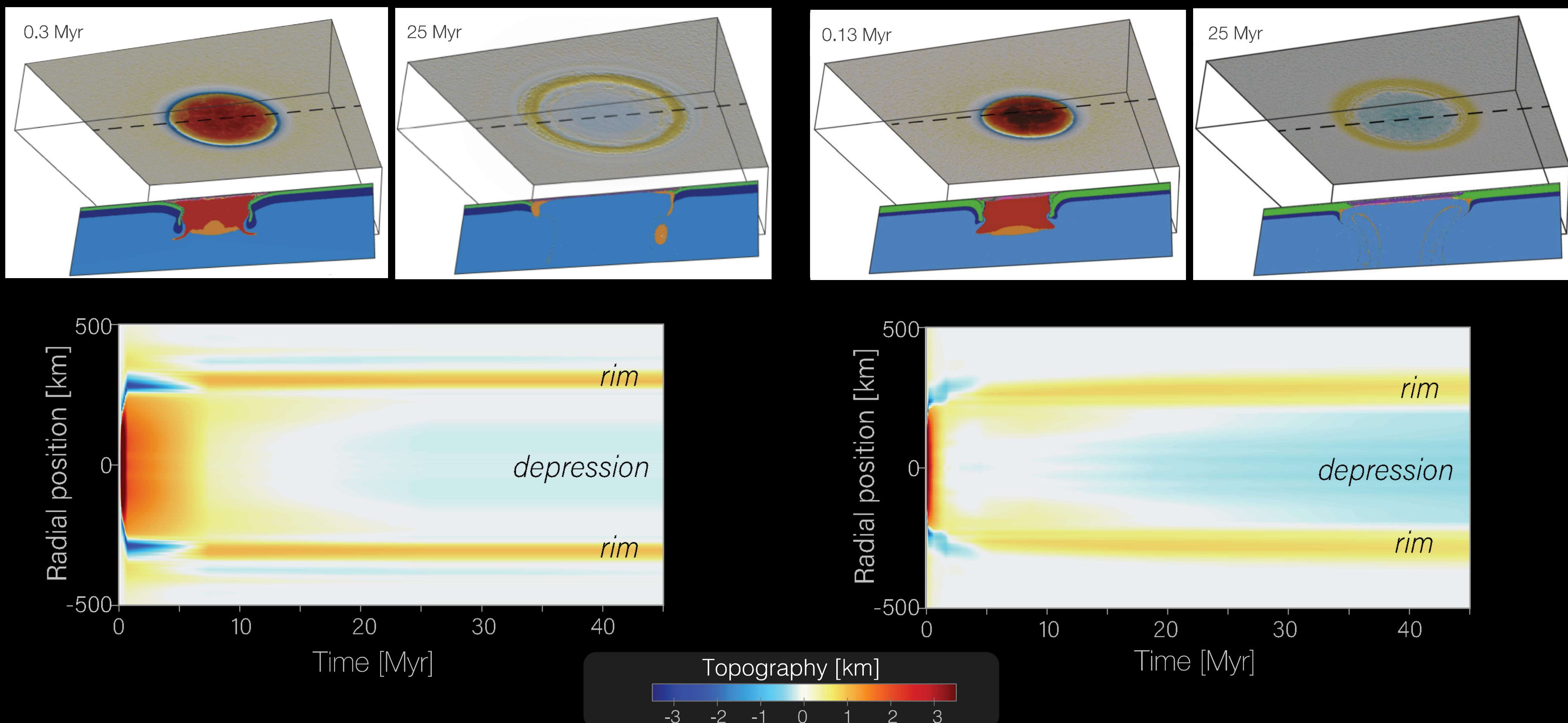
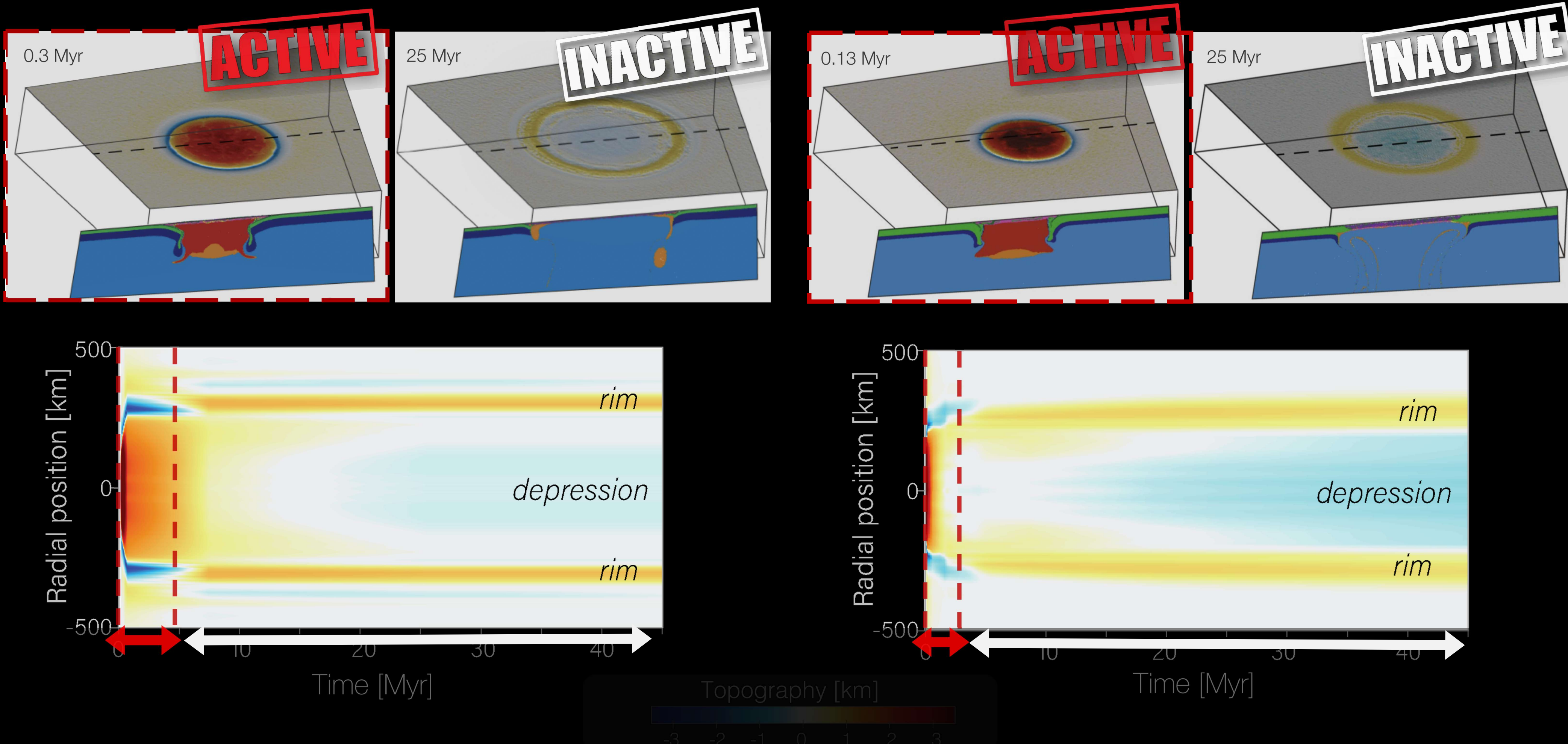


# Topographic inversion



# 3D models – *key points*

- The morphology of coronae is related to what processes are going on underneath it

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- Crustal thickness variations eventually lead to an isostasy-driven **topographic inversion**:

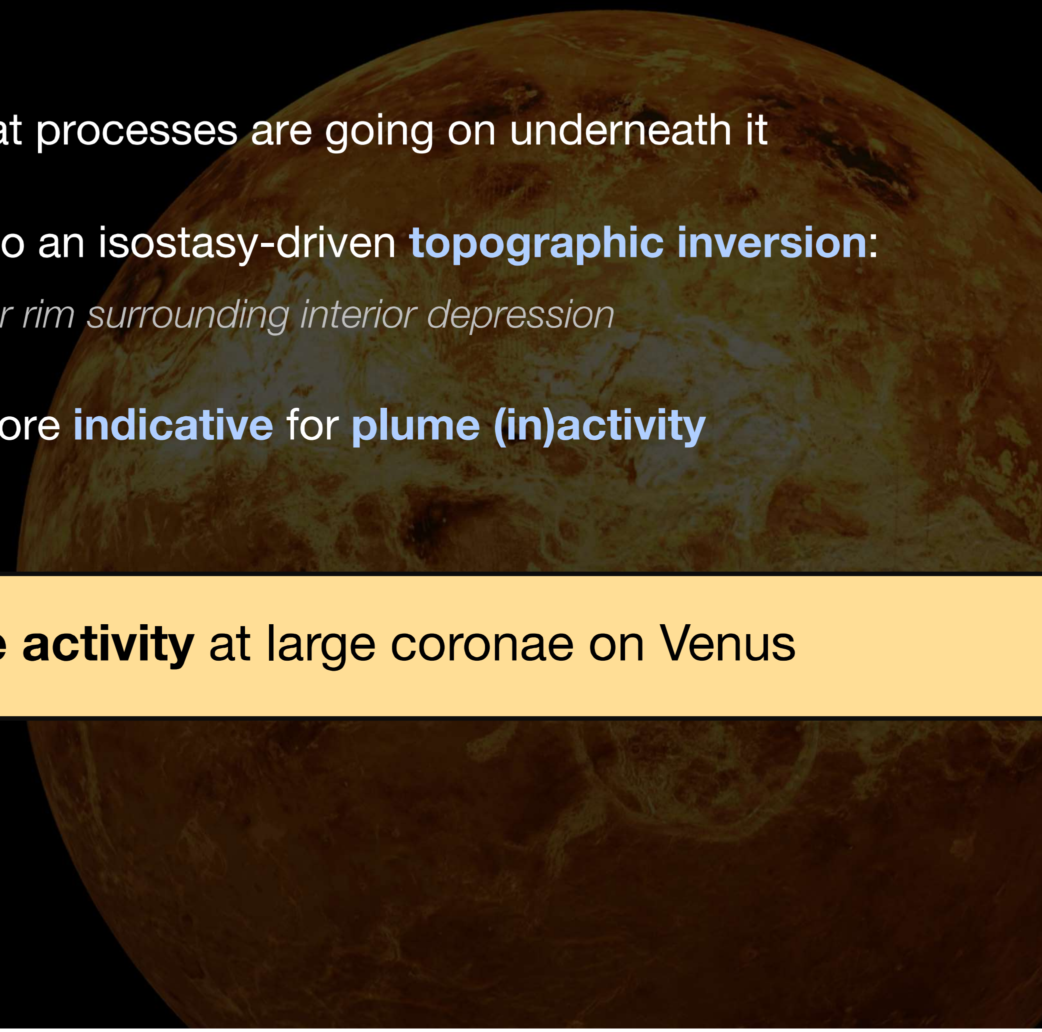
  *circular trench surrounding interior high* → *outer rim surrounding interior depression*

# 3D models – *key points*

- The morphology of coronae is related to what processes are going on underneath it
- Crustal thickness variations eventually lead to an isostasy-driven **topographic inversion**:

  *circular trench surrounding interior high → outer rim surrounding interior depression*
- The topographic pattern of coronae is therefore **indicative** for **plume (in)activity**

Address the **current state of plume activity** at large coronae on Venus



# Coronae classification

- Analyse topography of 133 largest coronae on Venus

  *(Magellan topography dataset and USGS coronae database)*

- Classify plume activity:

**ACTIVE**

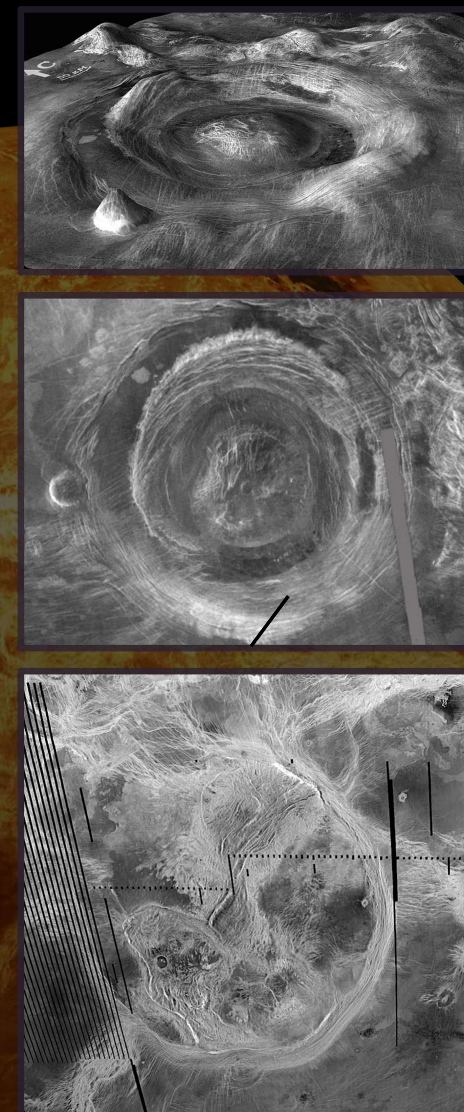
✓ Outer trench

✓ Outer rise

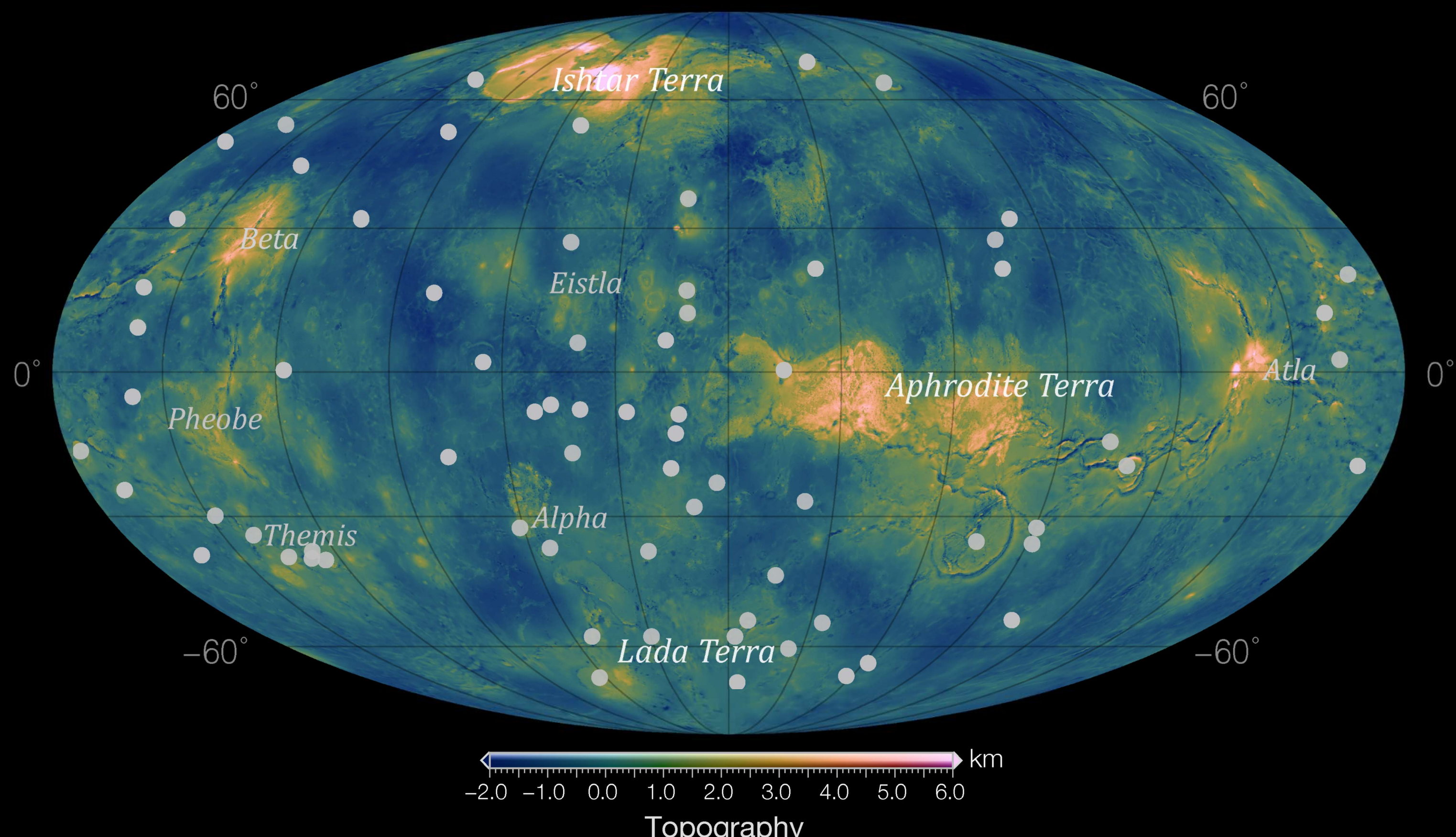
**INACTIVE**

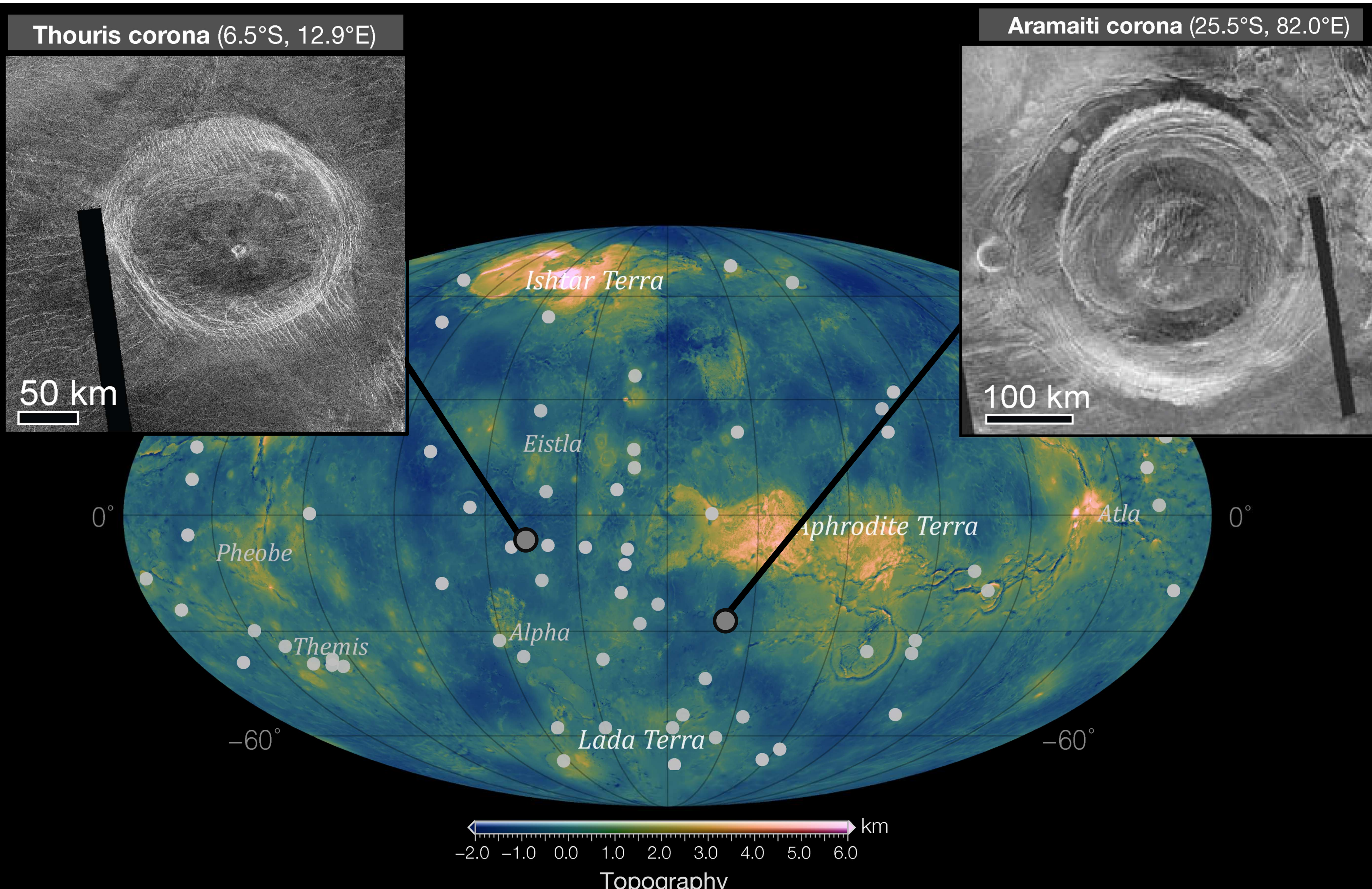
✓ Outer rim

✓ Inner depression

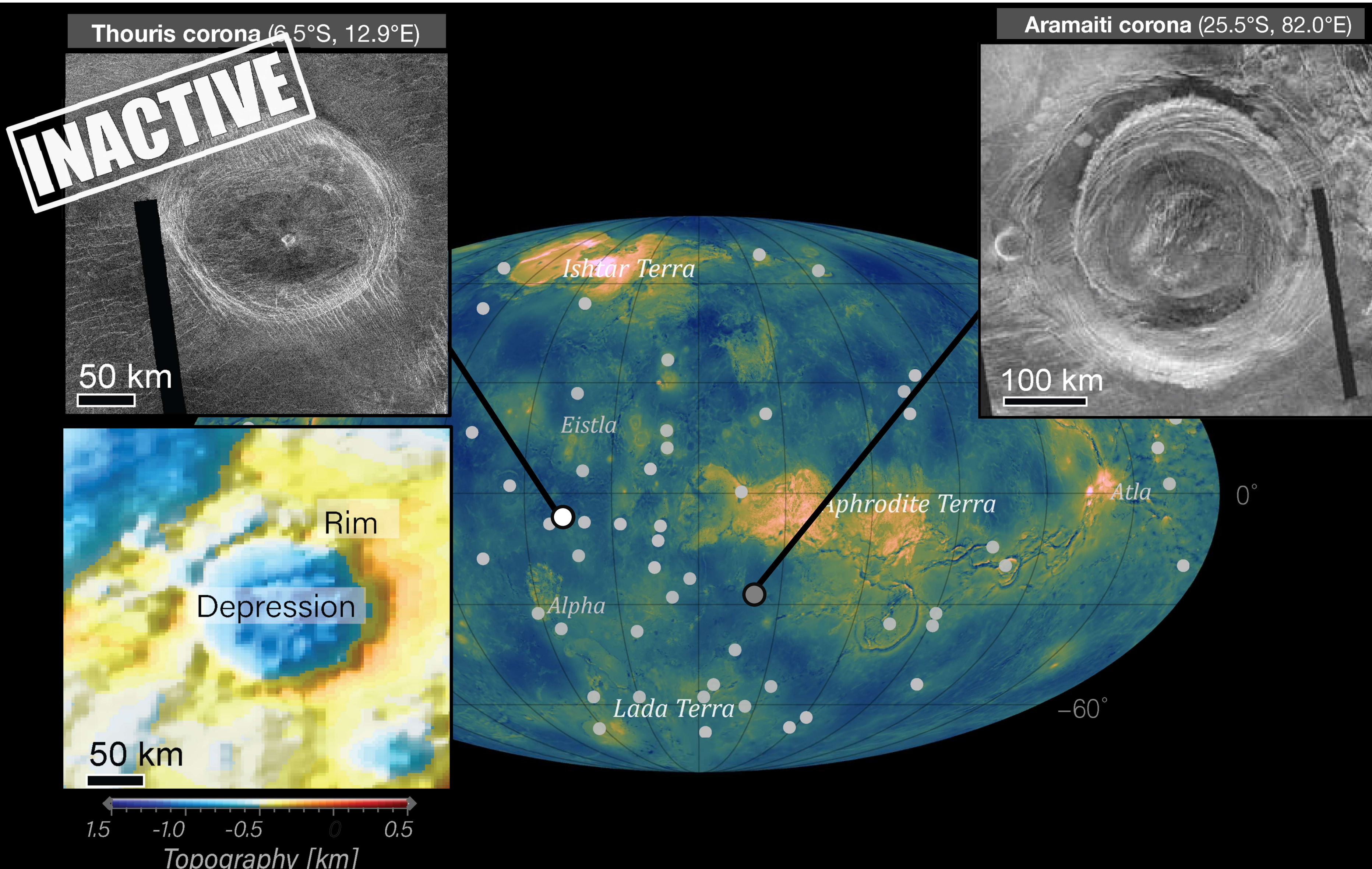


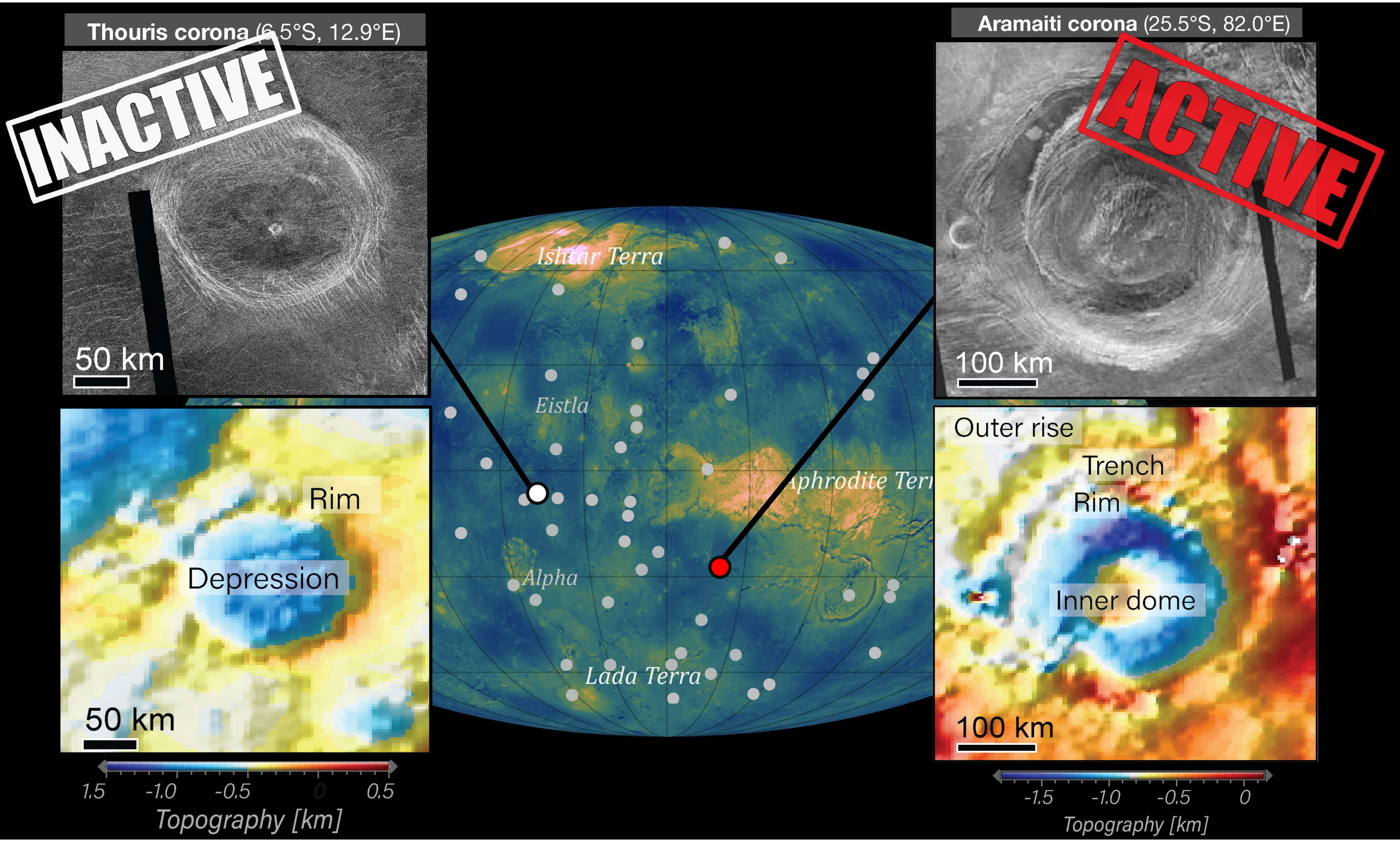
# Coronae classification





Thouris corona (6.5°S, 12.9°E)
50 km
Aramaiti corona (25.5°S, 82.0°E)
100 km
Ishtar Terra
Eistla
Aphrodite Terra
Atla
Pheobe
Themis
Alpha
Lada Terra
0°
0°
−60°
−60°
km
−2.0 −1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0
Topography


Thouris corona (6.5°S, 12.9°E)
INACTIVE
50 km
Rim
Depression
50 km
1.5
-1.0
-0.5
0
0.5
Topography [km]
Ishtar Terra
Eistla
Alpha
Lada Terra
Aphrodite Terra
Atla
0°
−60°
Aramaiti corona (25.5°S, 82.0°E)
100 km

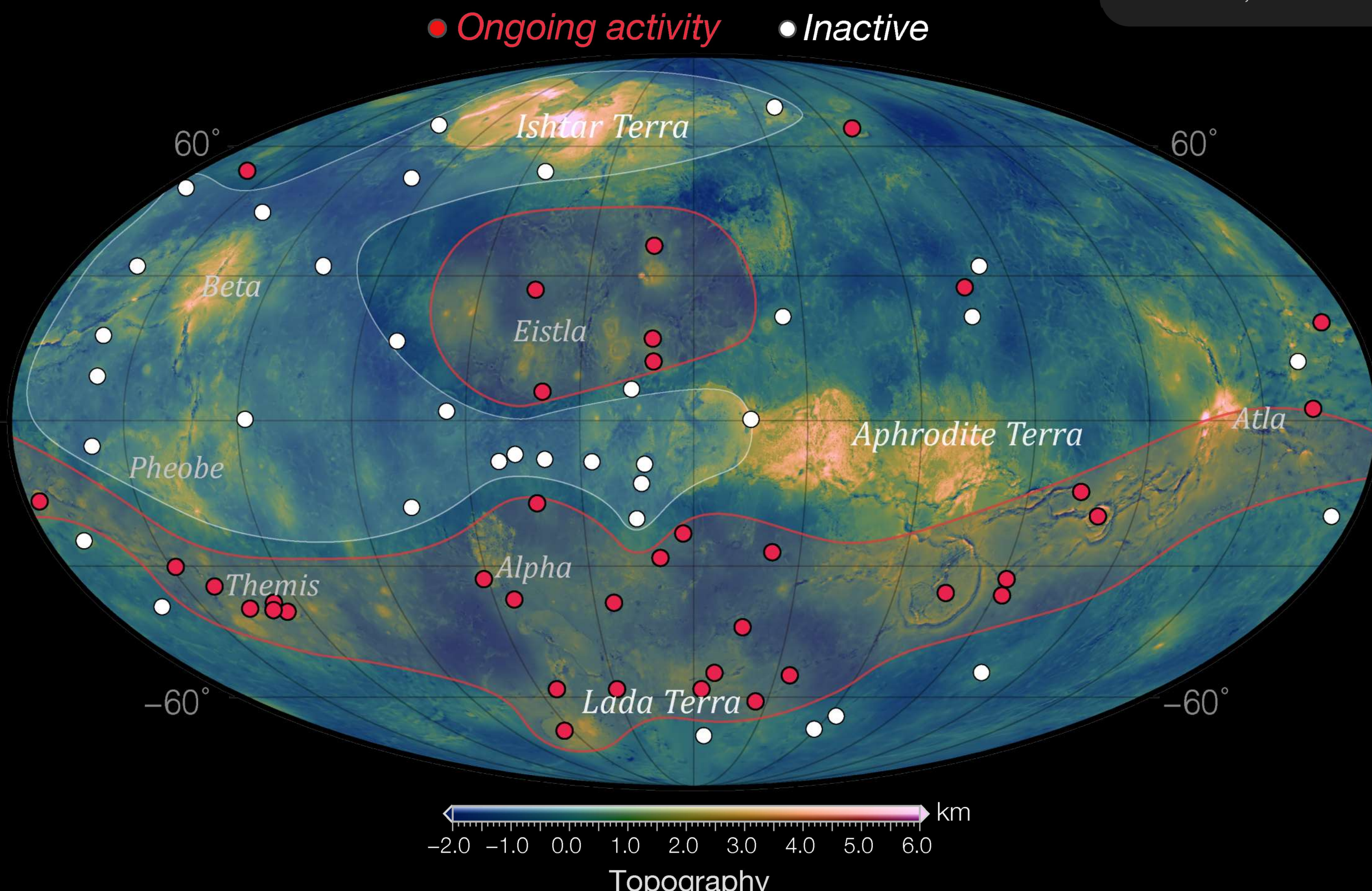


Thouris corona (6.5°S, 12.9°E)
INACTIVE
50 km
Rim
Depression
50 km
1.5
-1.0
-0.5
0
0.5
Topography [km]
Ishtar Terra
Eistla
Alpha
Lada Terra
Aphrodite Terr
Aramaiti corona (25.5°S, 82.0°E)
ACTIVE
100 km
Outer rise
Trench
Rim
Inner dome
100 km
-1.5
-1.0
-0.5
0
Topography [km]

# Coronae classification

Database *freely available*:

*Gülcher et al., 'Venus coronae classification', Zenodo, DOI:10.5281/zenodo.3608692*

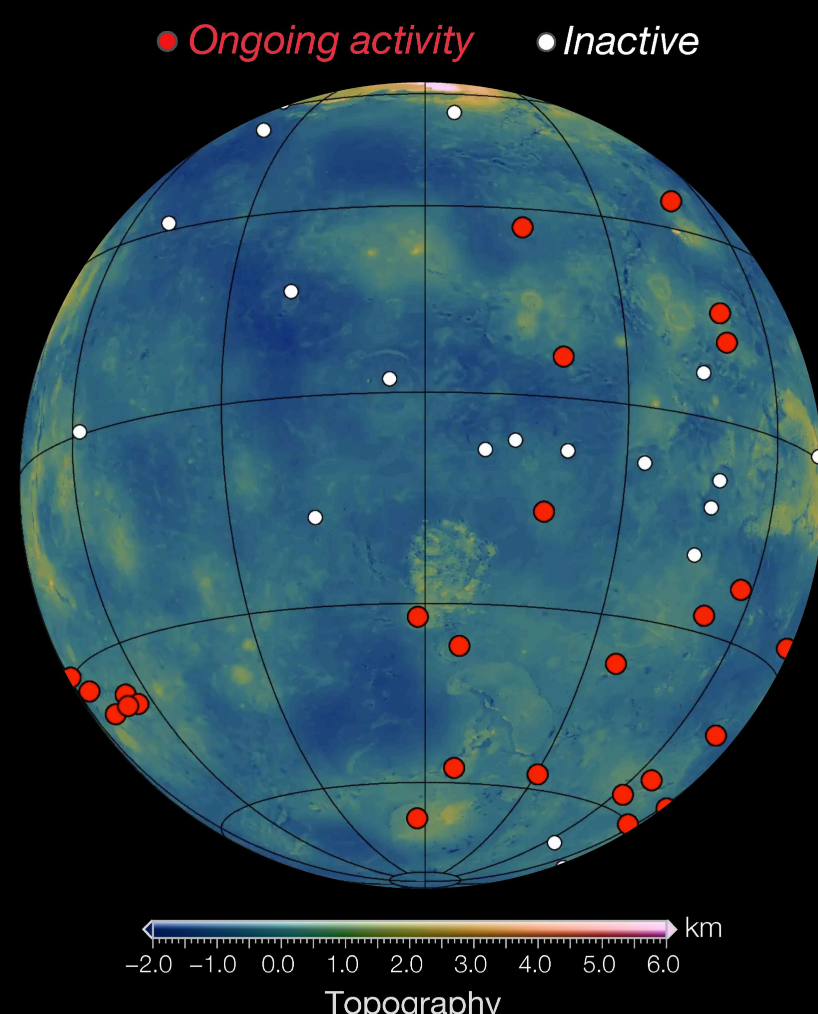


# Summary of our work

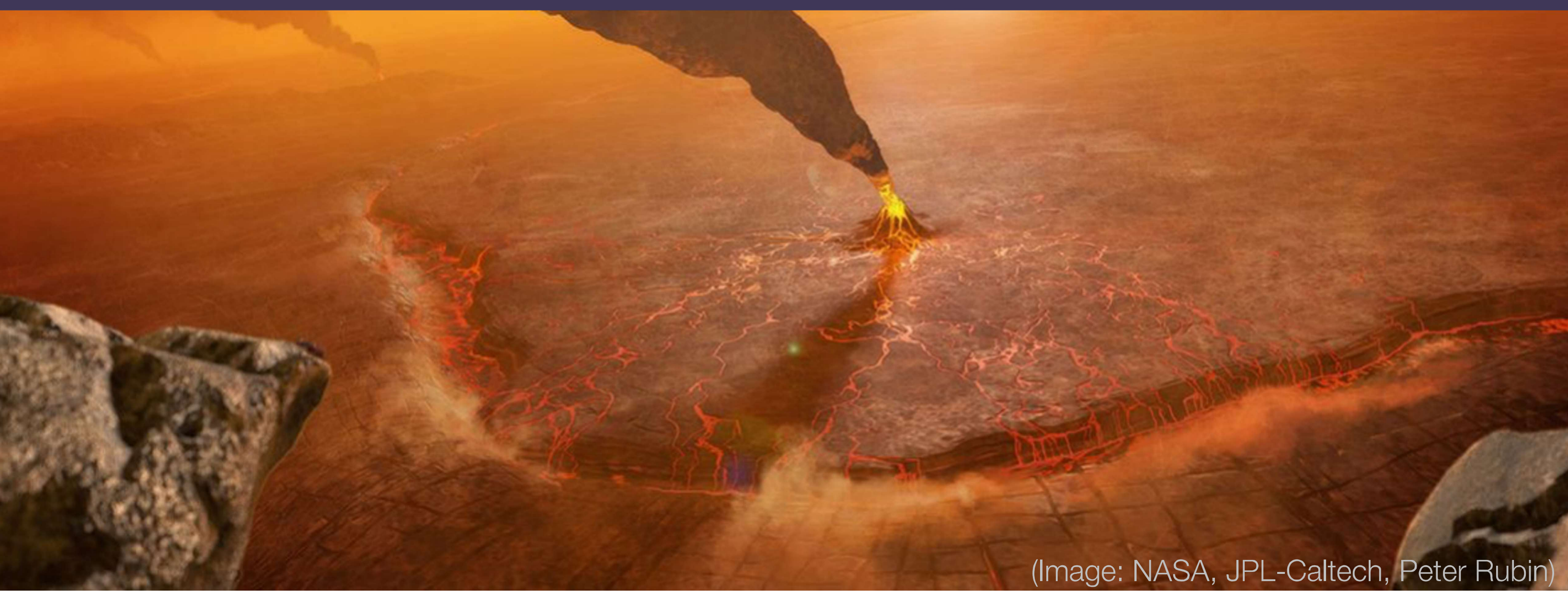
Outlook:

- Verify results with **other datasets**
  (gravity; geology/SAR imagery; heat flow; ..)
  *but limited in available datasets and resolution*
- Integrate distribution with other proposed “active” magmatic/volcanic structures
- How does **distribution** of surface activity reflect **circulation patterns** in the deep interior?

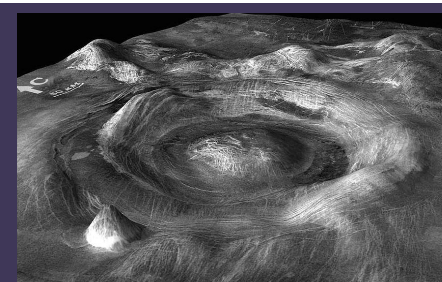
*Need for new and higher-resolution geological/geophysical data!*

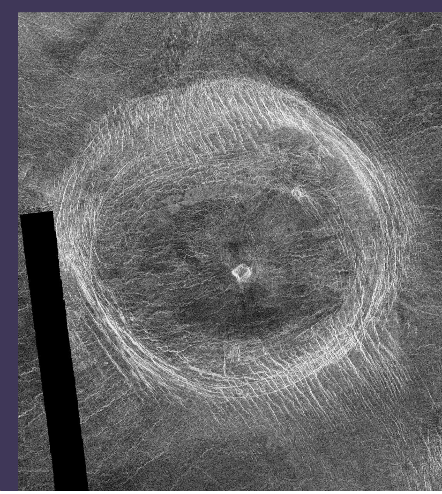


- The formation of **coronae** may be key for unraveling Venus’ interior **geodynamic processes**, and their present-day activity
- Global analysis revealed **37** coronae that bear testimony of **ongoing plume activity** underneath
- Supporting the hypothesis of a **“Hotspot” Venus**



(Image: NASA, JPL-Caltech, Peter Rubin)





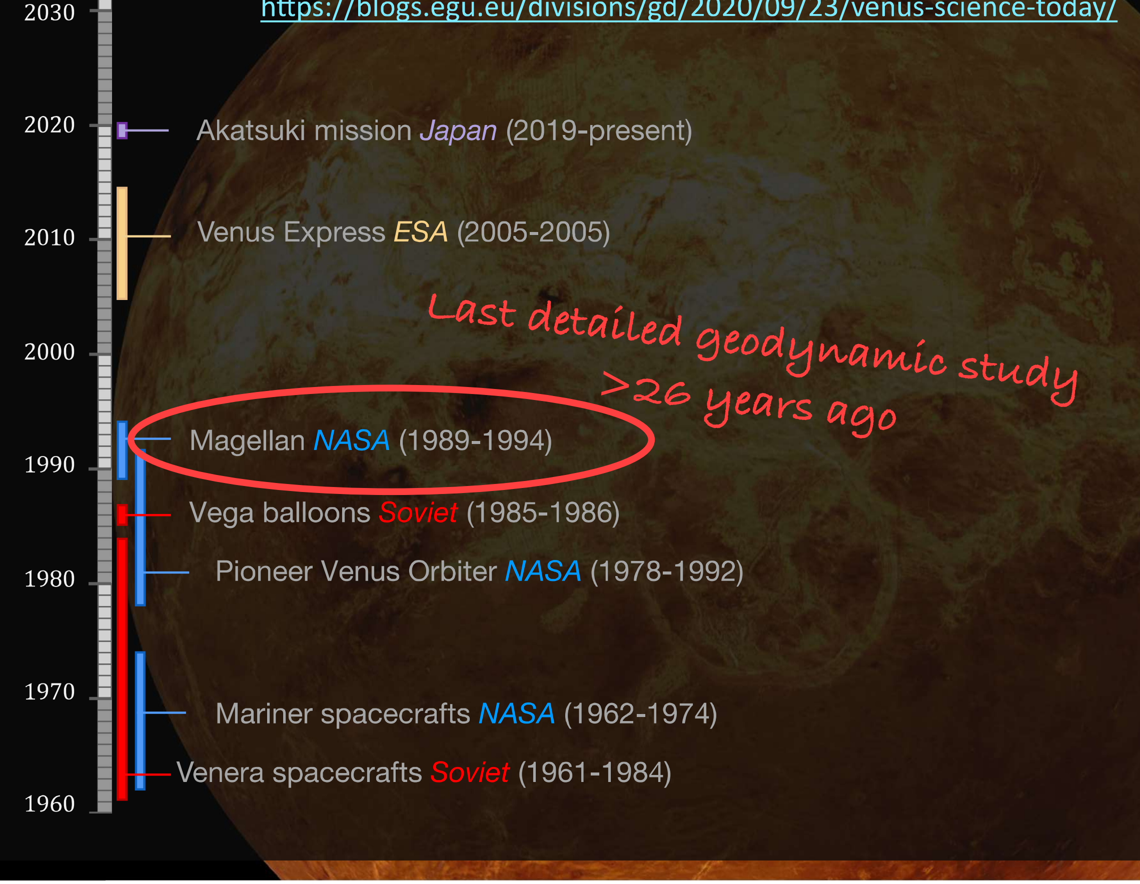
# Key questions

> It is clear that there are tremendous gaps in our knowledge that can only be fulfilled with new investigations of our sister world

> It appears that Venus is slow to reveal its secrets. Has our twin planet been misunderstood all this time?

https://blogs.egu.eu/divisions/gd/2020/09/23/venus-science-today/

- Did Venus have a past epoch of habitability?
- What are the physical mechanisms responsible for Venus' geologic activity?
- How have Earth and Venus diverged down such different geological paths?



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