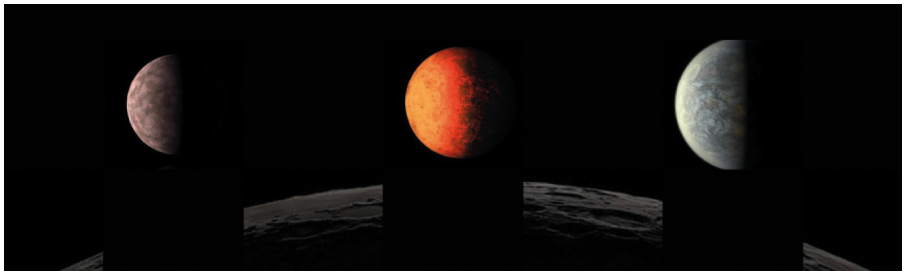

Contribution ID: **24** Type: **Talk**

Using seafloor geomorphological classification schema and spatial analysis to predict geologic structure, with applications for other terrestrial planets

Friday 24 October 2025 17:20 (15 minutes)

The surface topography of Mars is well-known but understanding of its subsurface structure is substantially more limited. Given this, identifying correlative relationships between the geomorphology of topographic features and subsurface faults in an analogue setting can potentially be applied to topographic data from Mars to yield insight into structural features and associated processes there. The Cascadia margin is chosen as an Earth analogue, for a Martian fault zone, Valles Marineris, and a potential subduction system found on Tharsis Plateau are chosen. The selected areas on Mars are likely to have significant sediment deposition, water-related landforms, and numerous faults, similar to the Cascadia margin. First, we use geomorphologic phonotypes, bathymetric position index (BPI), and the coastal and marine ecological classification standard (CMECS) to quantitatively classify surface geomorphic features in topographic data. Next, we record the values of these geomorphic schema along mapped fault locations. From there, initial spatial correlation analysis is conducted to evaluate the degree to which geomorphic units are related to fault locations throughout the study area. Additionally, spatial distribution modeling (Maximum Entropy) is used to develop predictive models of the probability of fault presence based upon collective morphologic schema values. K-fold cross validation is used to quantify the accuracy of resulting predictive models. Finally, these models will be applied to topographic data from the selected sites on Mars to map the probability of potential fault presence. These results may be helpful in identifying potential areas of interest on Mars, and other terrestrial bodies, for future research.

Primary author: MORGAN, Emma (Mississippi State University)

Presenter: MORGAN, Emma (Mississippi State University)

Session Classification: Mars Science