D4.4 Base-line and monitoring plan, Danish site

The present report details near-surface gas geochemistry research conducted at the Voulund Agricultural research site (central Denmark), which was used as a natural analogue of the near-surface environment above a potential northern European CO2 geological storage site. This work measured soil gas concentrations and CO2 flux to define the range of natural baseline values and to better understand the influence of such factors as land-use, climate, and seasonality on their temporal and spatial variability. Baseline data will be needed at CCS locations so that site monitoring during the injection phase can be put in the context of natural variability and to help differentiate gas anomalies due to biogenic processes (such as CO2 produced via respiration in the soil) versus those that may result from a leak. The Voulund site was sampled at about 200 points over an area covering about 1.3 x 1.6 km on two separate occasions (fall of 2011 and spring of 2012), and three CO2 monitoring probes were deployed in the soil for two separate periods lasting about 2 to 4 months. Data is examined in terms of statistical and temporal distribution as a function of sampling season and land-use type. CO2 concentrations ranged from 0.5 to 6% during both campaigns, and showed consistently higher CO2 concentrations in agricultural and scrub-brush soils compared to values in forested soils. Monitoring probes clearly showed how CO2 concentrations can change significantly during the different seasons. Based on results and lessons learned during this research, suggestions are made regarding an appropriate monitoring plan for this type of environment.