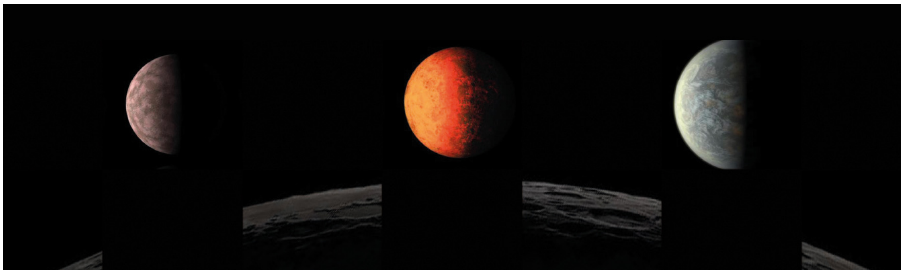

Contribution ID: **36** Type: **Talk**

Investigating the spatial and quantitative relationship between geomorphology and subsurface structures on the northern US Atlantic margin

Friday 24 October 2025 17:35 (15 minutes)

Expansive digital elevation models (DEMs) of surface topography are now available for many terrestrial planetary bodies. However, subsurface data for these bodies, particularly fault information, remains limited. Establishing a predictive relationship between DEM derived surface morphology and subsurface structures, like faults, could yield insight into tectonic and geologic processes on Earth and other planets. Accordingly, my research investigates this relationship by examining spatial correlation between faults and seafloor geomorphology, with the goal of applying these insights to analogous geological settings on other terrestrial planets like Mars.

I am using seismic interpretation software to analyze subsurface data from the US Atlantic Continental Margin, to identify and map fault locations. Spatial correlation between mapped fault locations and quantitative classifications of seafloor geomorphology derived from high-resolution (100 m) bathymetry data, are evaluated through maximum entropy modeling to develop a predictive model of fault presence. Geomorphological classifications used include slope, aspect, rugosity, bathymetric position index, and geomorphologic phonotypes.

Using seismic interpretation to map subsurface features and DEM data to map coincident geomorphological classifications, I am developing a framework to predict subsurface faulting from surface topography data. I will apply the resulting predictive model to an analogous location within a sedimentary basin on Mars, analyzing HiRISE images and DEMs. The goal of this is to determine whether a predictive model developed in similar geomorphic landscapes can be used to infer subsurface structure in the Martian crust. Ultimately, this analog based approach could enhance our ability to predict subsurface structural features and associated geologic processes based upon planetary surface data.

Primary author: STILES, Andrea (Mississippi State University)

Presenter: STILES, Andrea (Mississippi State University)

Session Classification: Mars Science