



A comparison of near surface CO₂ monitoring methods and their applicability in the CCS context

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The detection, characterization and quantification of different gas species in the vicinity of the soil-atmosphere interface is considered as one key element of near surface monitoring related to CO₂ storage operations. From a broad range of available techniques (see e.g. Korre et al. 2011 and Rütters et al. 2013), three different methods have initially been selected in order to compare their applicability in the CCS context:

- The eddy covariance method which can compute CO₂ fluxes within the atmospheric boundary layer,
- CO₂ flux measurements between soil and atmosphere by means of accumulation chambers,
- Permanent CO₂ concentration measurements in the vadose zone of the soil column.

Additionally, basic atmospheric CO₂ concentration measurements were also included in this comparison since they might have a potential as monitoring alternative on a low-cost basis.

Results and lessons learned from practical field experiments were elaborated to point out advantages and disadvantages of the individual methods as well as their integration into an overall monitoring concept of CO₂ storage sites.

Field work has been carried out in different locations of Northern Germany, amongst others in the Altmark region, a formerly proposed CO₂ injection site for enhanced gas recovery (Schlömer et al. 2014).

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References:

Korre, A., Imrie, C.E., May, F., Beaubien, S.E., Vandermeijer, V., Persoglia, S., Golmen, L., Fabriol, H., Dixon, T., 2011. Quantification techniques for potential CO₂ leakage from geological storage sites. *Energy Proc.* 4, pp. 3413-3420.

Rütters, H., Möller, I., May, F., Flornes, K., Hladik, V., Arvanitis, A., Gülec, N., Bakiler, C., Dudu, A., Kucharic, L., Juhojuntti, N., Shogenova, A., Georgiev, G., 2013. State-of-the-art of monitoring methods to evaluate storage site performance. *CGS Europe Report D3.3.* 109 pp. <http://repository.cgseurope.net/eng/cgseurope/knowledge-repository/key-reports/Monitoring.aspx>

Schlömer, S., Möller, I., Furche, M., 2014. Baseline soil gas measurements as part of a monitoring concept above a projected CO₂ injection formation - A case study from Northern Germany. *Int. J. Greenhouse Gas Control*, Vol. 20, p. 57-72. <http://dx.doi.org/10.1016/j.ijggc.2013.10.028>.