Geophysical Research Abstracts,
Vol. 11, EGU2009-12241, 2009
EGU General Assembly 2009

CO2 storage in Otway, Australia: influence of geological and reservoir parameters on time-lapse seismic signal modeling

A. Gendrin (1), S. Bouquet (1), M. Urosevic (2), H. Bernth (3), C. Kostov (3), P. Wisman (2), D. Labregere (1), and M. Verliac (1)

(1) Schlumberger Carbon Services, Paris, France, (2) CO2CRC/Curtin University, (3) Schlumberger Cambridge Research, Cambridge, UK

Until now, time lapse seismic signal is mostly used qualitatively in CO2 storage projects, to map the extent of the CO2 plume. Ultimately, we want to use it quantitatively to calculate the amount of injected CO2. This will allow us to check that all the CO2 injected is properly stored and that no leakage is occurring.

CO2 injection started in Otway, Australia, in March 2008. Over two years, 100,000 tons of CO2 should be injected in this depleted methane reservoir. This project is very challenging since the injected CO2 mixes with residual methane, which generates a weak time-lapse seismic signature. However, a wealth of information is available: logs, a static model, a calibrated reservoir model, and a rock physics model based on core measurements, which are fundamental for the project.

We use 3D finite difference modeling to simulate the expected time-lapse seismic signal. Our initial velocity model is built with logs and seismic interpretation. The rock physics approach is used on the outputs of the reservoir simulation to generate a velocity model after injection. Seismic simulation is then run before and after injection, which provides the theoretical time-lapse seismic signal.

Several parameters are poorly constrained in the workflow, which affect time-lapse signal prediction. Porosity and permeability grids are constrained at the wells and are statistically distributed throughout the volume. Relative permeability, capillary pressure, hysteresis, have been measured, for CO2, on a few samples only throughout the world. In this work, we explore the influence of uncertainty on these parameters, and derive an error bar on the estimate of the amount of CO2 stored.