



WHAT ARE LAVA TUBES

Length and Size: Lava tubes can vary greatly in length and size. Some can extend for several km and reach widths of up to 15 meters.

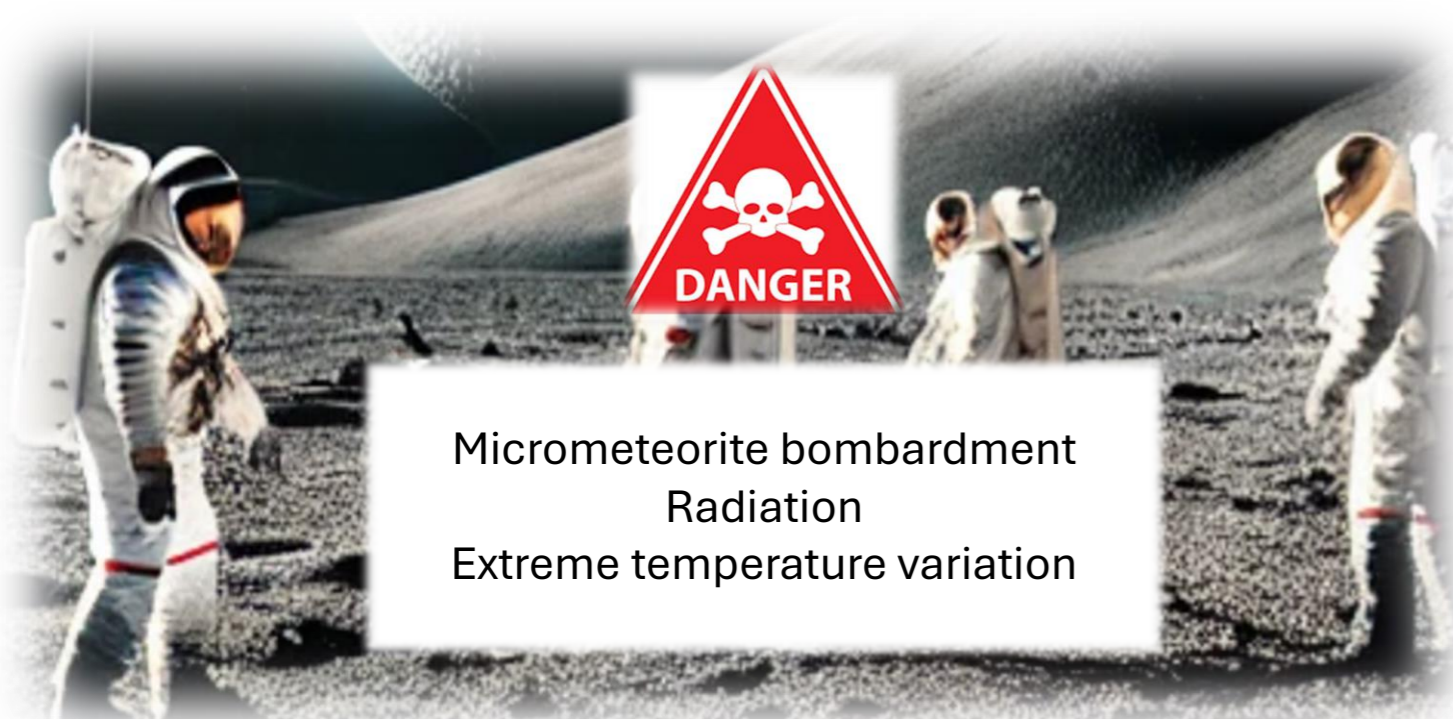
Structural Stability: The walls and ceilings of lava tubes are often very stable and can support significant weight, making them potential sites for future exploration and habitation.

Lava tubes are natural conduits formed during volcanic eruptions through which lava travels beneath the surface. Once the lava flow stops, these tubes can create extensive cave systems.

Temperature Regulation: Lava tubes maintain relatively constant temperatures, which can protect from extreme surface temperatures. This feature is particularly important for potential lunar habitats.

Lava tubes offer unique environments for studying geological processes, both on Earth and on the Moon. They also provide clues about the history of volcanic activity.

PLANNED SPACE EXPLORATION HUMAN MISSIONS TO THE MOON



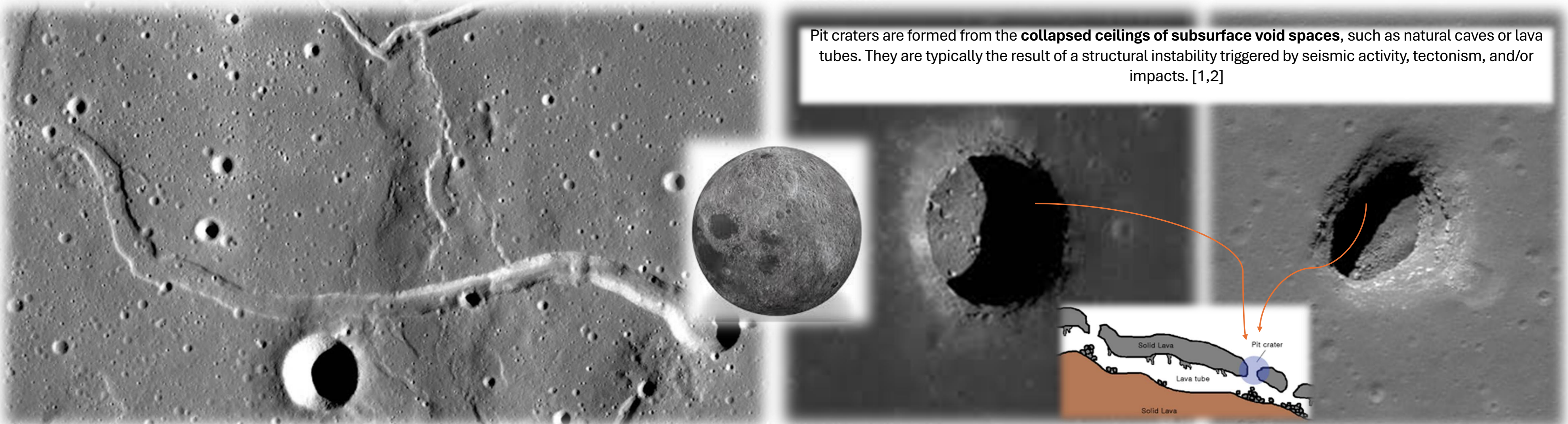
Lunar lava tubes as natural shelters!

ANTHELIA

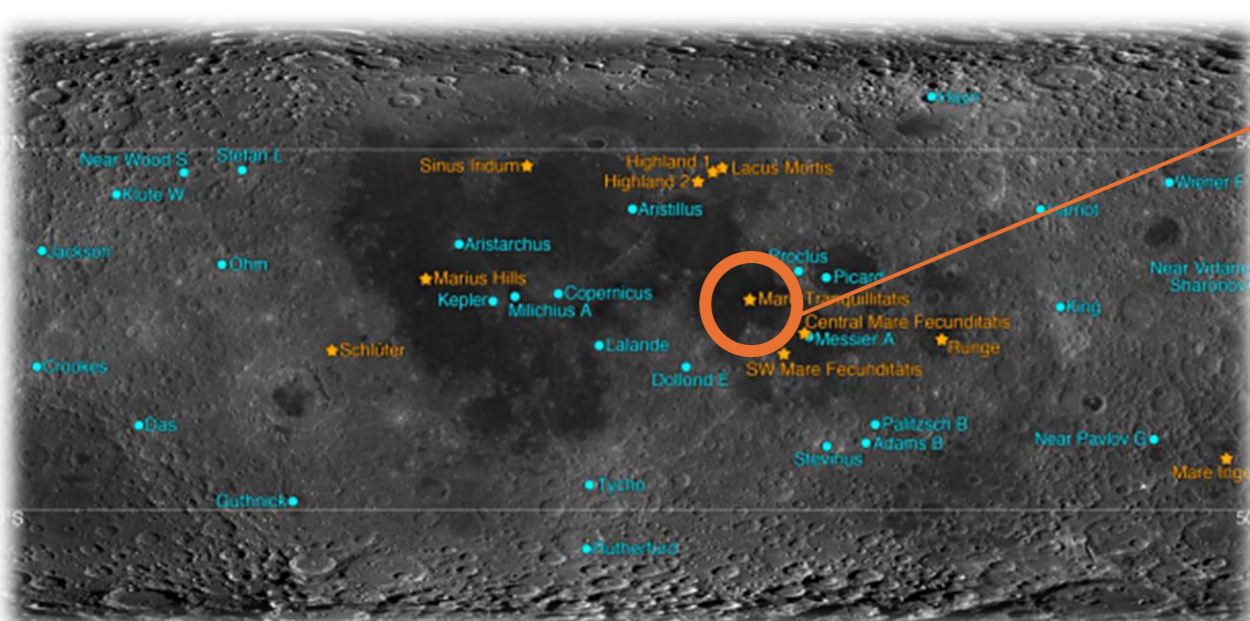
Analysis of illumination and thermal environment of lunar pits and lava tubes

Exploring subsurface lunar bases requires understanding temperature variations to identify optimal conditions (e.g., size, latitude, depth) for a thermally stable environment, beneficial for both human and industrial activities.

- We developed a ray-tracing illumination and thermal model to characterize the thermal environment of lunar pits and lava tubes.
- The model uses a 3D Digital Terrain Model (DTM) of specific surface features, updating orbital positions and orientations with respect to the Sun.
- The 3D thermal model outputs surface temperatures over time.
- This data provide inputs for a volatile transport model, calculating volatile loss rates based on pit geometry and latitude.

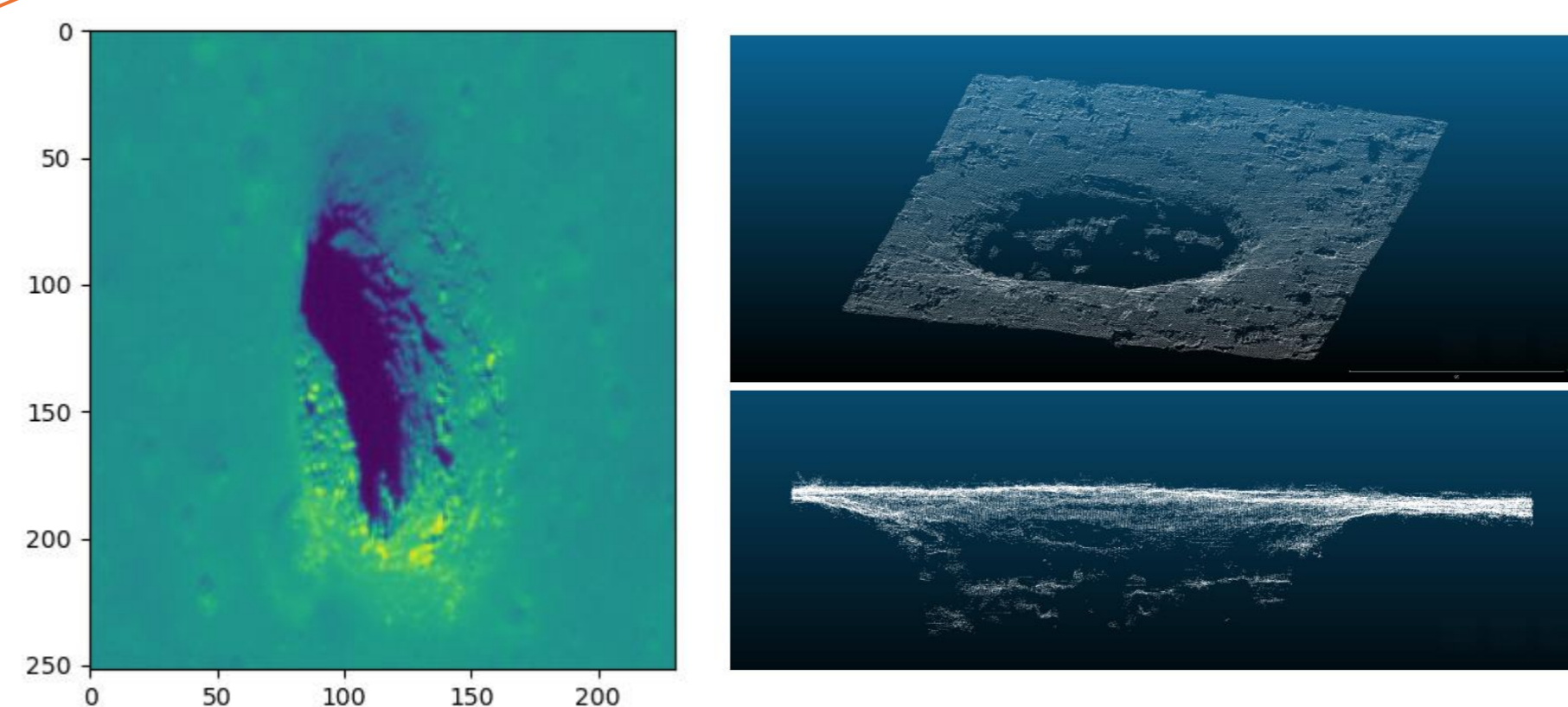


Pit craters are formed from the **collapsed ceilings of subsurface void spaces**, such as natural caves or lava tubes. They are typically the result of a structural instability triggered by seismic activity, tectonism, and/or impacts. [1,2]



There are 16 confirmed collapse pit features on the Moon potentially stemming from lava tube networks [3] and many more pits resulting from the collapse of impact melt material.

3D Digital Terrain Model – Mare Tranquillitatis Pit



Illumination and thermal model [4]

