Geophysical Research Abstracts
Vol. 15, EGU2013-3046, 2013
EGU General Assembly 2013

A CCS site survey in Taiwan

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The global warming gradually becomes a serious worldwide problem in recent years. It makes a great influence on the Earth's environment. Due to huge quantities and heat-capacity properties, CO_2 is known as the most important factor causing the global warming. How to reduce CO_2 has become an urgent subject of the environmental science. The CCS (CO_2 Capture and Storage)technology has been developed as a potential method to reduce CO_2. It includes the capture, convey and storage of CO_2. Three methods to seal up CO_2 are proposed: geological sequestration, ocean sequestration and mineral carbonation. Among them, the geological sequestration is mostly feasible. This paper describes a high-resolution reflection seismic survey at a CCS site in northern Taiwan. The site is near an electrical power plant along the coast and is planned to be a CCS experiment laboratory. The main objectives of the seismic survey are to verify the geologic interpretations of structure based on seismic and borehole data and to map, if possible, the reservoir pathways in which the CO_2 will be injected at 1000$\sim$1700 m depth, as well as providing a baseline for future seismic surveys and planning of drilling operations.
The size of the high-resolution method applied in this case is much smaller than that used in the oil exploration. The obtained high quality and high resolution data can resolve very fine structures. The survey parameters are 4m interval, 240 channels, 40Hz geophone, Minivibe source, 30 folds. The layer as thin as 4m is able to be detected even under a depth of 3000m. Such a high resolution allows us not only to estimate the structure, but also able to monitor the migration of CO_2 after storage.
Eight intersected 2D lines distributing evenly in a 3kmx3km area were acquired first to map the background structure pattern of the region. A 3D seismic survey was then followed at the future drilling site. This 3D survey has 30-fold with a bin size of 8 by 8 m using Minivib as a source with high frequencies over 100Hz. A surrounding type of data acquisition was carried out with the sources at outside and the receivers at the center. The subsurface coverage area was about 200 m x 200m.
The results of 2D and 3D surveys are quite consistent. Very fine layered structures with dipping angle of 3.5 degrees toward the inland direction are revealed. It means that if we inject CO_2 in the reservoir, it may migrate to Taiwan Strait. Some true amplitude variations with offsets are also examined. Limited data of lithologic properties of the reservoir layer are obtained . These information of structures and rock properties can also be used in the gas migration modeling.