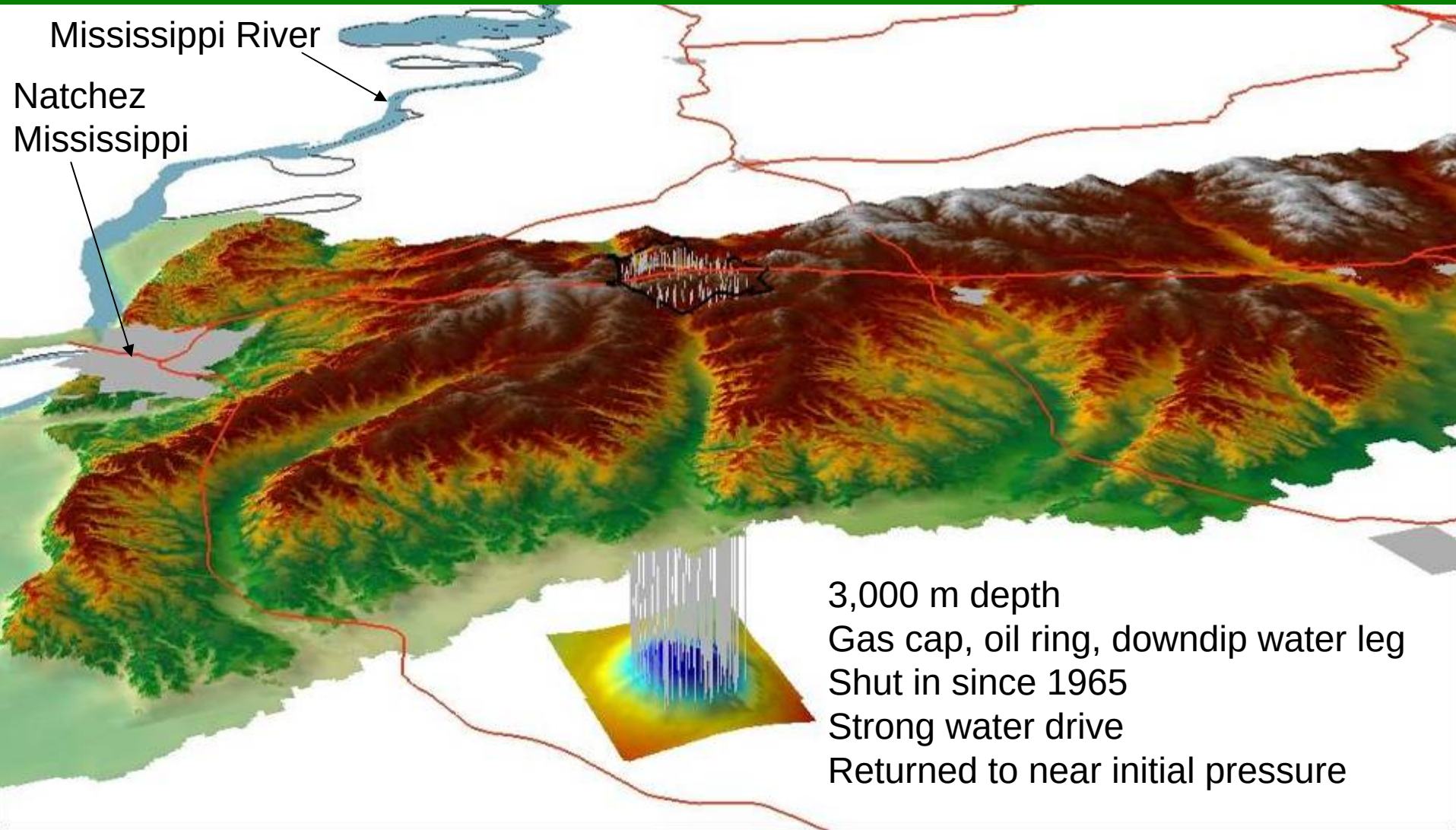
SECARB Phase II – Stacked Storage Test

at Cranfield Unit operated by Denbury Resources Inc



3,000 m depth
Gas cap, oil ring, downdip water leg
Shut in since 1965
Strong water drive
Returned to near initial pressure

Management of SECARB

Stacked Storage Test

University of Texas at Austin

DRI Denbury Resources Inc

Sandia Technologies LLC

Schlumberger Carbon Services

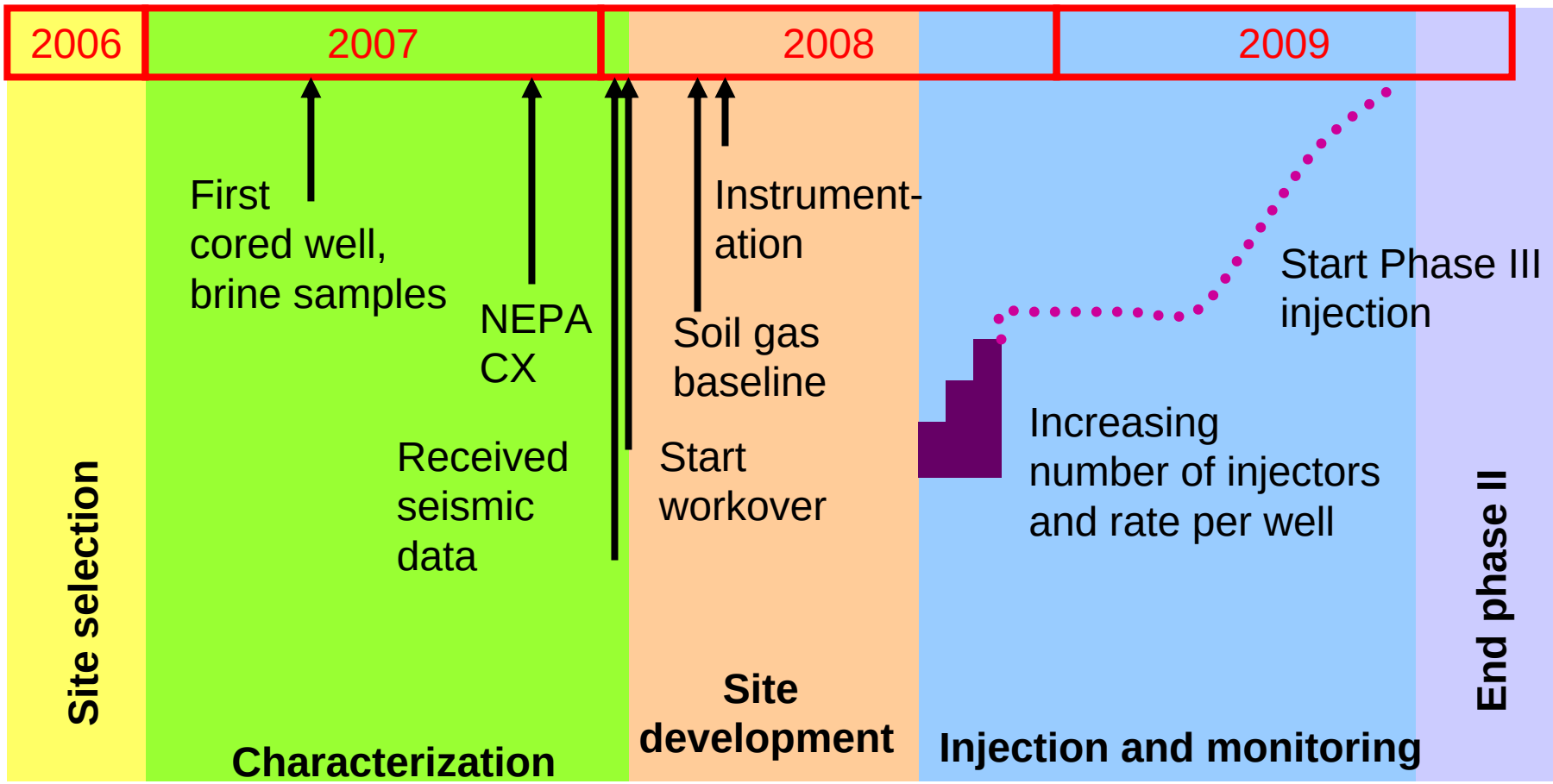
Gulf Coast Carbon Center

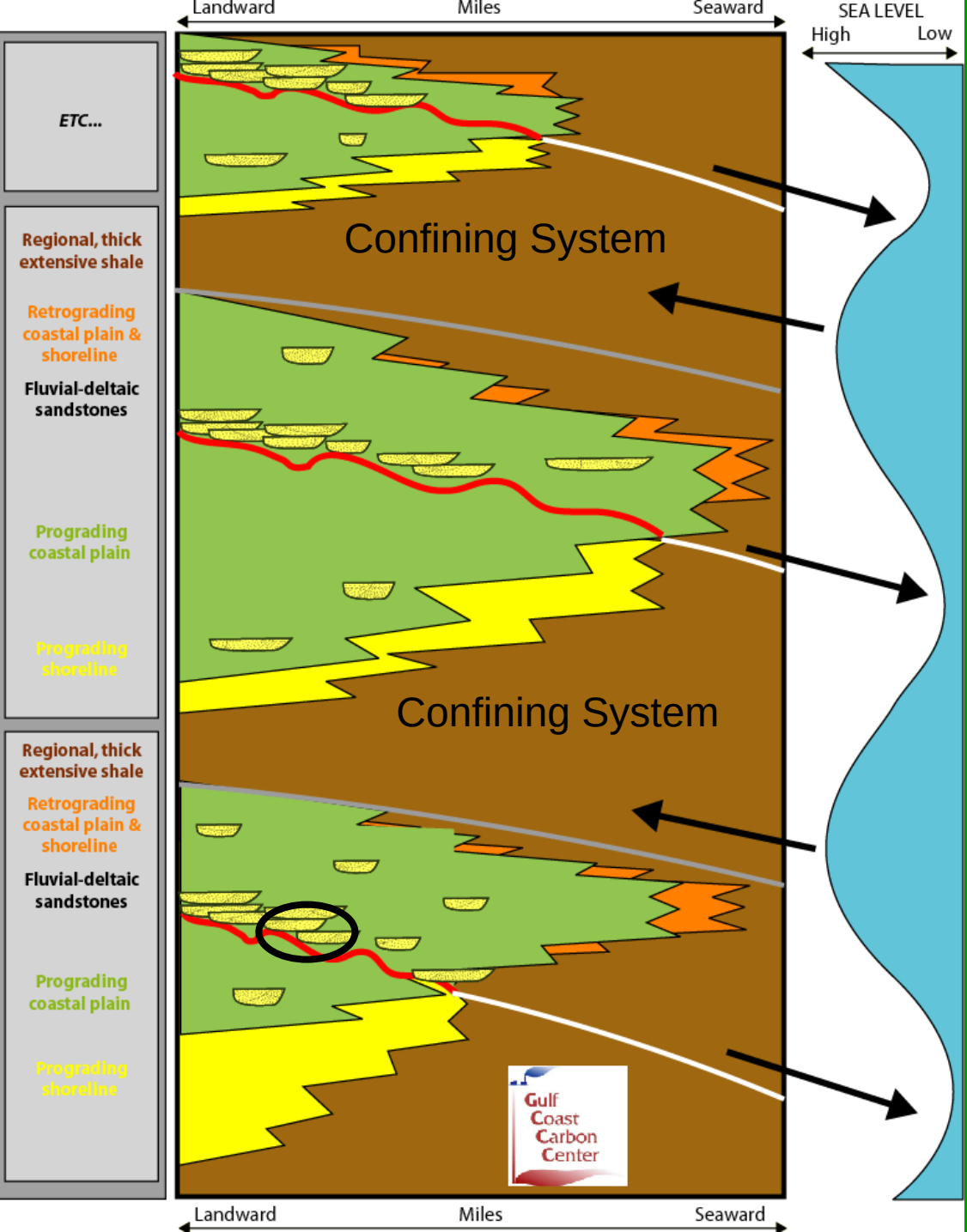
Other SECARB Phase II tests

SECARB coal seam
Geological Survey of Alabama
Virginia Tech

SECARB Plant Daniels
EPRI
Southern Co
ARI

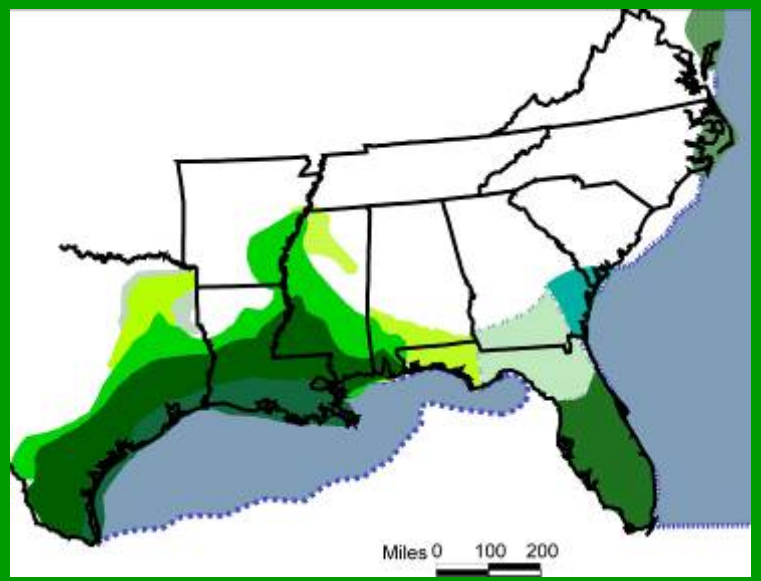
Phase II Stacked Progress



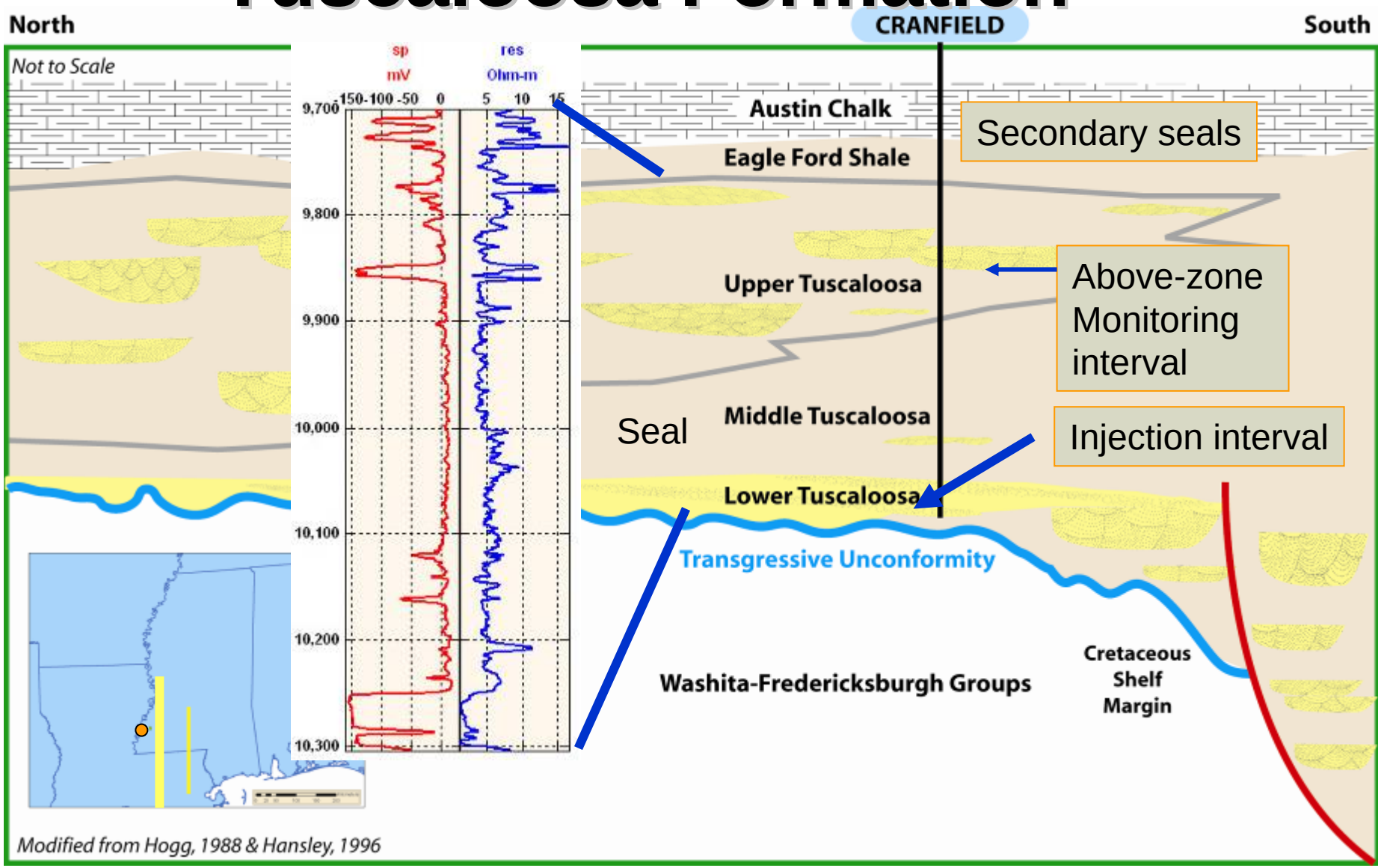


Regionally significant sequestration target: Gulf Coast wedge

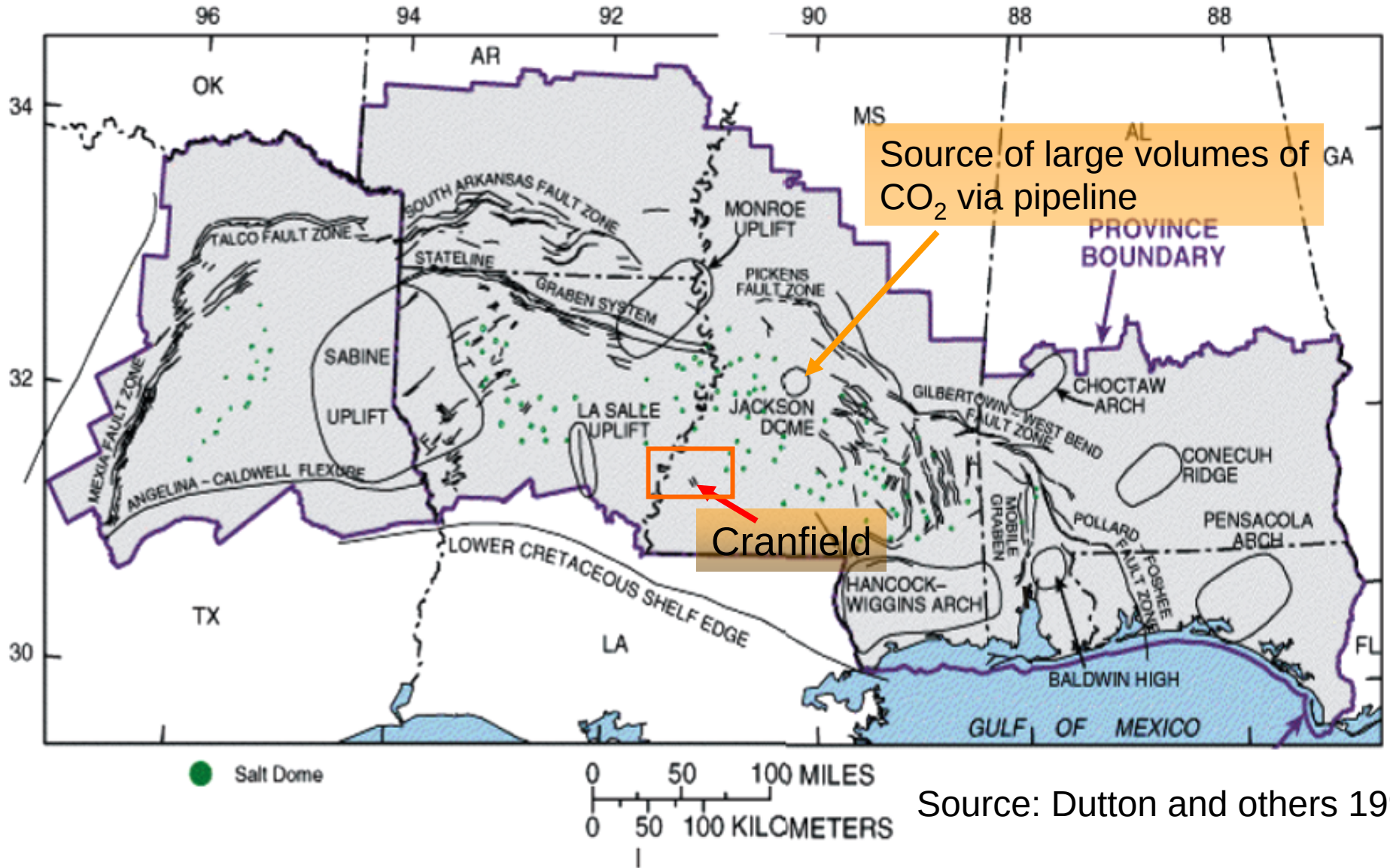
- Results transferable to:
  - older and younger units
  - other parts of region



Regional Stratigraphy of the Tuscaloosa Formation

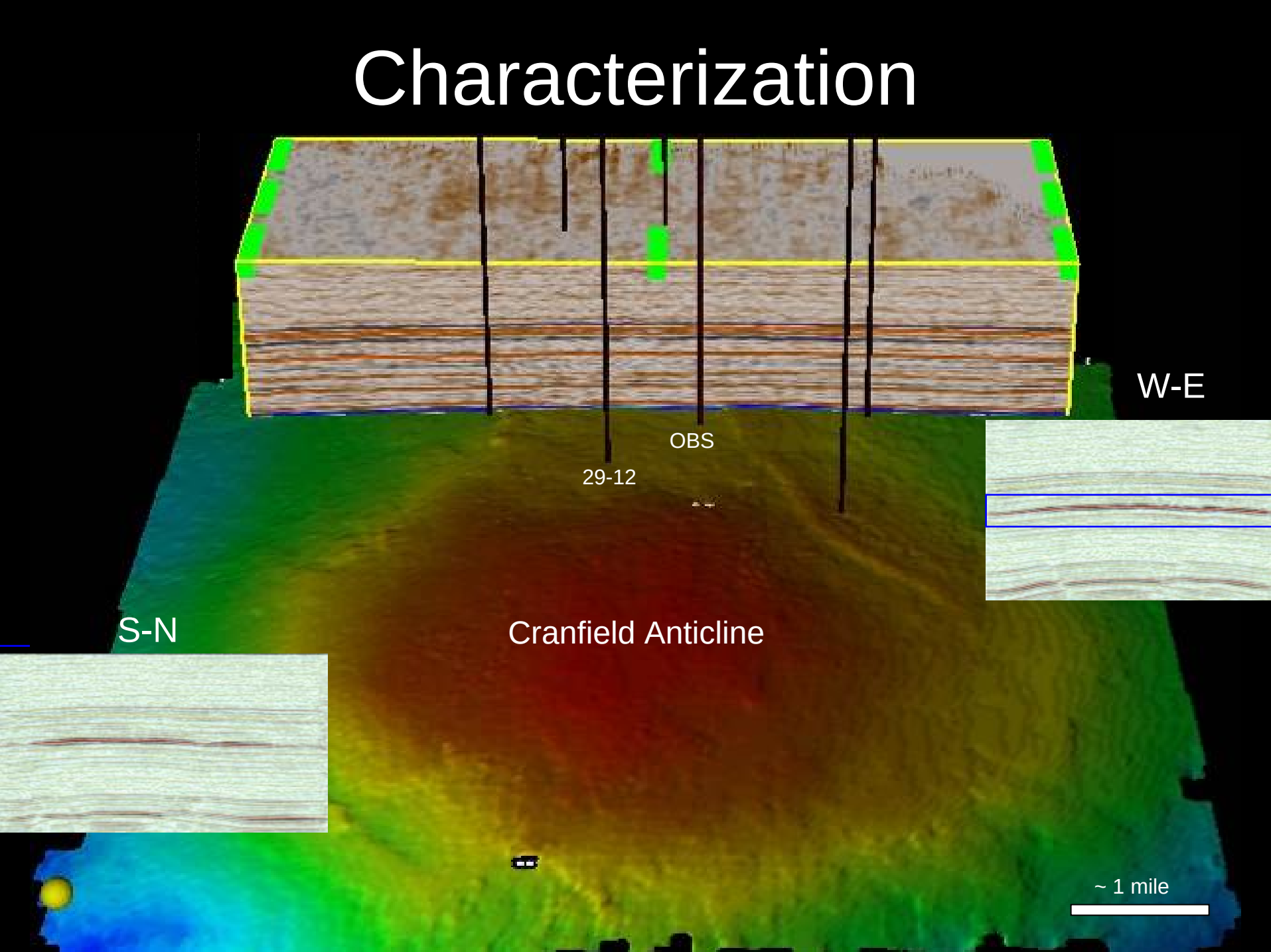


Cranfield is part of Upper Cretaceous Tuscaloosa-Woodbine Trend of the Mississippi Salt Basin

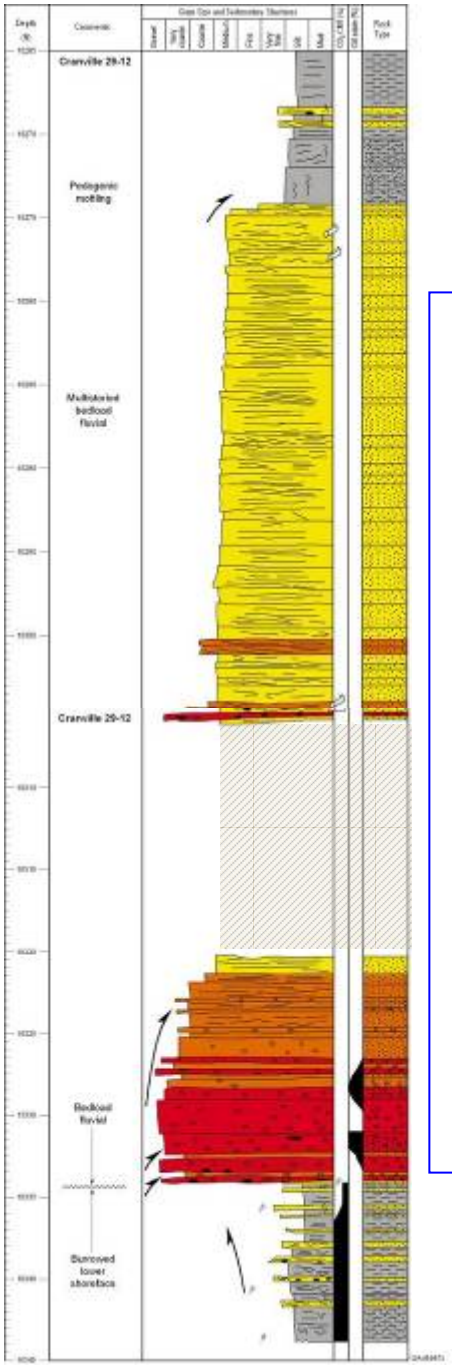


Source: Dutton and others 1993

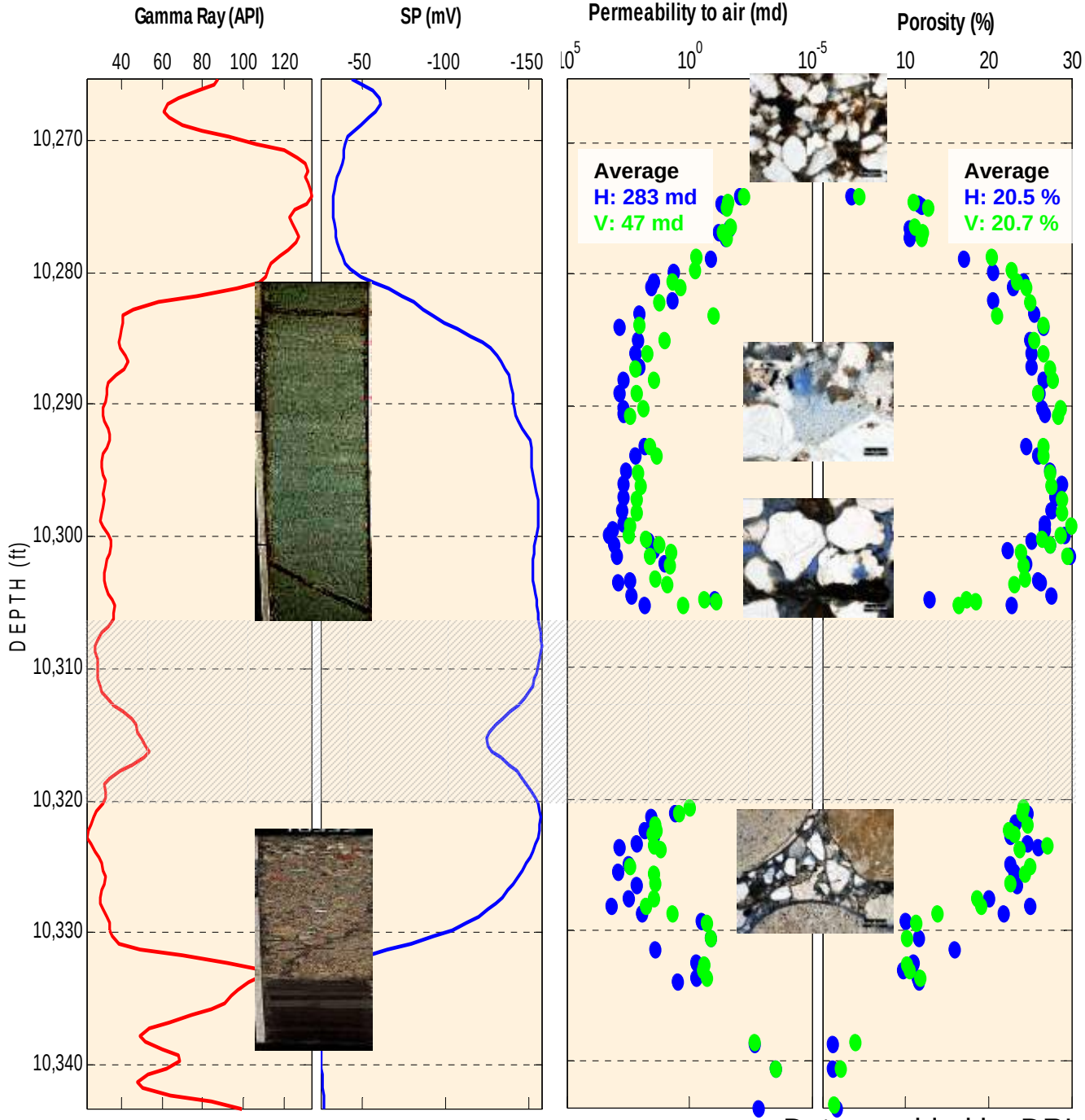
Characterization



CFU 29-12: New Injector



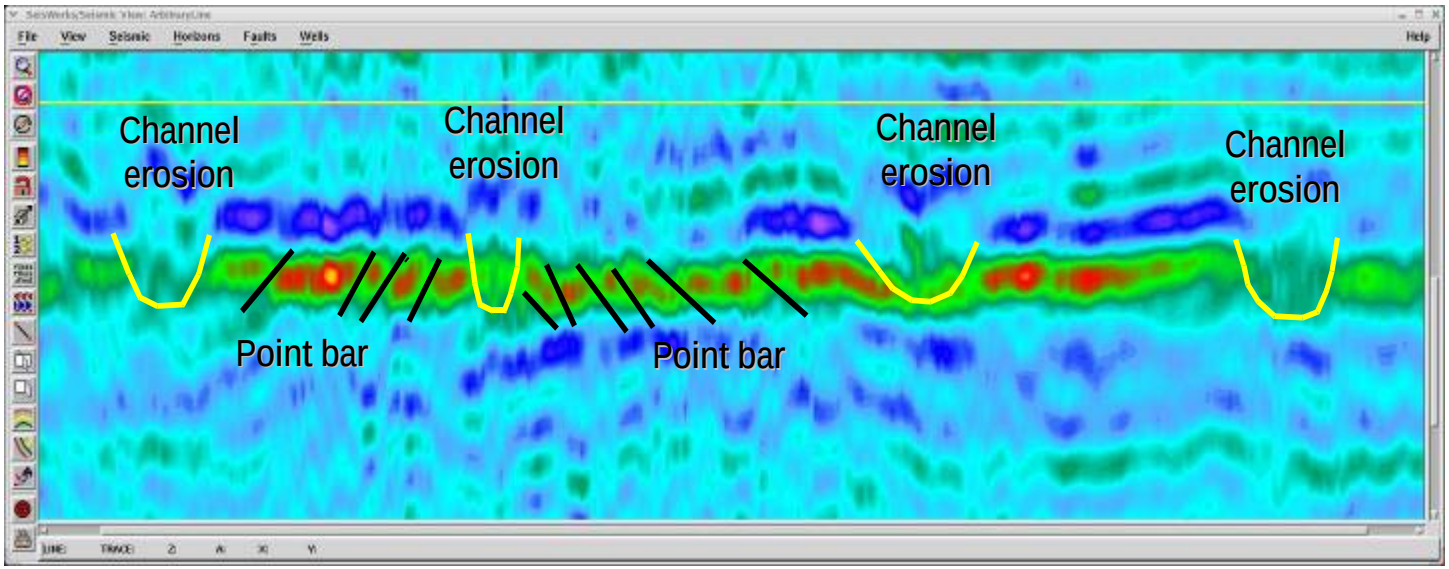
INJECTION ZONE

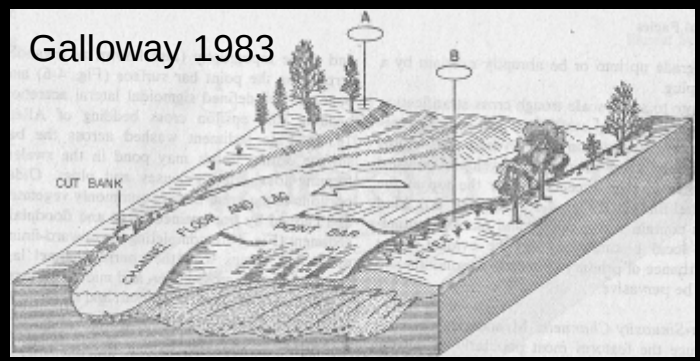


Data provided by DRI

Fluvial Depositional Environment

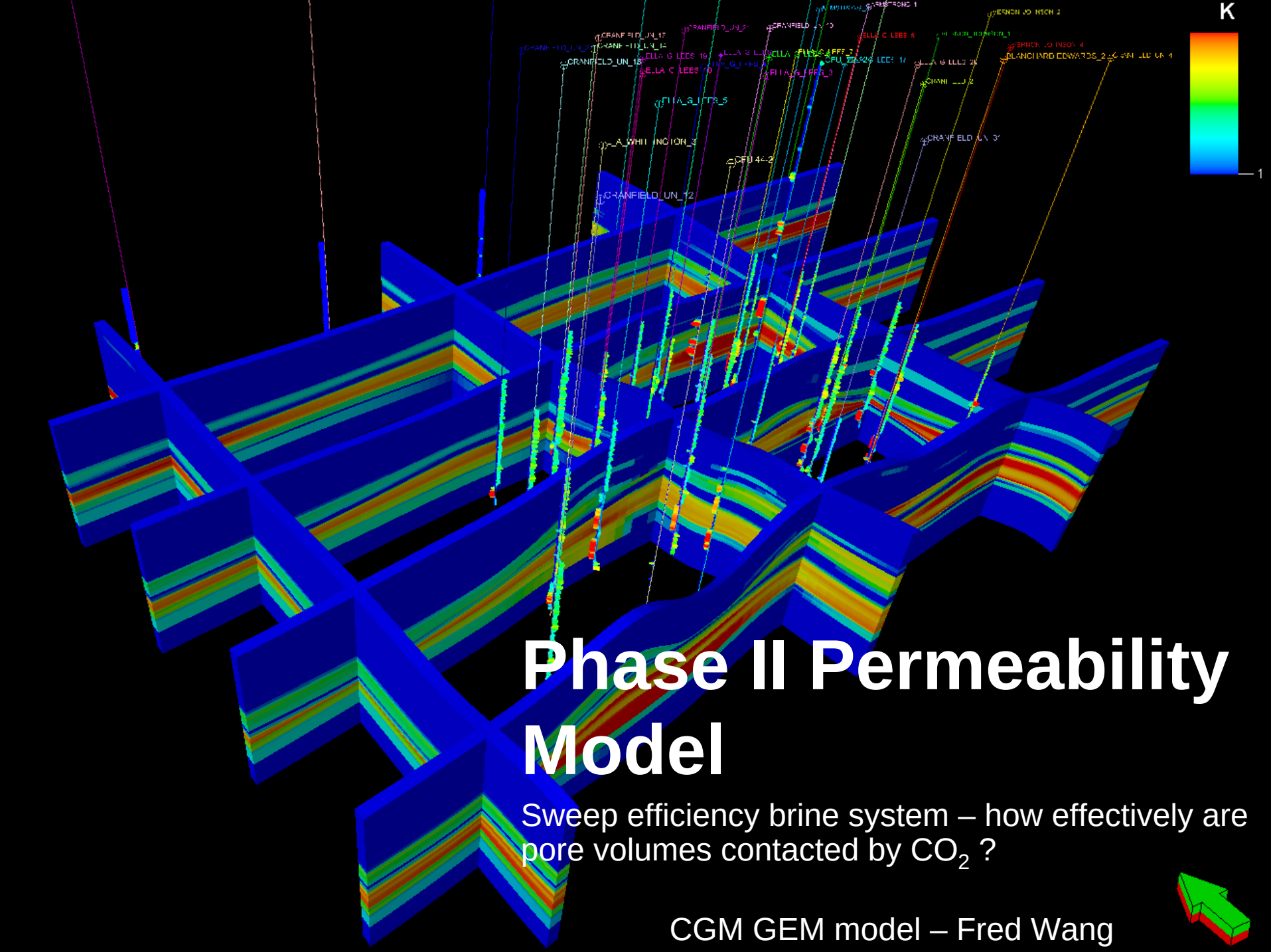
Stratal slicing seismic interpretation





Meander fluvial model

Hongliu Zeng



Phase II Permeability Model

Sweep efficiency brine system – how effectively are pore volumes contacted by CO_2 ?

CGM GEM model – Fred Wang

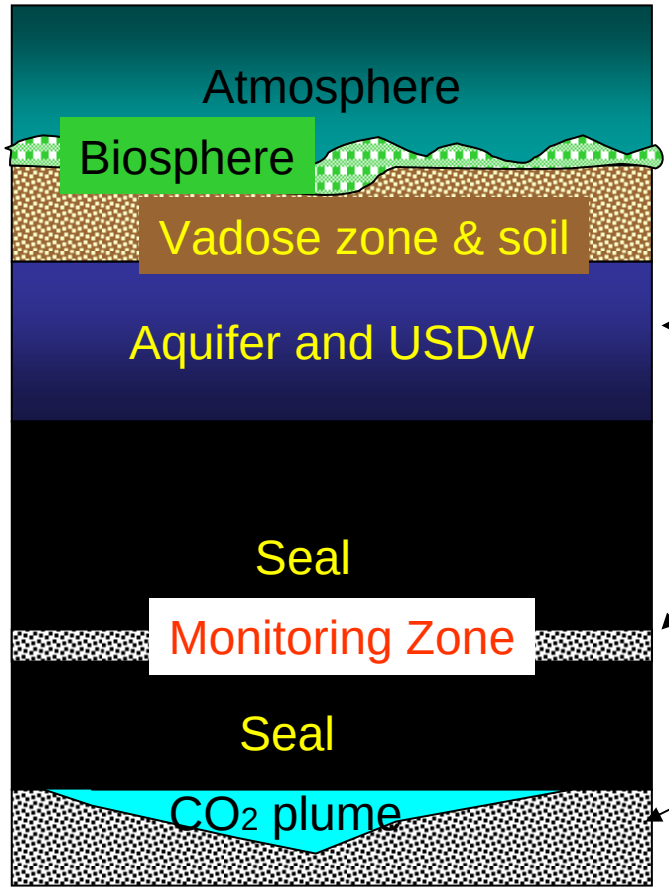
Phase II Research Focuses
½ MMT CO_2 /year

(1) Sweep efficiency – how effectively are pore volumes contacted by CO_2?
- Capacity of subsurface volume & prediction of plume size

(2) Injection volume is sum of fluid displacement, dilatancy, dissolution, and rock+fluid compression (oil present)
- Bottom hole pressure mapping to estimate fluid displacement

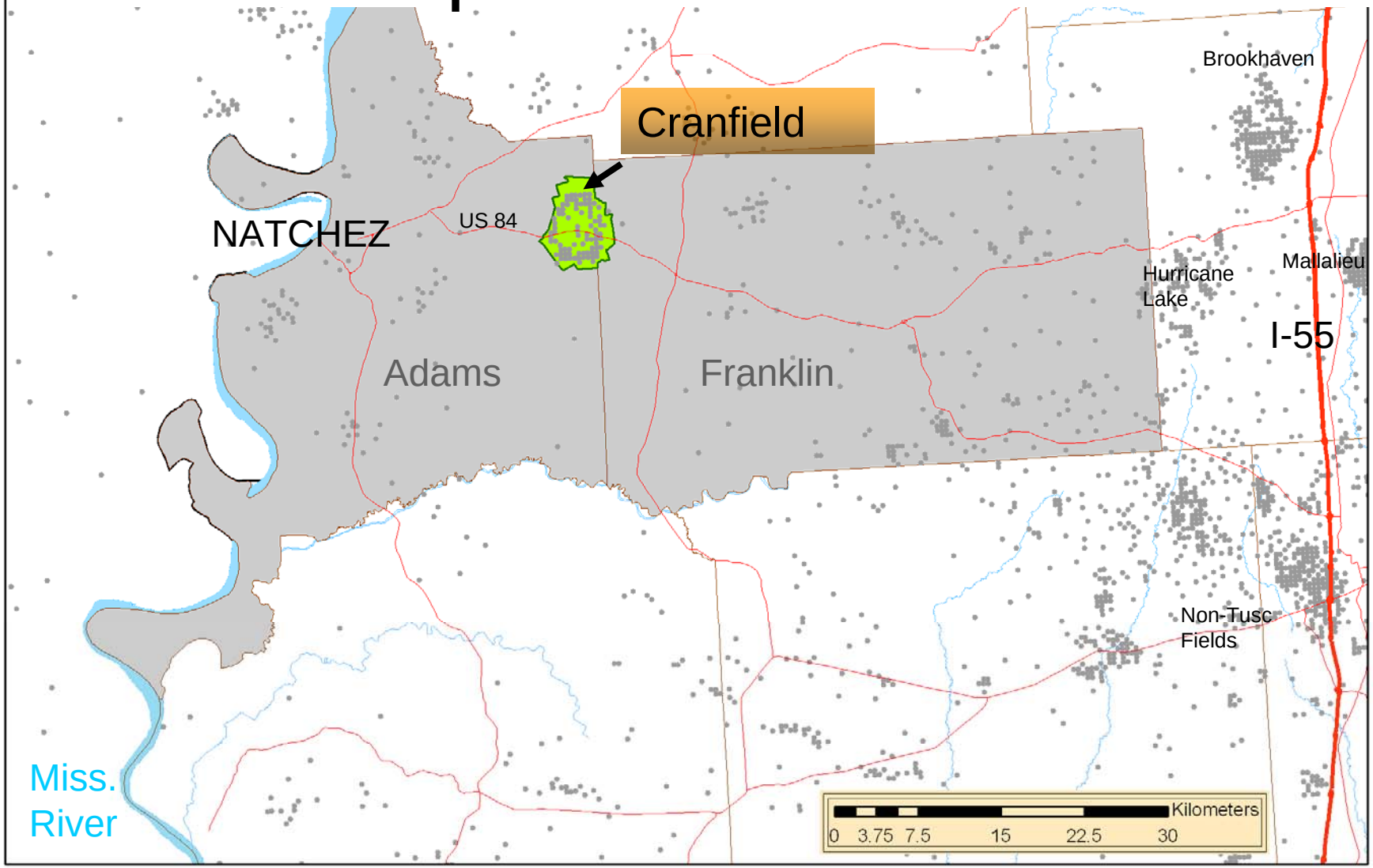
(3) Effectiveness of Mississippi well completions regulations in retaining CO_2 in GHG context
- Above-zone monitoring and historic well program

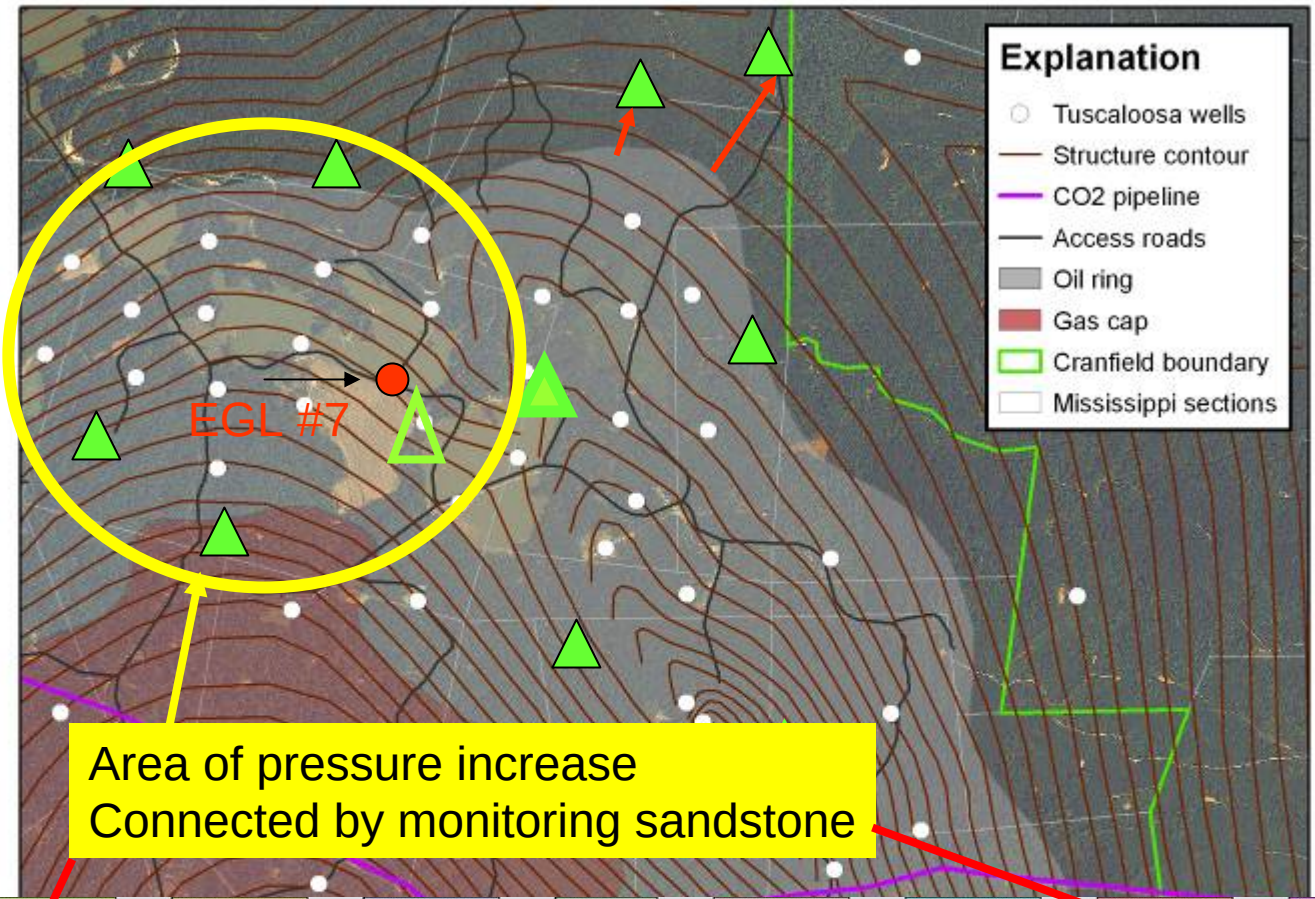
Phase II Monitoring Zones



- Atmosphere
  - Ultimate receptor but dynamic
- Biosphere
  - Assurance of no damage but dynamic
- Soil and Vadose Zone
  - Integrator but dynamic
- Aquifer and USDW
  - Integrator, slightly isolated from ecological effects
- Above injection monitoring zone
  - First indicator, monitor small signals, stable.
- In injection zone - plume
  - Oil-field type technologies. Will not identify small leaks
- In injection zone - outside plume
  - Assure lateral migration of CO_2 and brine is acceptable-far field pressure

Abundance of historic wells is a risk issue for parts of SECARB area





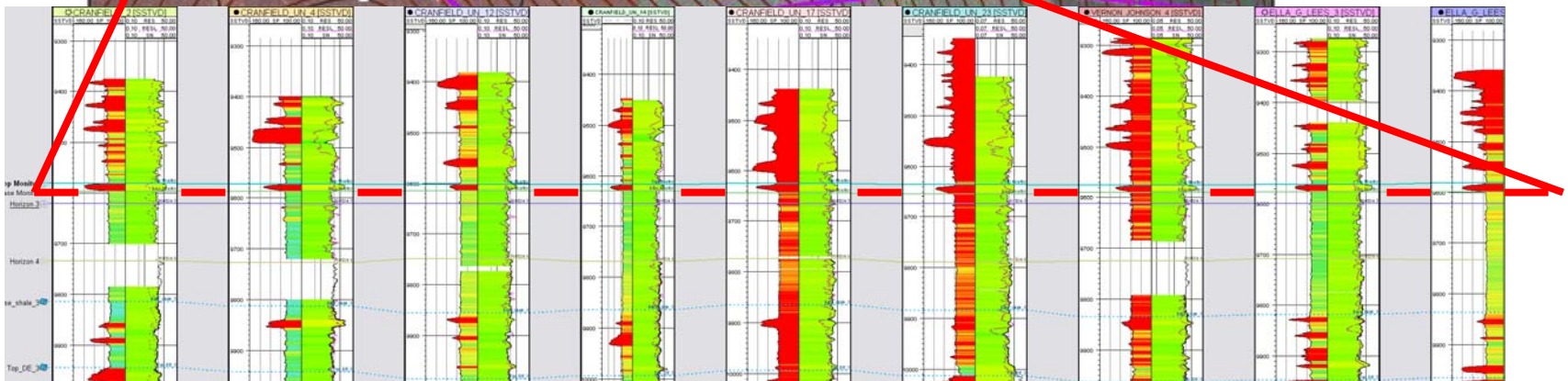
DRI injectors 10/08

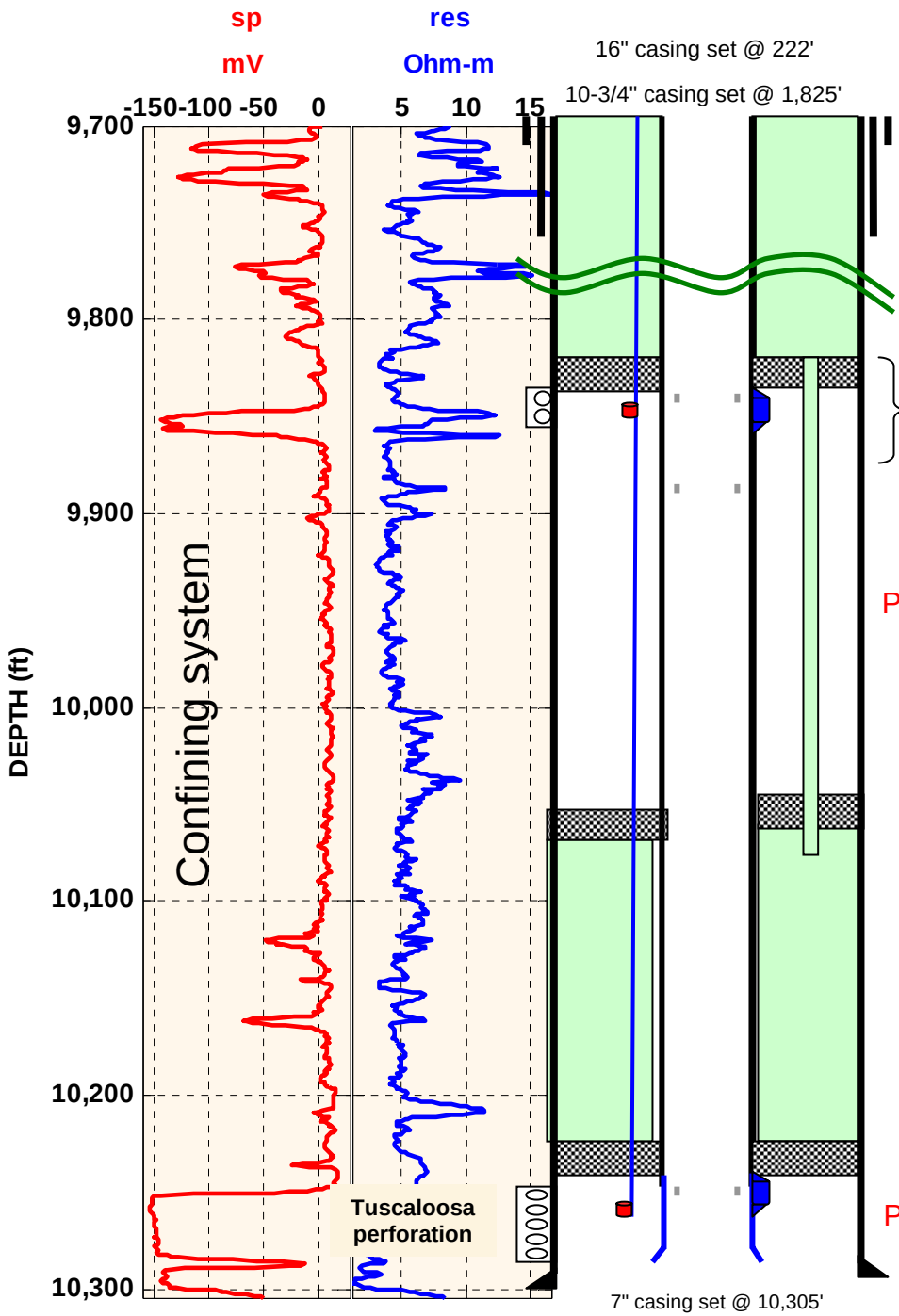
Planned 2008 injectors

Phase II obs well

1945 producer

Area of pressure increase
Connected by monitoring sandstone





Test adequacy of Mississippi well completions for CO_2 sequestration

13-Chrome Isolation packer w/ feed through

13-Chrome Selective seat nipple

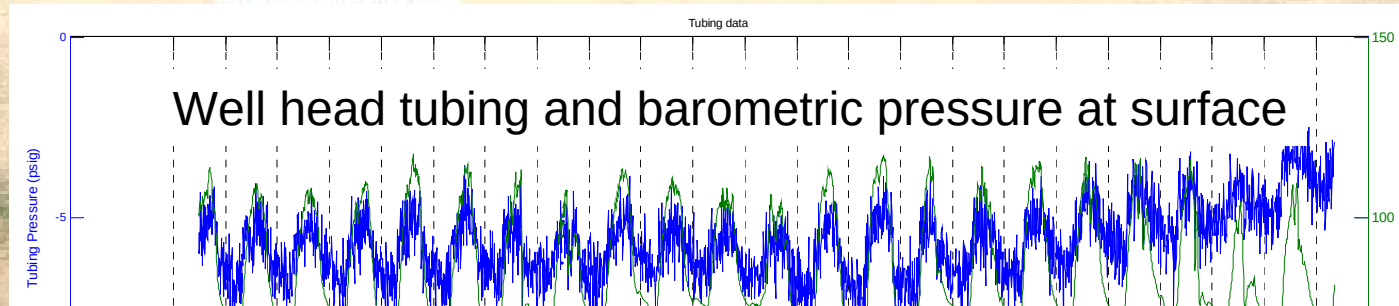
Pressure transducer Side Pocket Mandrel w/dummy gas valve

1/4" tubing installed between packers to Provide a conduit between isolation packers

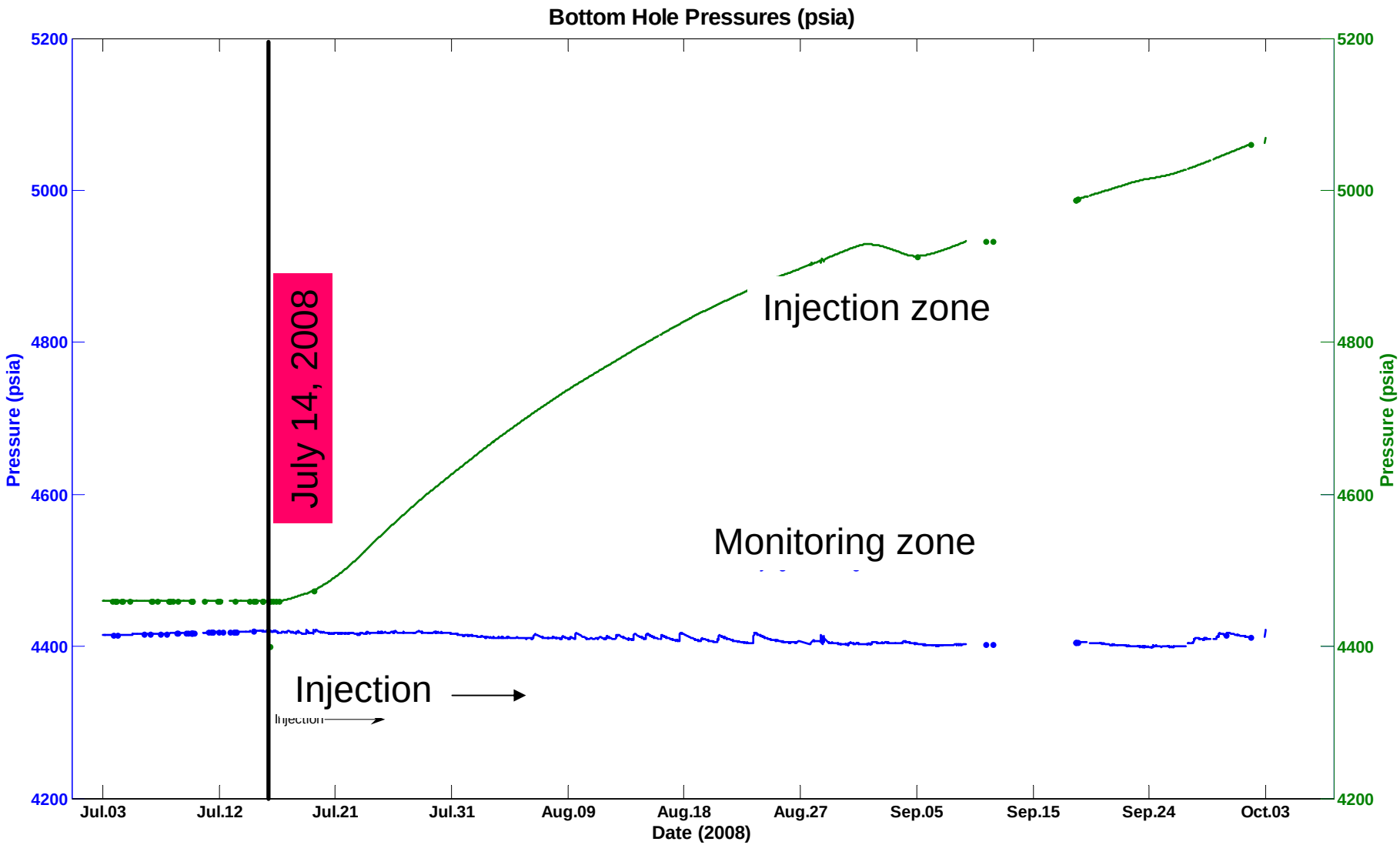
13-Chrome Production packer w/ feed thrus

Pressure transducer Side Pocket Mandrel w/dummy gas valve

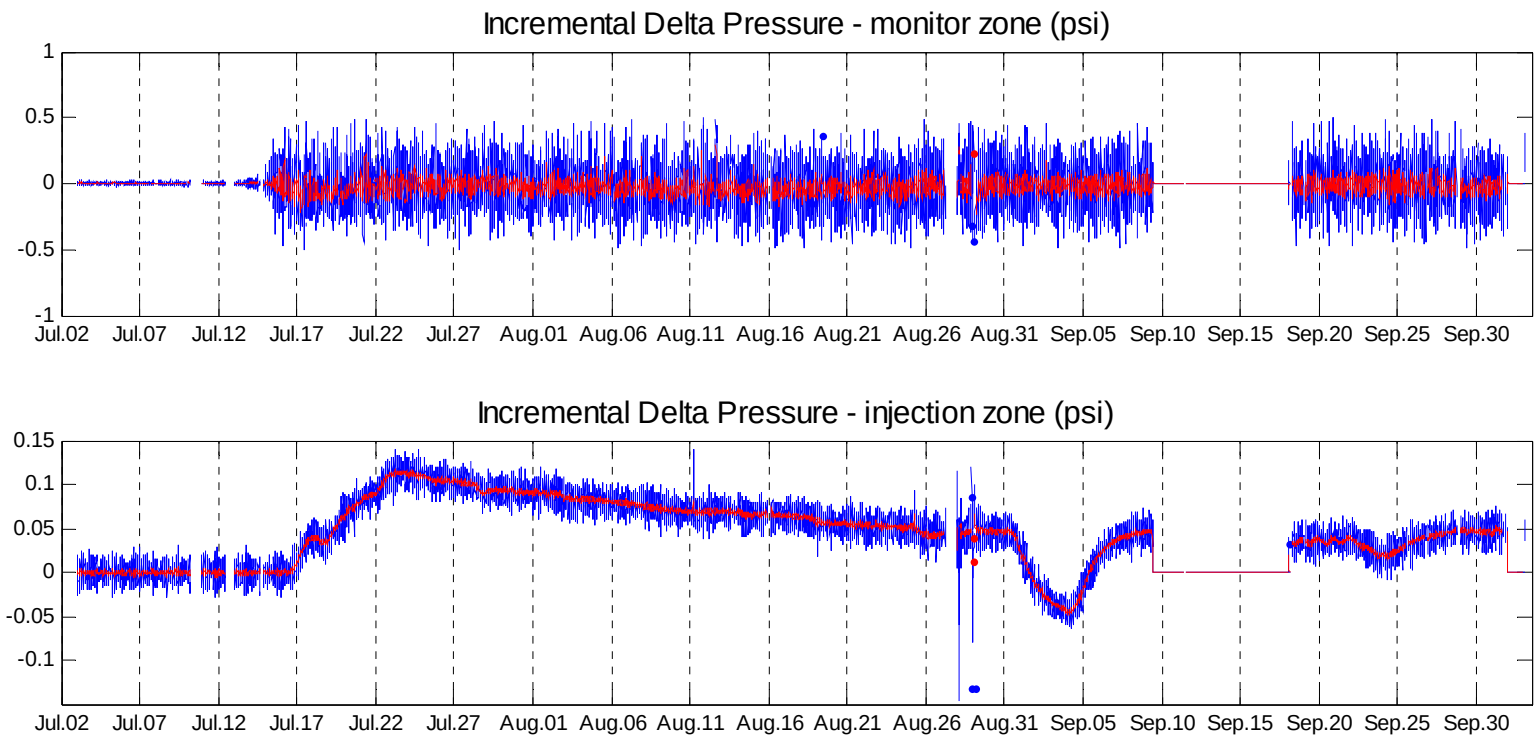
Real-time monitoring via Satellite Uplink



Validation: Reservoir Response to Injection

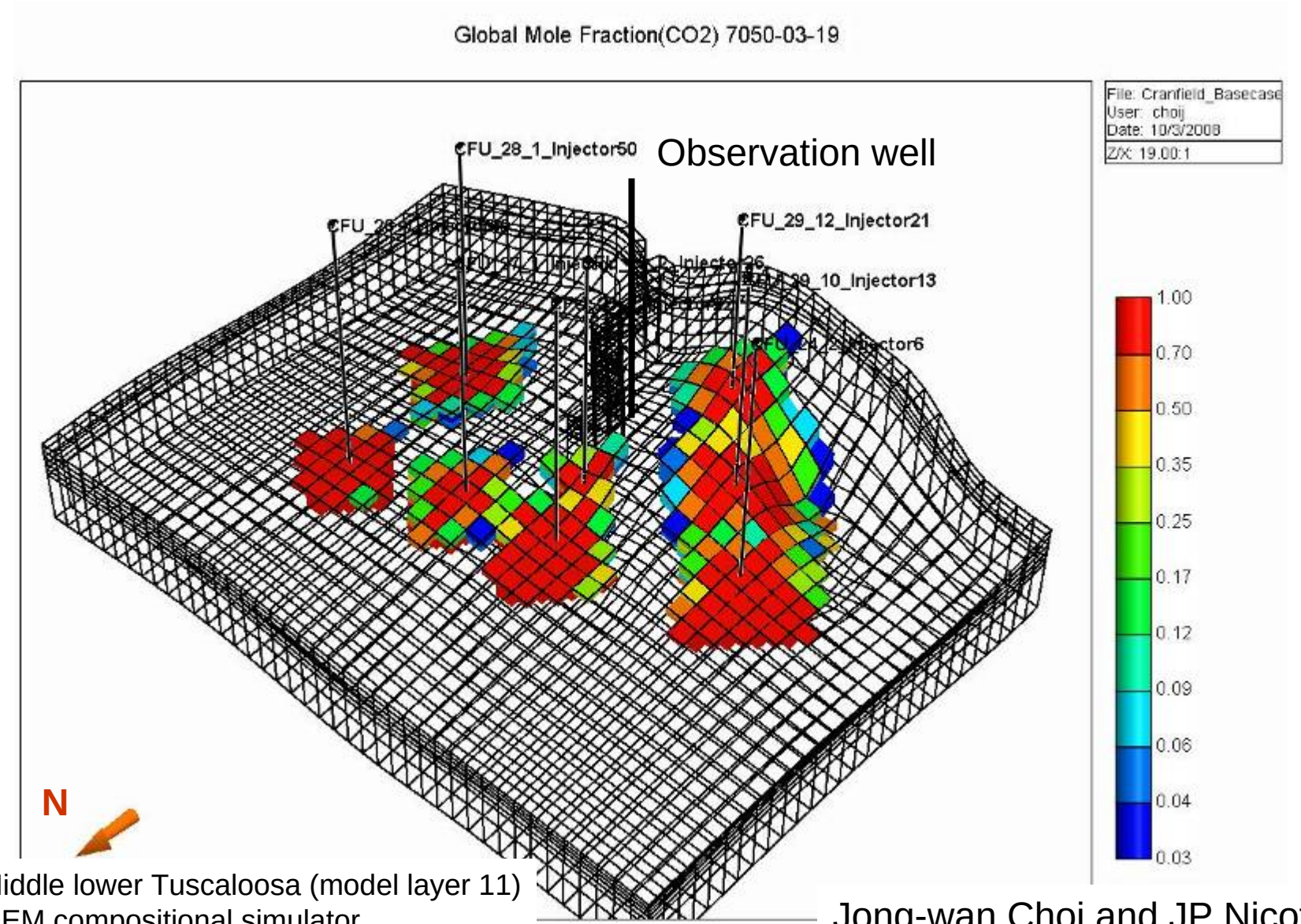


First Derivative Pressure Response



Tip Meckel

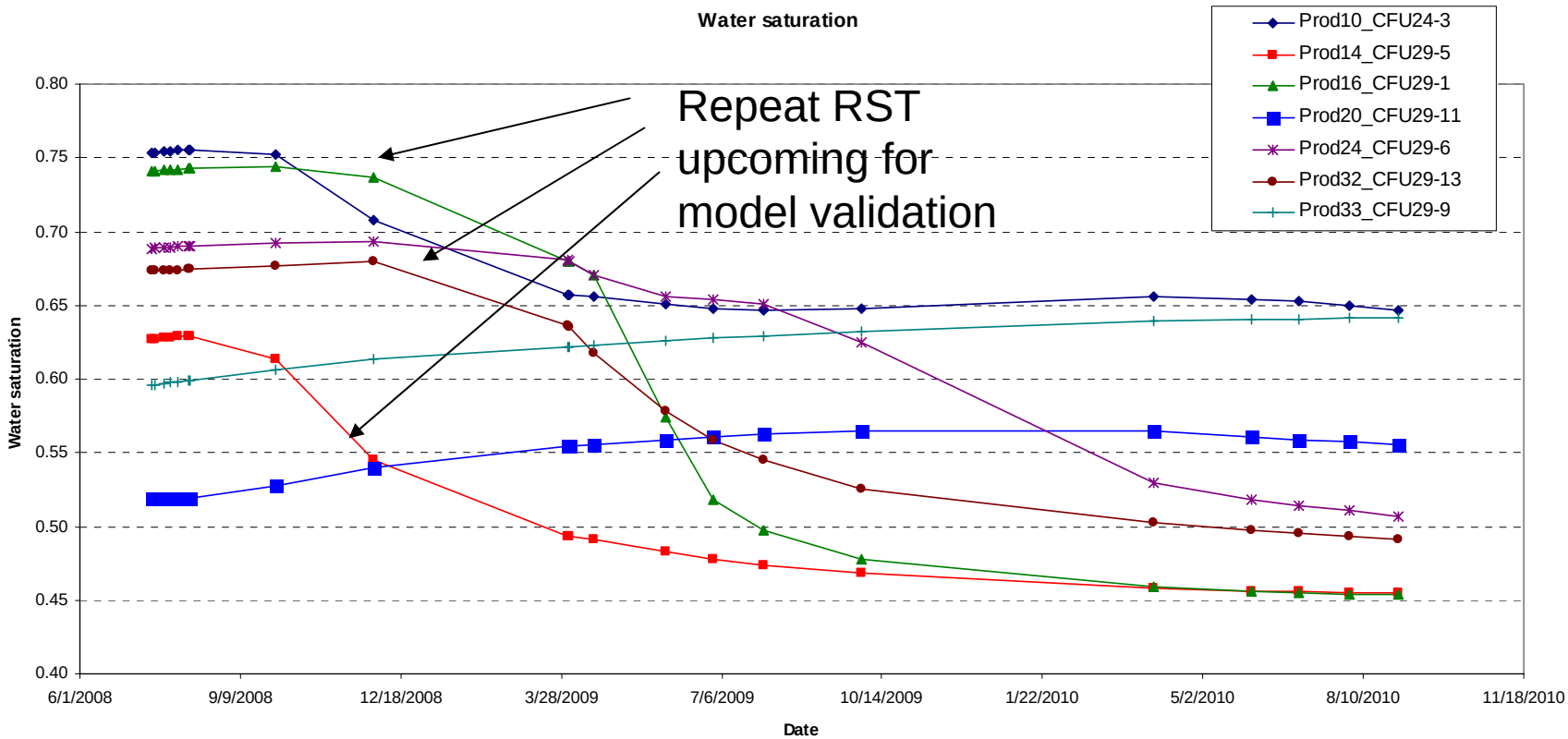
Validation:
Modeled Current Distribution of CO_2



Middle lower Tuscaloosa (model layer 11)
GEM compositional simulator

Jong-wan Choi and JP Nicot, BEG

Modeled Water Saturation showing CO_2 Breakthrough



Jong-wan Choi

Mid-process Phase II Conclusions

- 100,000 tons injected in 2 ½ months
- Current injection rate at ½ million ton/year rate.
- No pressure increase detected in above zone monitoring zone – about 1945 vintage wells are limiting fluids migration
- Far-field pressure data collected
- CO_2 breakthrough to monitoring wells expected.