



## WESTCARB Annual Business Meeting

### Arizona's Tertiary Basins – Potential Sinks?

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## Outline

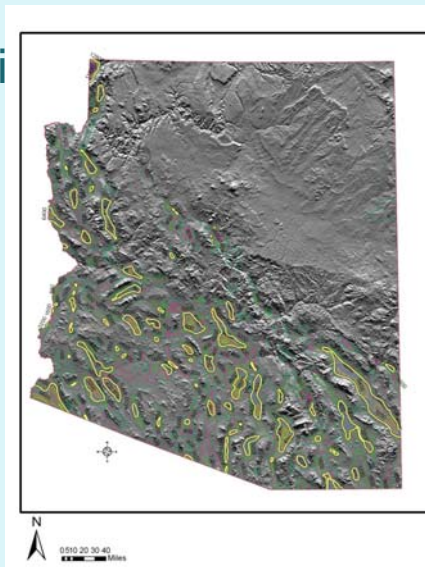
- Tertiary Basins -
  - Where
  - How they formed
  - General characteristics
- Methods to refine Tertiary basin subsurface geology
  - Geologic maps
  - Borehole data
  - InSAR
  - Gravity surveys
  - Vintage seismic
- Potential Sinks/Reservoirs
  - Deep basins (>3000 ft)
  - Voluminous
  - Reservoirs (sands with porosity), and traps (clay bodies, salts)
  - Leakage problems (faults, lateral facies changes)
- Example Basins
  - Higley Basin (central AZ)
  - Willcox Basin (southeastern AZ)
  - Hualapai Basin (northwestern AZ)

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## Arizona's Tertiary Basins

- Basin and Range normal faulting formed many local non-marine basins
- Up to 4 km deep
- Contain volcanics & locally derived clastics
- Thick salts and clay bodies near basin centers
- Faults dip basin-ward

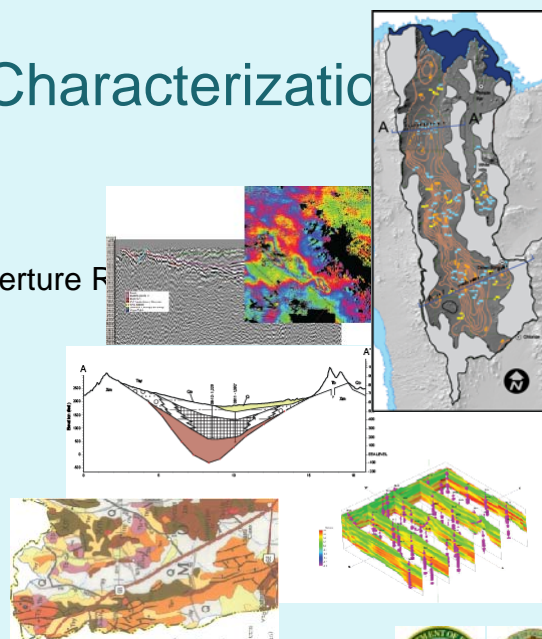


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## Methods of Characterization

- Geologic maps
- Borehole data
- InSAR (Synthetic Aperture Radar)
- Gravity surveys
- Vintage seismic



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## Potential Sinks?

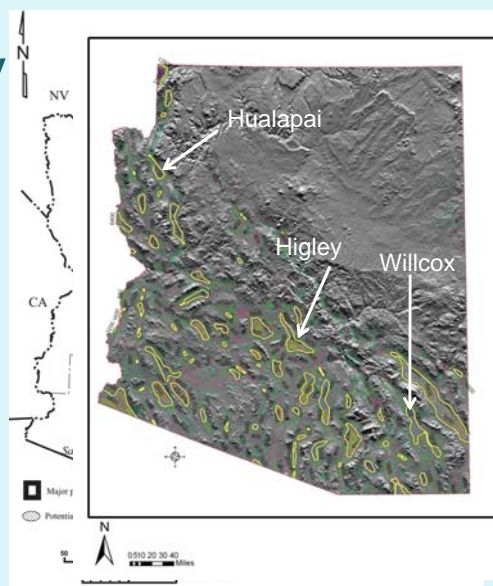
- Are Tertiary basins deep enough?
- Are they large enough?
- What are the potential reservoir units?, traps?
- Is containment possible? Faults, facies changes?

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## Previous Study

- Large Tertiary Basins
  - Higley
  - Willcox
  - Luke
  - Red Rock
  - Mohawk
  - San Cristobal
  - Tucson
  - Hualapai?

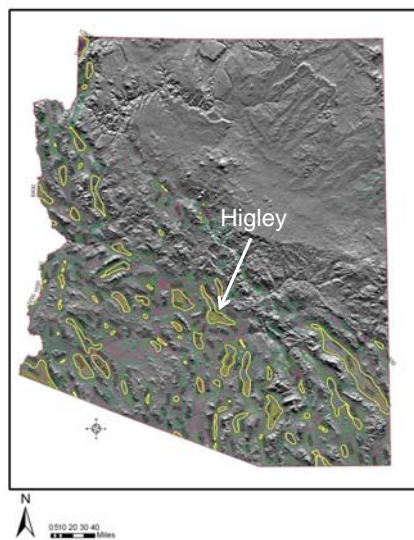


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## Higley Basin

- Located in central Arizona, Phoenix area
- Approx. 12,000 ft deep
- Contains gypsum and anhydrite as well as a large clay body

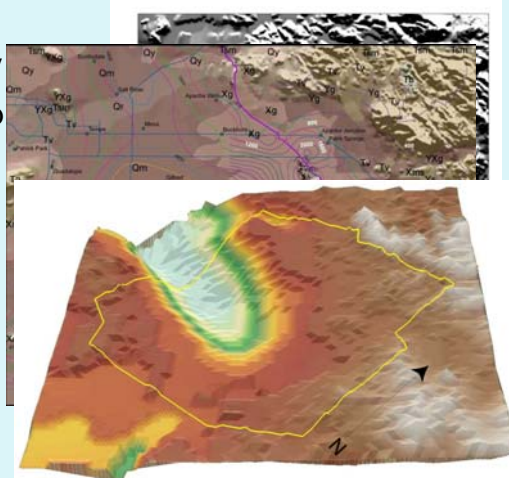


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## ADWR-AZGS Gravity Survey

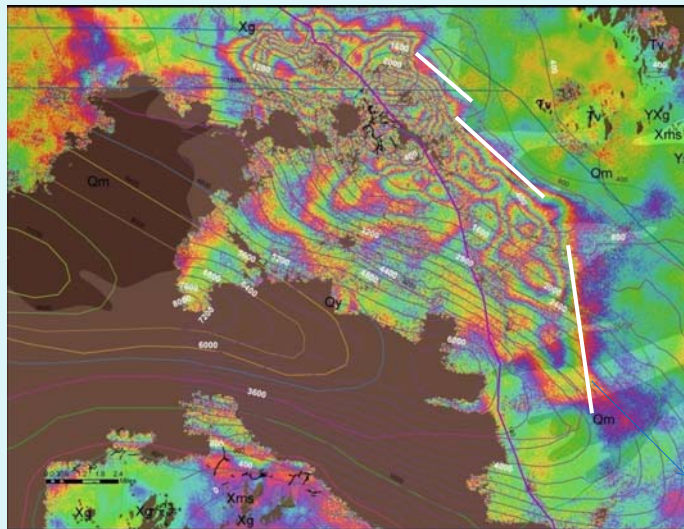
- Current gravity survey
  - Basin is 12,000 ft deep
  - Multiple sm basins near margins
  - Subsurface bedrock margin (north side of the San Tan Mtns) is very steep



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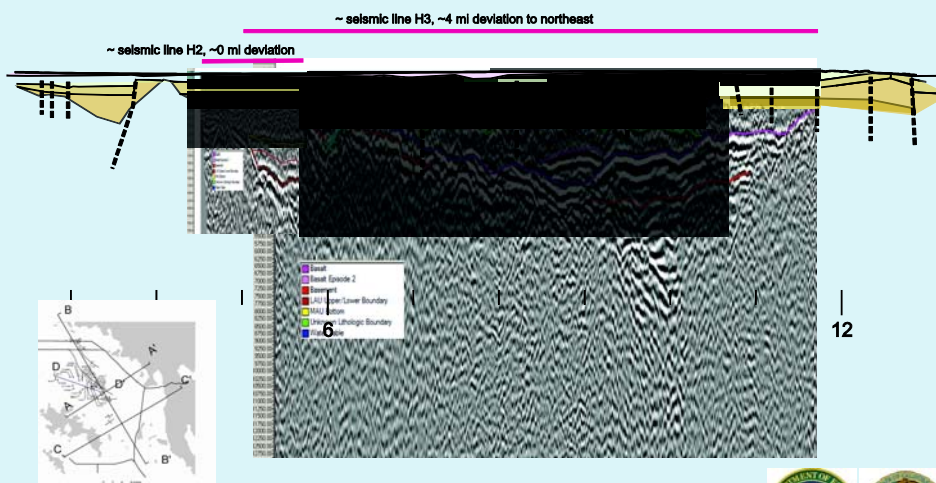
## ADWR InSAR



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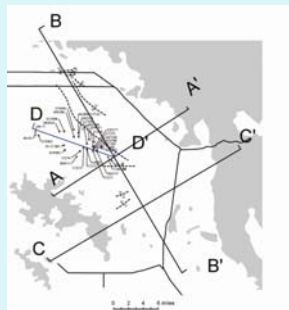
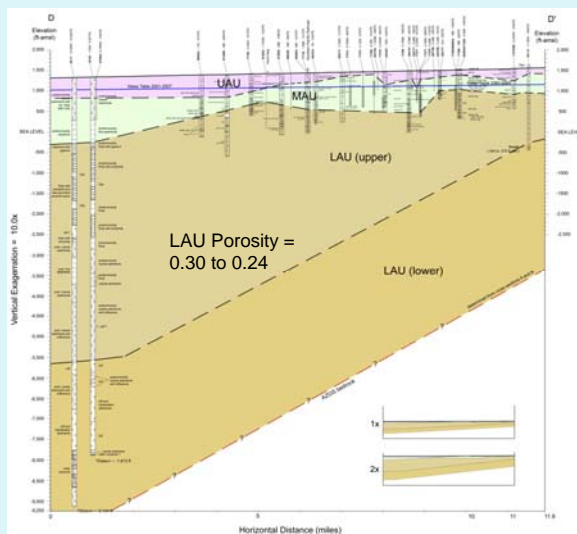
## Seismic Reflection



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# Cross-Section D-D'

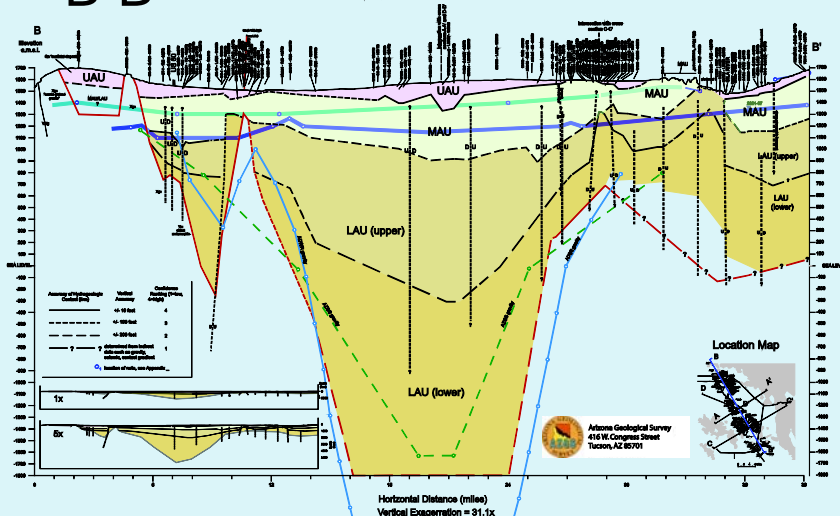


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# B-B'

Geologic Cross Section B-B' - Hgley Basin Area, Arizona  
 From Salt/Gila Aqueduct to Florence  
 View to east-northeast



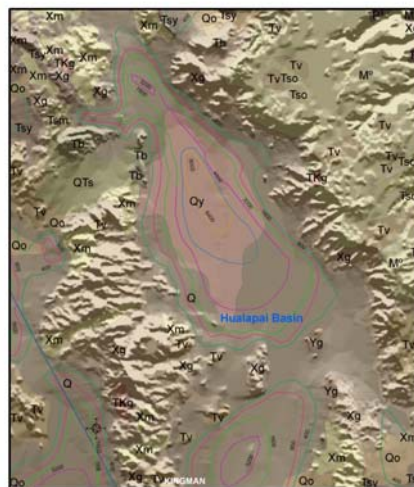
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## Hualapai Basin

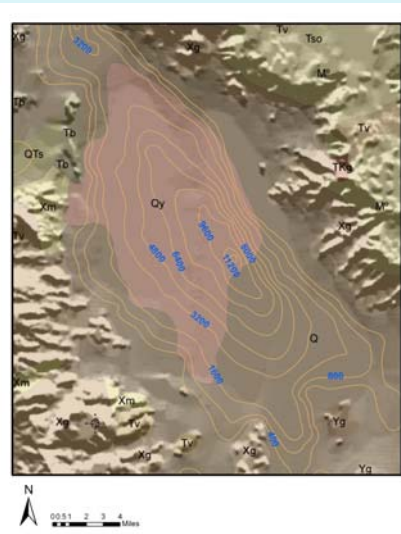
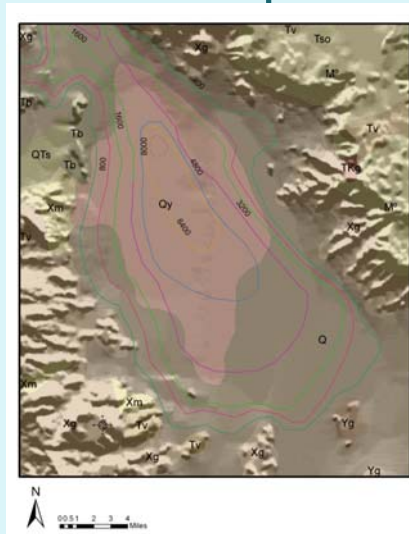
- Approx. 9000 ft deep (ADWR new gravity survey)
- 2.5 to 3 km thick halite body
- Clastic basin fill



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## New Depth-to-Bedrock Model

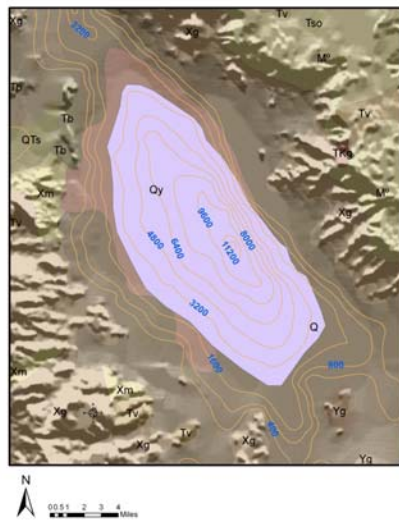


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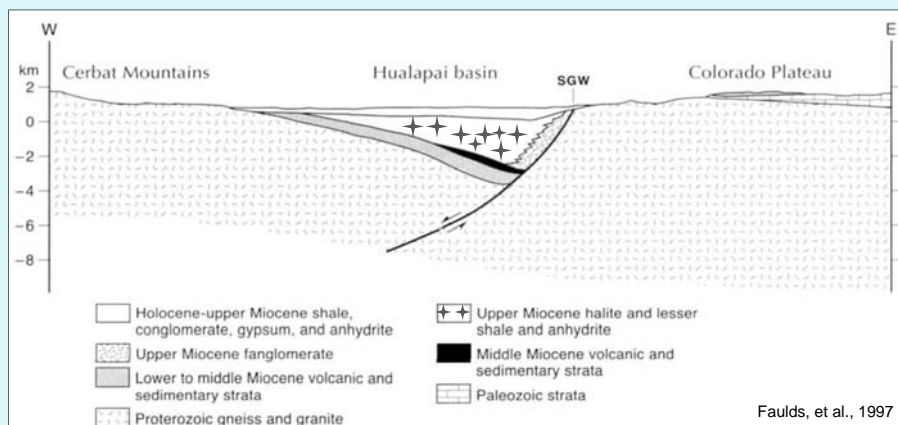
## Salt Body Extent



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## Generalized Cross-Section



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## Conclusions

- Current depth to bedrock models suggest previous studies underestimated basin depths.
- Basins often contain trapping clays and salt bodies and are used to store natural gas.
- InSAR and vintage seismic data may refine geologic framework.
- Tertiary basins are located near population centers and may accommodate carbon sequestration from existing and newly developed point sources.

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## Acknowledgements

- AZGS Basin Analysis Team
- University of Arizona – Dr. Roy Johnson and students
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