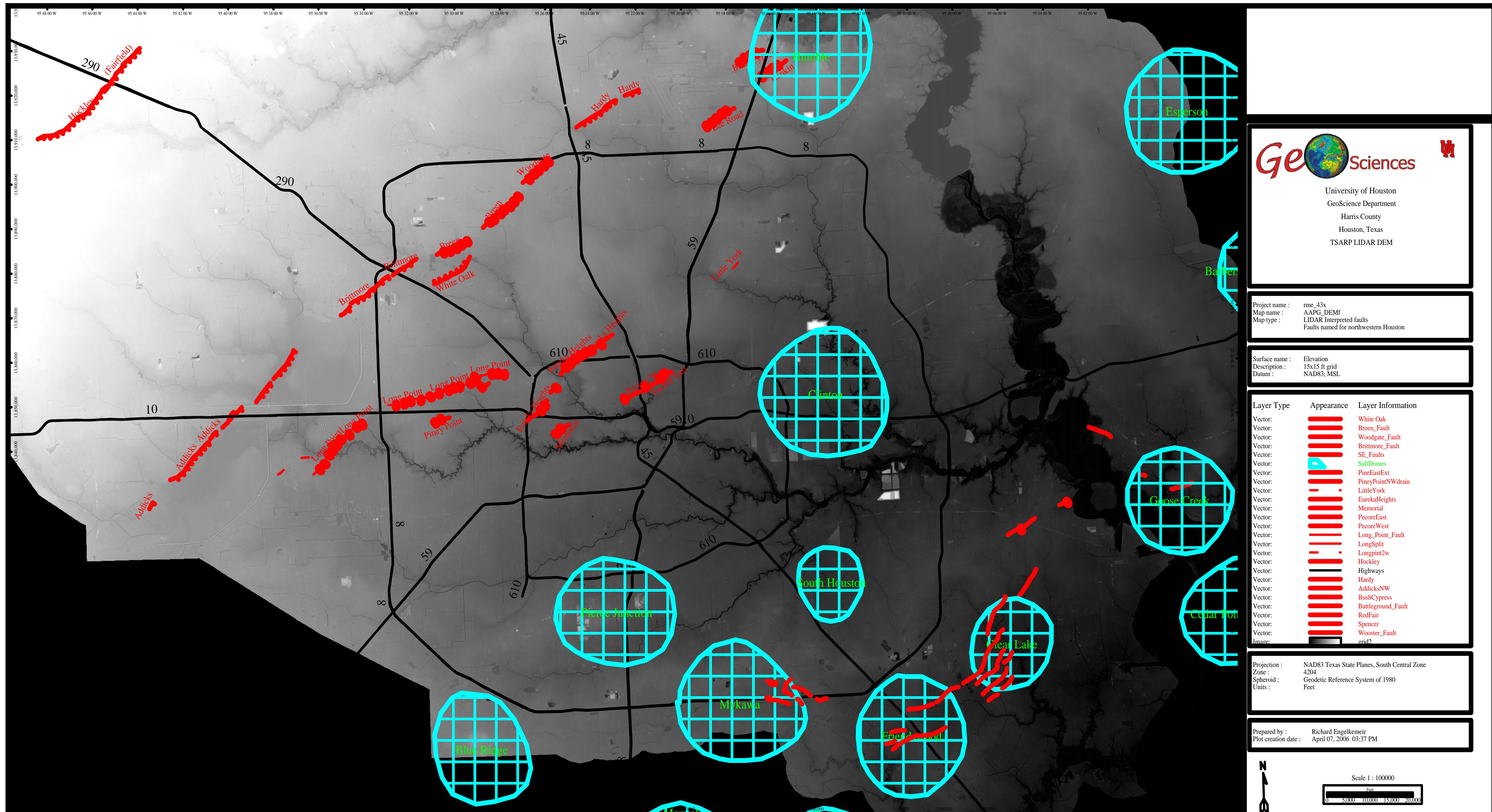


Richard Engelkemeir, University of Houston  
 Dr. Shuhab Khan, University of Houston  
 Dr. Carl Norman, University of Houston



## LIDAR DEM of Harris County



**LIDAR Mapped Faults**  
**Salt Dome Locations**

The elevation changes associated with the faults can be seen in some places.

# Mapping Active Faults in the Houston

## Geologic Overview

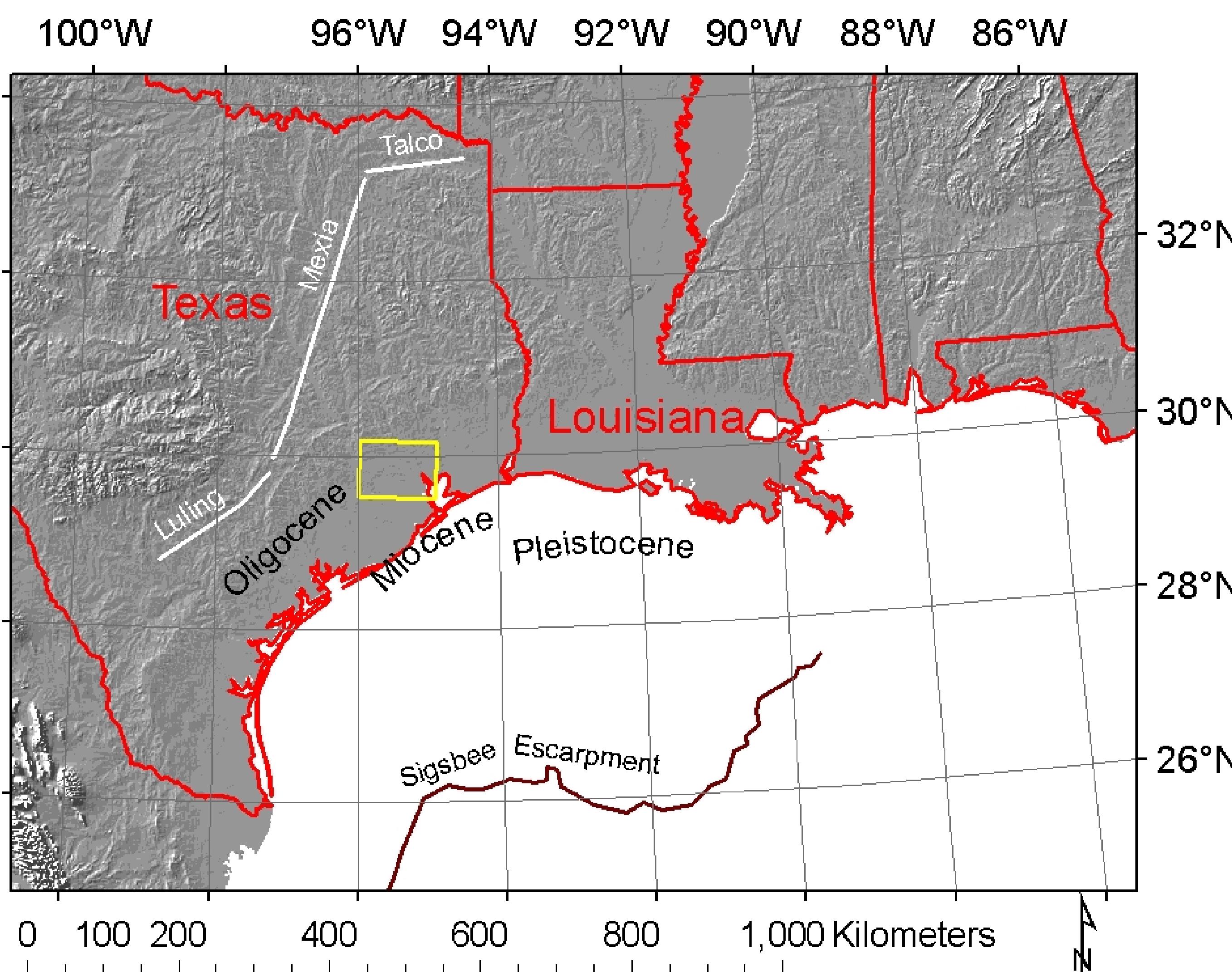
Salt deposited during extension prior to sea floor spreading

Deposition prograding into basin

Faulting initiating along shelf margin

Depositional and salt role in faulting

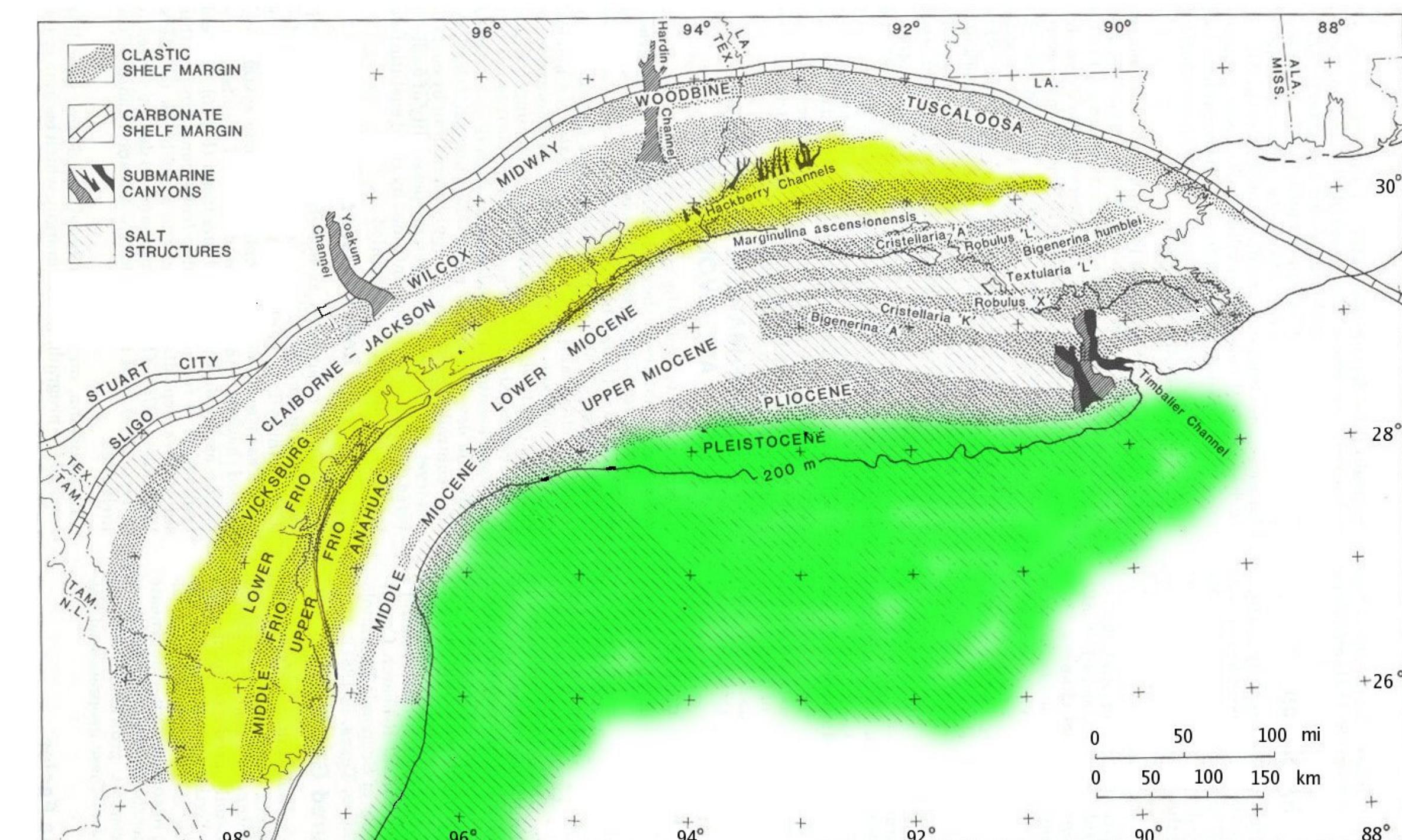
## Northwest Gulf of Mexico Region



Regional map, showing the Northwestern Gulf of Mexico. The labels indicate the primary depocenters, showing the prograding into the basin along with the eastward migration of depocenters. The salt basin limits are shown. The salt basin extends from the Luling-Mexia-Talco faults to the Sigsbee escarpment. The box shows the study area (Harris County).

We see the general basinward progression of deposition.  
Tectonic subsidence is amplified by sediment loading.  
Is Basement high the northern half of the split mantle plume in Bird et al, 2005  
?

## Cenozoic Shelf Margins



Note progradation of shelf margins throughout Cenozoic. Most active growth faulting occurs at shelf margin. Significant subsidence due to loading of sediments (perhaps also mantle causes).

Late Cretaceous – Woodbine, Tuscaloosa

Paleocene – Midway, Lower Wilcox

Eocene – Upper Wilcox, Claiborne, Jackson

Oligocene – Vicksburg, Frio, Anahuac (yellow) – Houston on shelf margin

Miocene (undifferentiated)

Pliocene-Pleistocene (green)

Paleogene predominately in S. Texas; Neogene in E. Texas and Louisiana

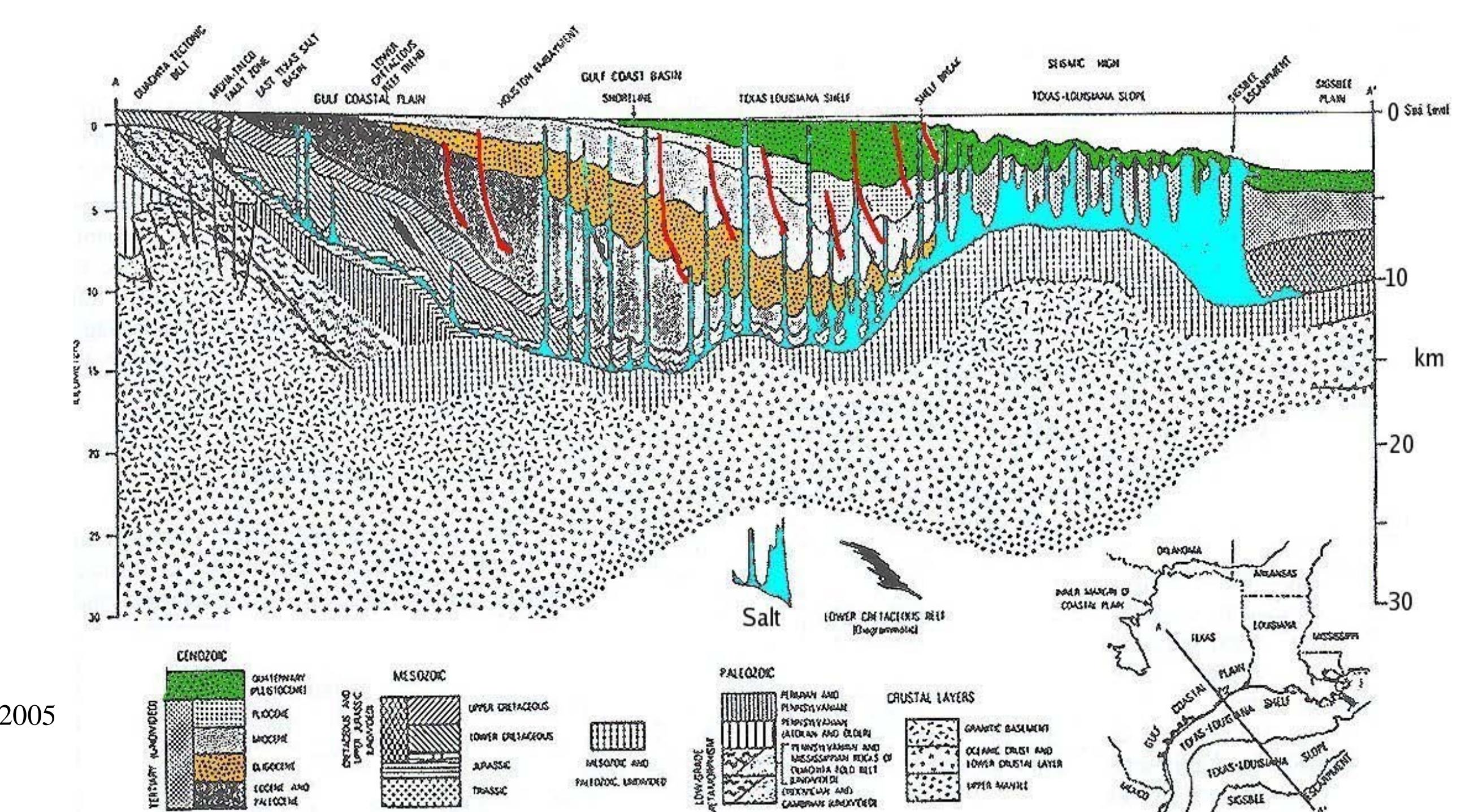
Salt deposited during period of extension which preceded sea floor spreading in Middle Jurassic

The weight of the sediments has displaced the salt.

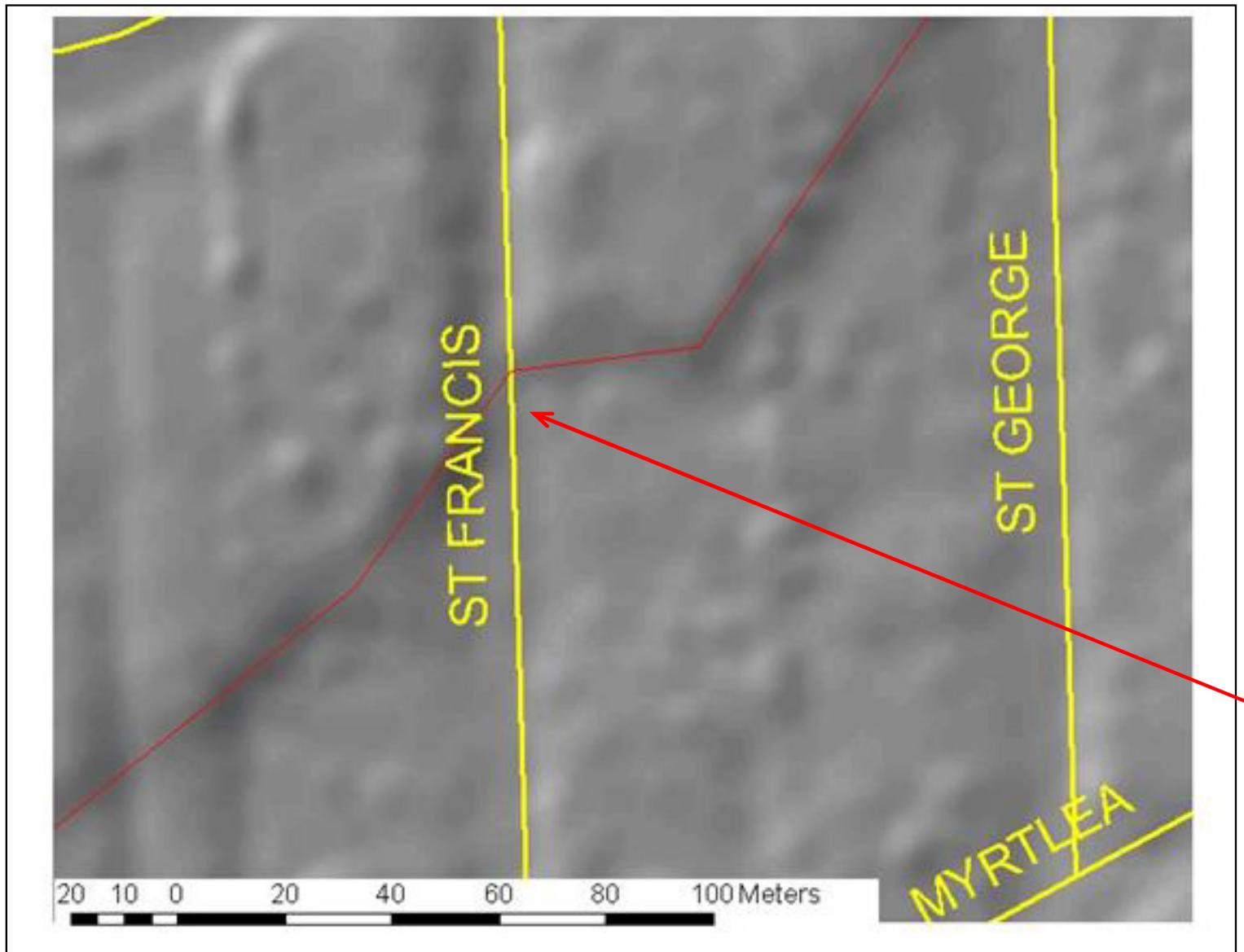
Note that bulk of salt now to the South.

Also note growth faults. The faults typically dip into the basin.

## Deposition and Salt Migration



# St. Francis Kink



Looking East across St. Francis Street.  
Visible relief is minor but LIDAR image clearly shows slope.

Hillshade image showing Long Point Fault where it crosses St. Francis Street. East-West segment of trace on East side of St. Francis runs along property line between 2 houses. The kink in the trace thus appears to be man-made. With ongoing fault movement the house on the south side of the scarp is at risk.

## Long Point Splits



LIDAR hillshade image of Long Point fault where it crosses Long Point. Here the scarp splits into several branches.

## Looking NW across primary scarp



## Looking E across 2nd scarp



## Looking S across 2nd scarp, with primary scarp in distance



## Future Research

### InSAR :

- Attempt to measure fault displacements.
  - See whether salt domes are actively rising
- GPR, seismic:
- Try and image faults in near-surface
  - Test potential fault picks

### Abstract

Over 300 active faults intersect the earth's surface in the Houston Metropolitan area. They cause damage to man-made structures such as roads, pipelines and buildings. We used LIDAR DEM images from the 2002 Tropical Storm Allison Recovery Project (TSARP) to examine known faults and to search for others that may have been overlooked in previous studies. We used hill-shading as the primary visualization method for locating the faults. Later we examined them in the field. At some locations fault deformation and associated damage were evident, while in other locations field expression of the fault was subtle and the presence of a fault was difficult to confirm. In some areas we used refined grids, using both raw data and supplied DEM, to better define known faults and to identify previously unknown faults.

Proper documentation of active surface faults is important so that developers can avoid building in the zone of disturbed ground along them. In some cases developers and builders have taken steps to avoid construction on fault traces, often by leaving the land as an open greenbelt or as a storm water detention pond. In other cases structures have been built unknowingly within fault hazard bands.