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Monitoring of near surface CO2

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Underground gas storage and sequestration of carbon dioxide is one of the methods to reduce the input of antropogenic CO2 into the atmosphere and its greenhouse effect. Storage of CO2 is planned in depleted reservoirs, in aquifers and in salt caverns. Storage sites must have very small leakage rates to safely store the CO2 for centuries. Thus, a careful investigation and site selection is crucial. However, any leakage of CO2 to the surface is potentially dangerous for humans and environment. Therefore, instruments and systems for the detection of any CO2 escaping the storage sites and reaching the atmosphere have to be developed.
Systems to monitor gases in deep wells, groundwater and surface sediments for leaking CO2 are developed, tested and are contnuously improved. Our group is mainly analysing CO2 in shallow (down to 3 m) soil samples using automatically operating monitoring systems. The systems are equipped with sensors to measure CO2 (and other gases) concentrations and other environmental parameters (atmospheric pressure, ambient and soil temperatures, etc.). Data are measured in short intervals (minute to subminute), are stored locally and are transferred by telemetrical systems into the BGR laboratory (Weinlich et al., 2006). In addition to soil gases monitoring systems technical equipment is available for continuous underwater gas flow measurements. Several of those monitoring systems are installed in different areas like Czech Republic, Austria, Italy and Germany.
To detect any leaking gas from a sequestration site after CO2 injection, the naturally existing CO2 concentration (before injection) must be known. Thus, the natural CO2 baseline for each location must be determined prior to injection. Depending on the location or survey area, data collected so far have shown small to quite large variations of CO2 in soil gases. For some locations a considerable influence of meteorological conditions like atmospheric pressure and precipitaion on the data (Faber et al., 2008) has been found.
Technical systems, data from stations and some interpretations from results obtained in different areas will be presented.

Literature

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