Using Landsat 8 to Map the Geomorphology and Structural Geology of Northwestern Venezuela

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The study area is approximately 427,000 hectares (1,640 mi²)

Covers portions of the northern extent of the Barinas Basin and the foothills of the Mérida Andes.

Structural features influencing the study area include the Maracaibo block against the Guyana Shield of the South American Plate.
Data Acquisition

• Focused on Landsat 8, ASTER DEM, and Hyperspectral data

• These data were accessed through EarthExplorer, GloVis, and by Contractor

• ArcGIS/ERDAS/Geomatica PCI
Data Processing and Analysis

• The goal for the processing phase of this research was to identify geomorphological features within the image data that have a high correlation with the structural geology of the area.

• Multiple image processing techniques were used
  • NDVI, PCA, Unsupervised Classification, Convolution Filters, Hydroflow mapping, Lineament extraction
• Painted Relief DEM produced by generating a sun-angle shaded representation of the DEM data, which visually emphasized elevation change throughout the study area (indicated by the red boundary). The Elevation of DEM ranges from -26 feet to 6544 feet based on dark green being the lowest in elevation, and violet being highest in elevation.
Geologic map of the study area draped over the painted relief DEM image to create an elevated view of the geology.
Structural Geology

- Structural map of the study area representing the different types of faults, folds, and buffer of the proposed location of the possible link between the two thrust faults.
Geomorphology

- Geomorphologic map draped over the painted relief DEM image representing the key features of the study area with an elevated view of the geomorphology.
The automatic lineament extraction method was conducted with Geomatica PCI. As seen in the lower left-hand corner of the study area, a lineament extraction process could not be fulfilled due to the software’s problems with extracting lineaments from a mosaicked image.
Rose Diagram

- Rose diagram of lineament trends from Geomatica PCI analysis method. Outer ring represents 25% of total population of identified lineaments. Only one-half of the plot is shown for clarity. The data was normalized to east side.
Further Studies

• Further studies are to be added in regards to PCA analysis
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