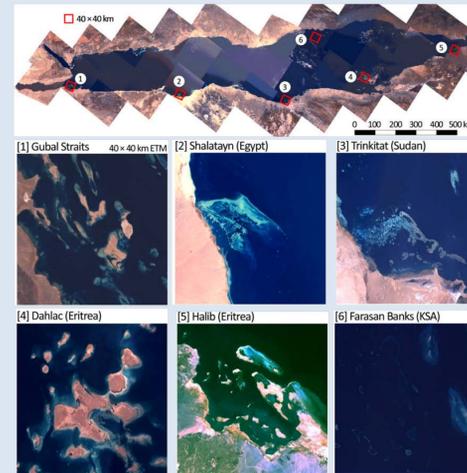


Using GIS to Analyze and Visualize Carbonate Analogs in Support of Subsurface Exploration in Rift Settings

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This project was driven by requests to provide carbonate analogs for subsurface hydrocarbon exploration in rift settings. ArcGIS was key geospatial technology to compile, attribute, and analyze enhanced satellite imagery, maps, and DEMs of select carbonate settings around the globe. 3D Analyst provided essential tools for contouring, interpolation, and visualization. The objective was to build a GIS database that could be used to better understand, visualize, and interrogate modern carbonate features that would be expected in early rift settings. The analog sites in rift settings spanned from East African Rift fresh-water lakes to Western USA pluvial lakes to the marine Red Sea. The analogs can be related to types of carbonates that are inferred from seismic and cores.

The widespread development of modern reefs along the sides of the Red Sea marine rift serve as a robust example for quantitative interrogation of the depositional patterns formed in this case by reefs and associated skeletal sands.

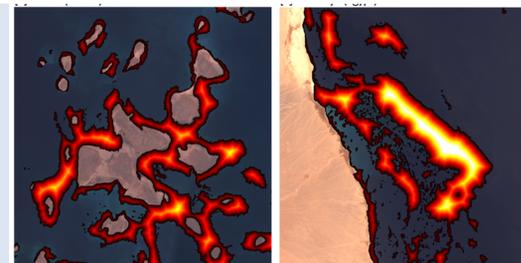


Analyzing Extent of Carbonates (Reefs) Relative to Shoreline & Comparative Morphometric Analysis

- The Red Sea can be used to explore local and regional controls on shallow-water carbonate facies geometry in an extensional tectonic setting.
- It is unique in its extent (20° of latitude) and transects a gradient in climate
- 6 Sites, each of 1,600 sq. km, selected to cover the range of reefal and sedimentary styles

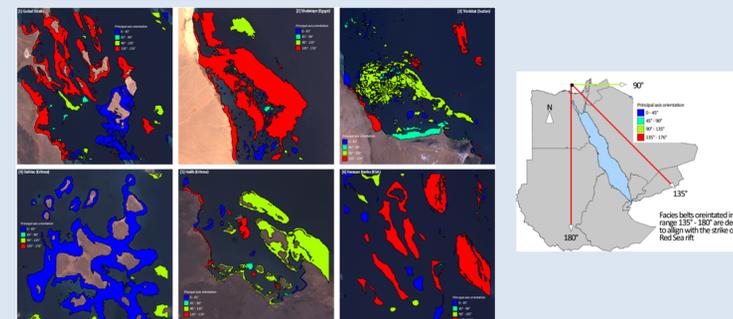
Widths-Maps of Potential Reservoir Bodies

- Abundant offshore islands provide a topographic high from which shallow water carbonate systems can nucleate and laterally develop
- For example, in Dahlac (Eritrea), the offshore islands form closely spaced highs, often fully or partially knitted together by 'necking' of reefal and sedimentary facies
- However, sites such as Shalatayn are capable of building as expansive shallow-water carbonate fairways despite their lack of islands
- Complex depositional geometry and so should expect abrupt lateral and vertical facies changes



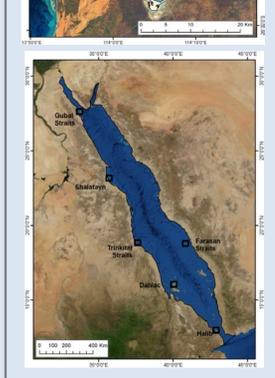
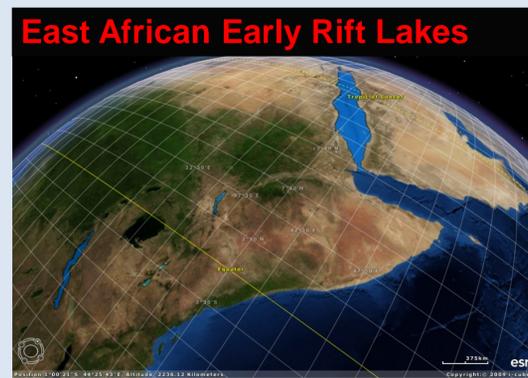
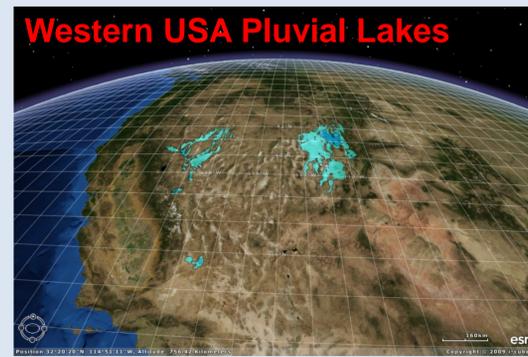
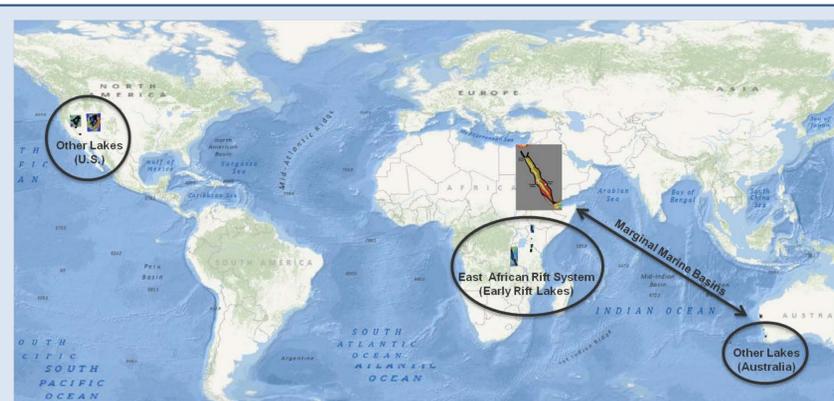
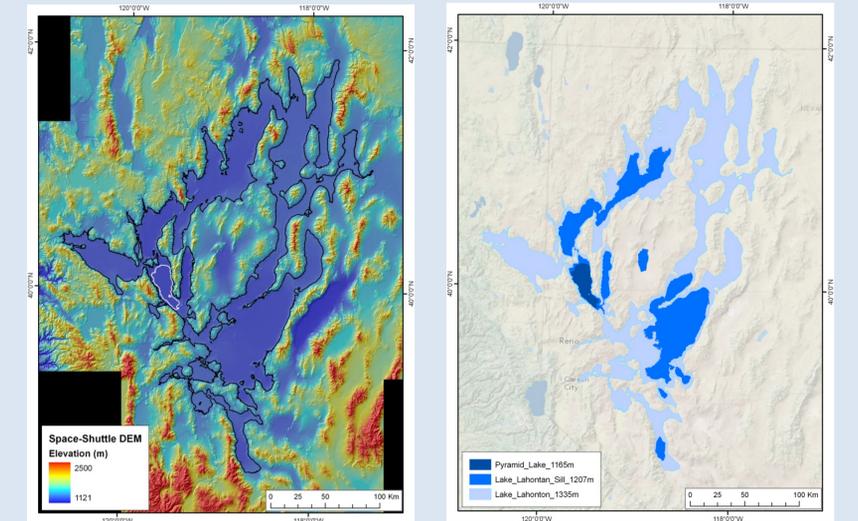
Orientation of Geobodies

- When offshore islands or reefs are sufficiently widely separated that sediment and reefal 'necks' cannot easily develop to span their divides, there is a clear tendency for facies belts to align with the strike of the rift (red)
- Inshore reefs also are rift aligned as they are associated with the strike of the coast
- Closely spaced offshore islands and reef blocks serve to yield more complex depositional highs and direct the orientation of associated facies belts (see Trinkitat and Dahlac)

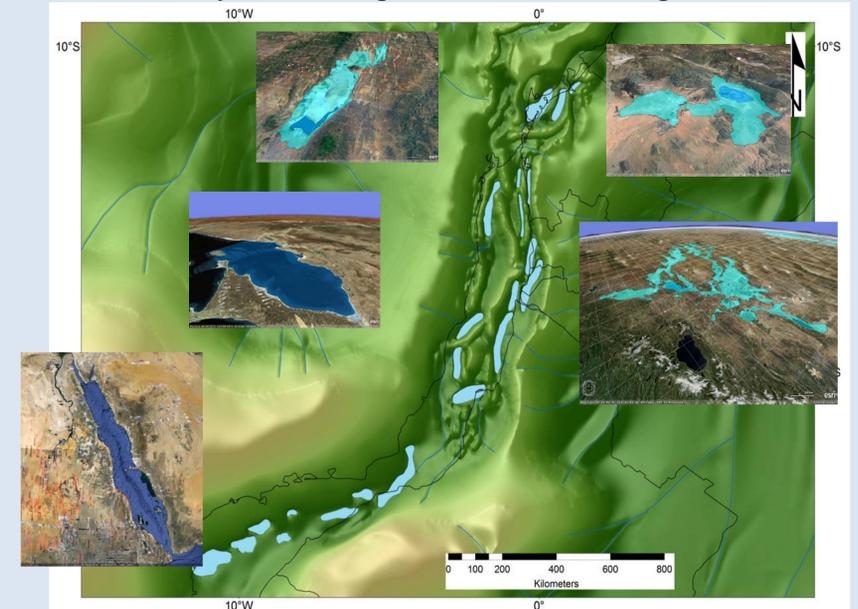


The GIS attribute table was exchanged with MATLAB to support complex morphometric analyses of the landforms (work done by S. Purkis).

Lake Lahontan shows the magnitude of change in size, shape and complexity that a lake repeatedly undergoes and assesses the impact of this change on carbonate formation.



Modern Carbonate Features (Analog) Compared with Early Rift Setting, South Atlantic Margin



From GETEC, 2008

The GIS layers were transferred to ArcGIS Online, ArcGIS Explorer, animation, and GeoPDFs to expand access and support training. The GIS database with supporting documentation is available from SEPM as a 2-DVD set (Short Course Notes No. 55).

