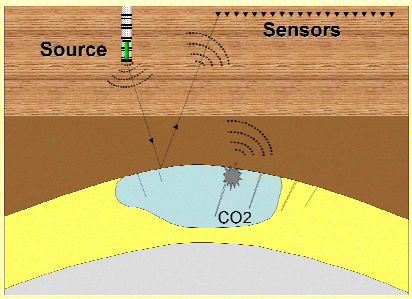
EMSAPCO2: Geophysical methods for CO2 reservoirs monitoring

Goal : Propose an integrated and adaptative panel of geophysical solutions to monitor CO2 geological storages

- **Development of permanent acquisition methods**
- **Better understanding of wave propagation in CO2 reservoirs**



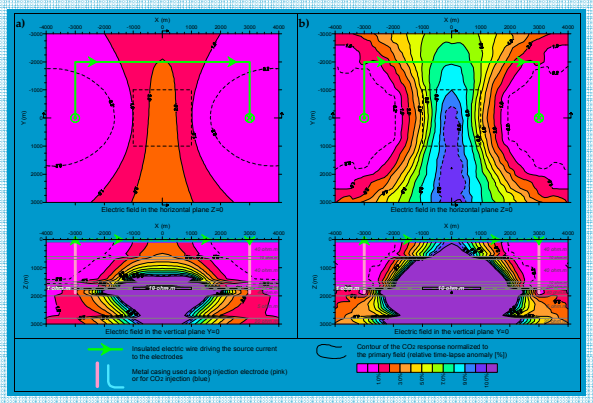
ELECTROMAGNETISM

Modeling of the time-lapse electric response of a 2 km×2 km×70 m CO2 bubble, of 10 ohm.m resistivity in a deep saline aquifer

a) for a short-electrode injection at the surface

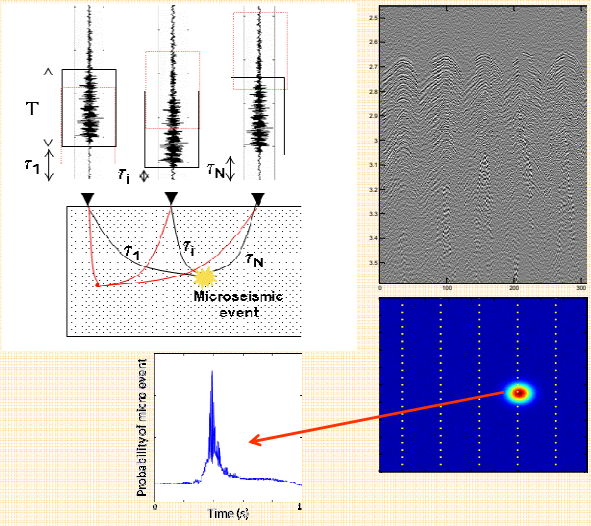
b) for a LEMAM injection via a pair of vertical casings (1900 m long).

Communication to the Hedberg conference on "Geological Carbon Sequestration: Prediction and Verification ", 16-19 Août 2009, Vancouver, Canada. « Numerical modelling of the time-lapse EM response of a CO2 injection in a deep saline aquifer using metallic casings for the current injection »



MICROSEISMIC

- Detection and localization from a surface network
- Implementation of the slant stack algorithm

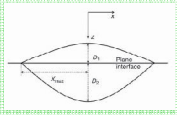


SEISMIC

Influence of the interfaces

The spatial region in the vicinity of a curved homogeneous interface, which actually affects the interface response has been investigated .The maximum vertical extent of the Fresnel volume may be greater than the seismic wavelength for near-critical incidence angles. Although the region of influence below the interface is less than indicated by earlier studies, the total vertical extent is larger than previously reported.

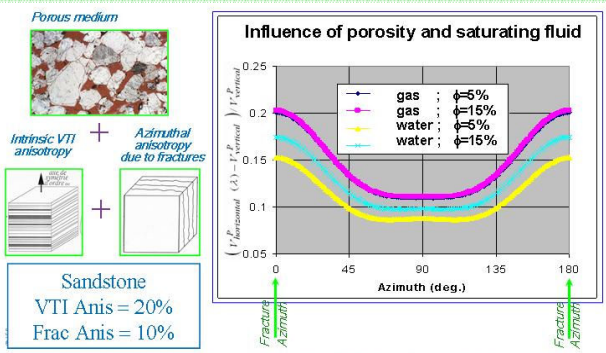
Communication in Geophysics, Jannuary 2009, « What is a seismic reflector like? »



Impact of fractures on CO2 geological storage seismic monitoring

Pwave anisotropy parameter , i.e. the normalized difference between horizontal and vertical Pwave velocities as function of the difference between the azimuth of the seismic profile and the azimuth of the fracture for different porosities (Phi=5% and Phi=15%) and for different saturating fluids (gas and water).

Communication: Impact of fractures on CO2 storage monitoring, 1st EAGE CO2 geological storage workshop Budapest, 29-30 septembre 2008



Wave velocities and impedances in porous media saturated with liquid and gas

Left plots: Pwave velocity as a function of saturation for a porous rock equivalent to Utsira formation saturated with water/CO2 mixture. The Gassmann-Landau&Lifshitz method takes into account the phases transfers when acoustic wave is occurring. Available in low frequency domain (f<fc).
Right plots: Pwave velocity, impedance and reflectivity curves for a 100 m-thick low gas-saturated (Sg(CO2) = 1%) reservoir sandwiched between shales, calculated according to the two methods, Wood and Landau-Lifshitz.

Communication: EAGE Amsterdam June 8-10th 2009, Congrès Français de Mécanique, Marseille, August 2009