

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

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# Background

- The study area is approximately 427,000 hectares (1,640 mi<sup>2</sup>)
- 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

# ASTER DEM

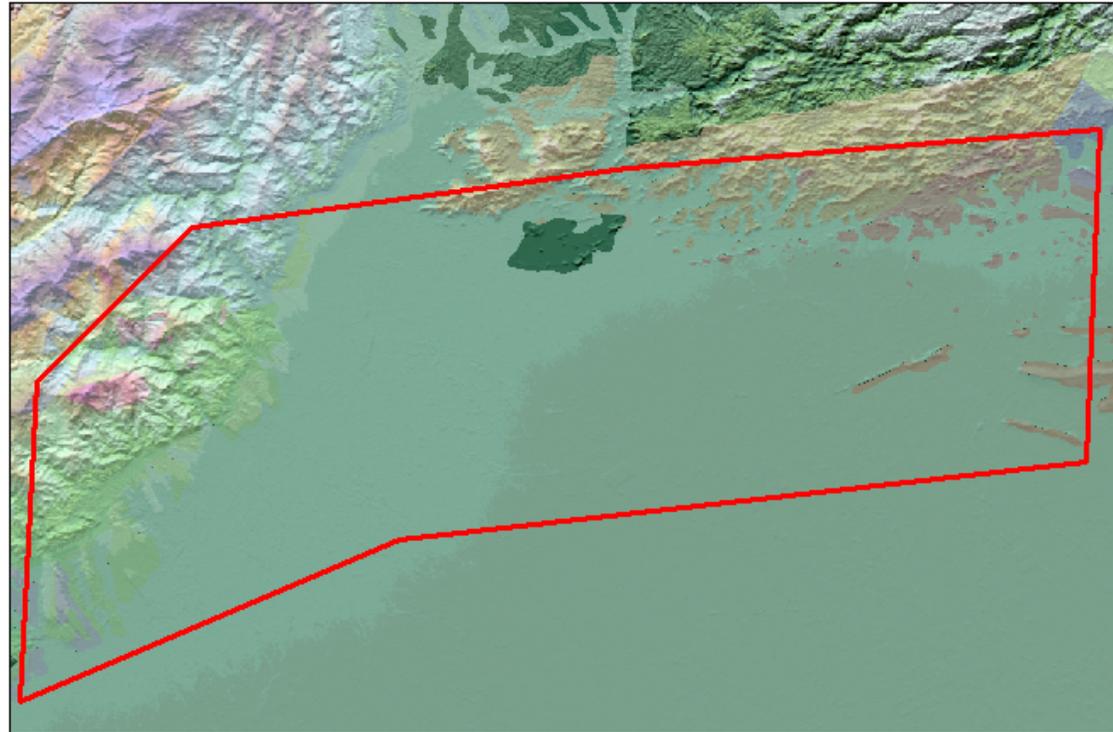
Painted Relief DEM



- 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.

# GEOLOGY

Geologic Map of Study Area



## Explanation

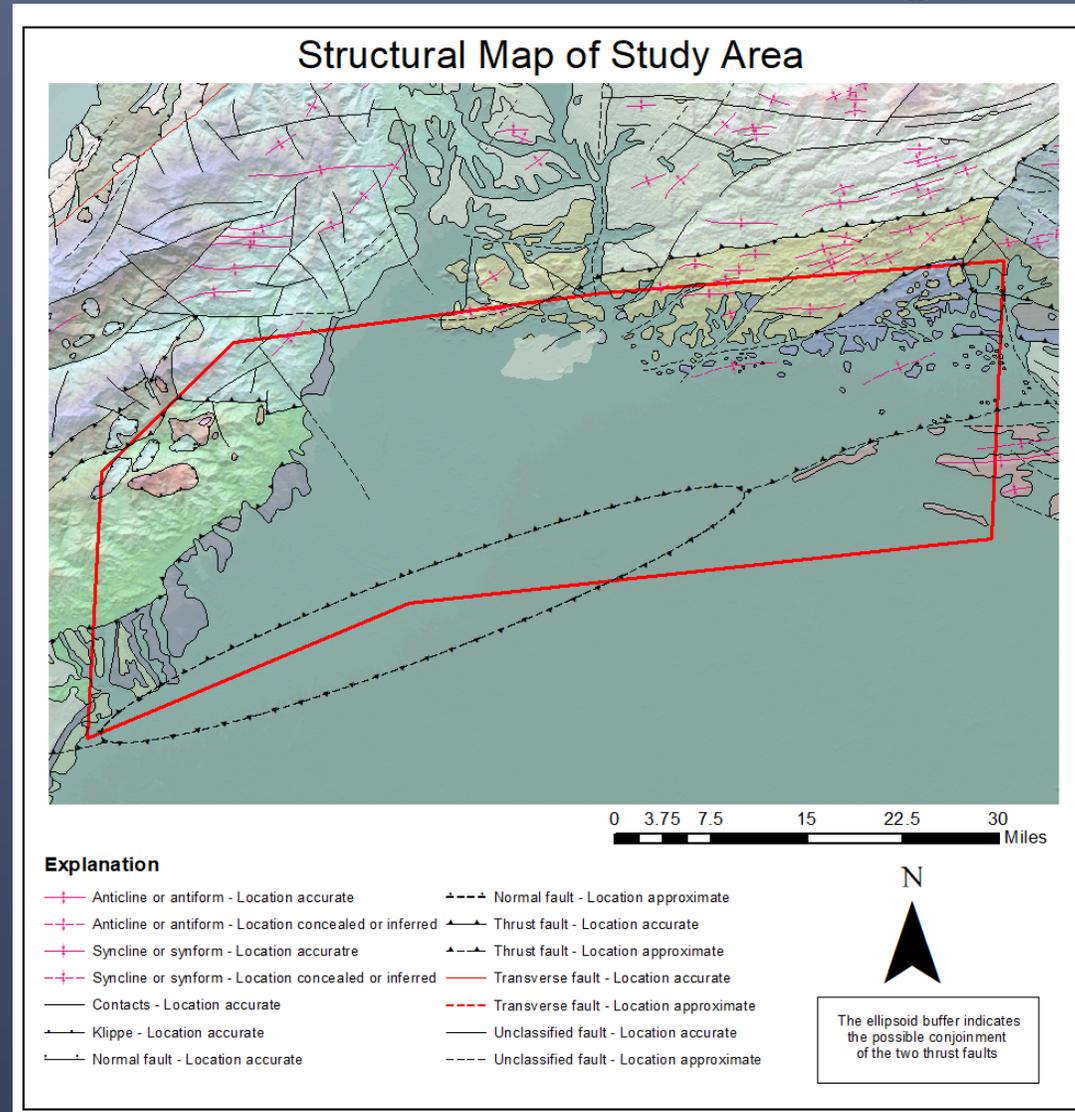
KTlc	Ma	Qg
KTrg	Mcp	Tmap
Klaa	Mir	Tqq
Klm	Pzet	Try
Km	Pzett	
Kub	Qal	

Locations not mentioned in the explanation are unmapped



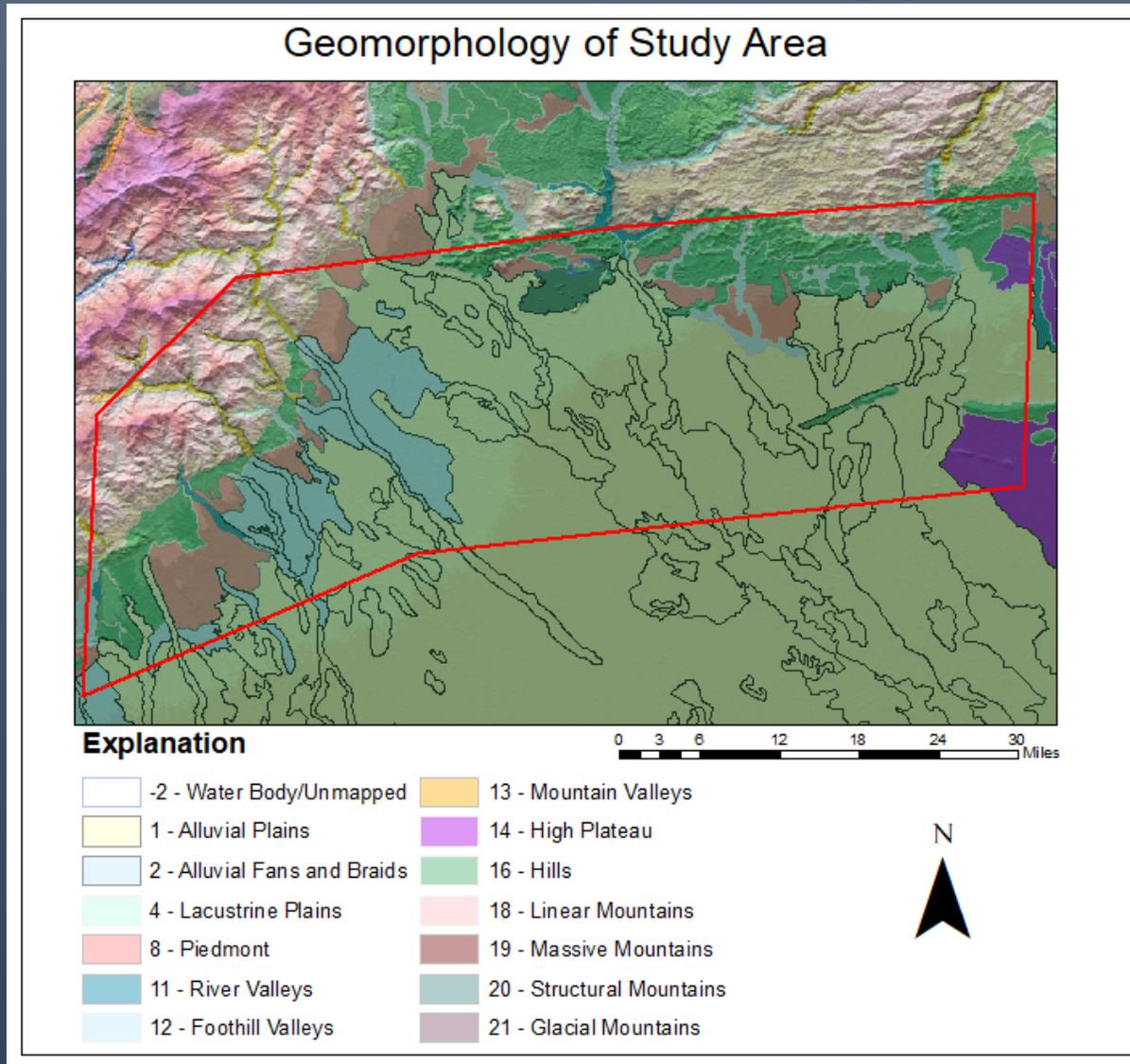
- Geologic map of the study area draped over the painted relief DEM image to create an elevated view of the geology.

# Structural Geology



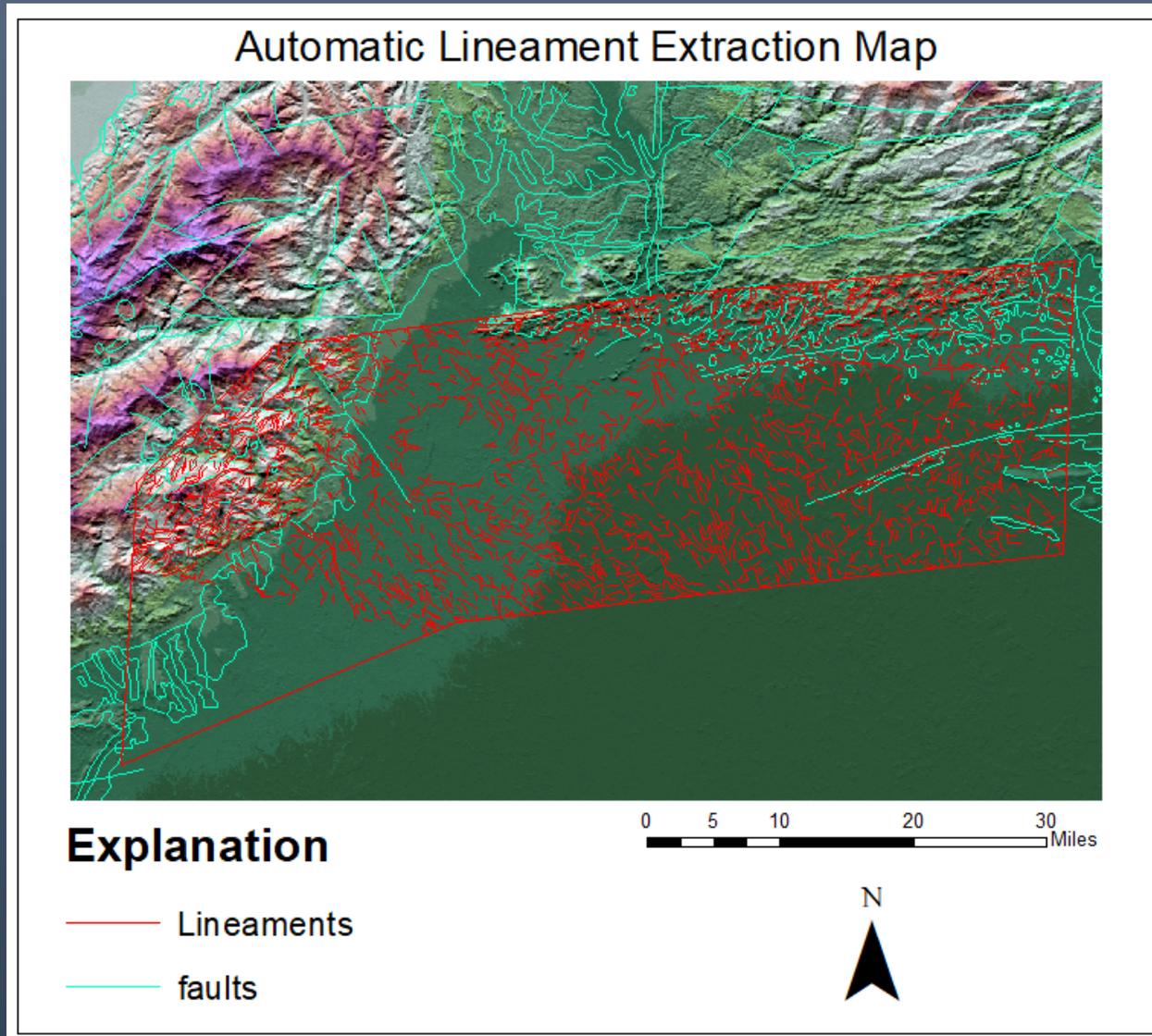
- Structural map of the study area representing the different types of faults, folds, and buffer of the proposed location of the possible link between the two thrust faults.

# Geomorphology



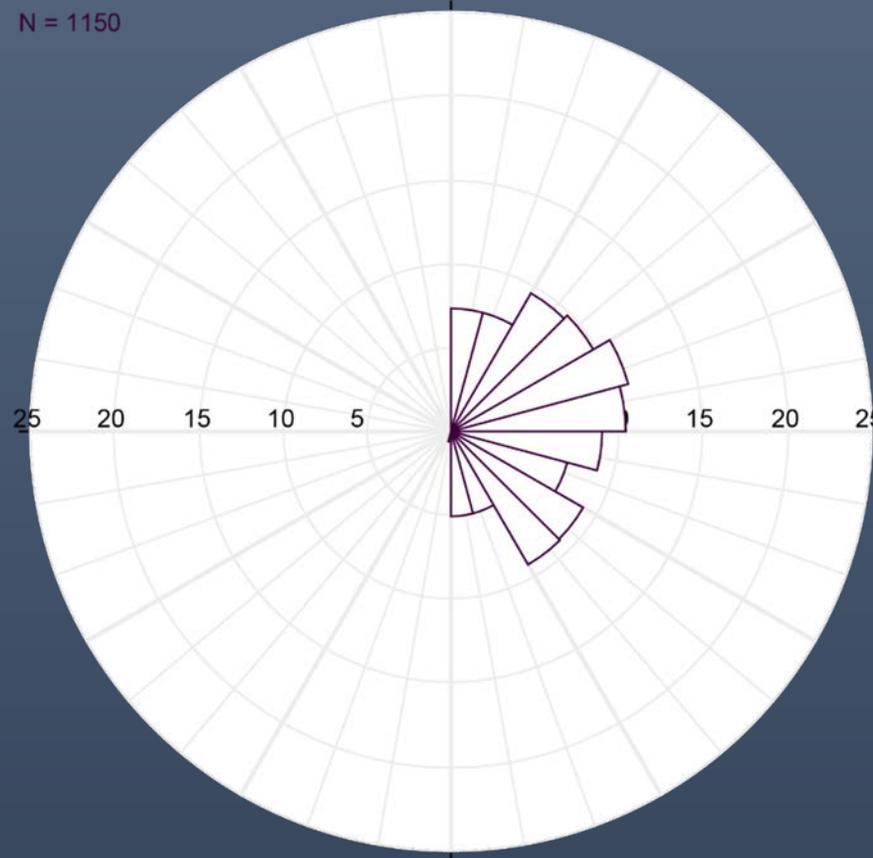
- Geomorphologic map draped over the painted relief DEM image representing the key features of the study area with an elevated view of the geomorphology.

# Lineament Extraction Data



- 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

# Acknowledgments

- This research was supported in part by AmericaView and Mississippi View.