

## **Assessing Seal Capacity of Exploited Oil and Gas Reservoirs, Aquifers and Coal Beds for Potential Use in CO<sub>2</sub> Sequestration**

**Investigator:** M. D. Zoback, Professor, Geophysics Department

In this study we will investigate the seal capacity of exploited oil and gas reservoirs, deep aquifers and coal beds in order to assess their potential utilization for CO<sub>2</sub> sequestration. Excess pressures at the top of the formation used for sequestration arise from the buoyancy of the CO<sub>2</sub> column with respect to the water or oil originally in the reservoir. The excess pressure has the potential to fracture hydraulically the cap rock (allowing leakage to occur), or to activate reservoir-bounding faults that results in leakage of natural gas from reservoirs at depth. This concept, which we refer to as dynamic seal capacity, has been applied in a number of oil and gas fields around the world. An important outstanding question is how such processes may influence CO<sub>2</sub> sequestration.

### **Status**

- Completed comprehensive review of ExxonMobil trap and seal evaluation work flow as a possible analog for development of a related work flow for CO<sub>2</sub> sequestration in depleted oil and gas reservoirs.
- Initiation of review of Weyburn project in Alberta in which CO<sub>2</sub> is being used for enhanced oil recovery (EOR) activities and possible CO<sub>2</sub> dual-use strategies for EOR and sequestration.
- Initiation of review of Burlington project in San Juan basin, New Mexico in which CO<sub>2</sub> injection is being used for enhanced gas recovery (EGR) activities and possible CO<sub>2</sub> dual-use strategies for EGR and sequestration.
- Initiation of review of dual-use EGR/CO<sub>2</sub> sequestration in the Powder River Basin, Wyoming
- Initiation of review of laboratory data implying significant changes in the mechanical properties of coal when CO<sub>2</sub> is introduced at pressures and temperatures comparable to conditions likely to be encountered in sequestration

### **Examples of Capability**

- Evaluation of seal integrity of potential repositories in terms of conventional and advanced concepts governing seal capacity (such as dynamic constraints on column height, potential for production-related loss of seal integrity, etc.).
- Laboratory equipment (and theoretical framework) to study the viscoelastic properties of coal in the presence of CO<sub>2</sub> and other gases

### **Contact:**

M. D. Zoback: [zoback@pangea.stanford.edu](mailto:zoback@pangea.stanford.edu)