



CO₂SINK –3rd year progress

Site characterization and start of drilling

In the third year for the European Commission funded CO₂SINK project - lead by the GeoForschungsZentrum Potsdam (GFZ) - a detailed site characterization and the approval for the deep drilling were completed. Interpretation of a new seismic survey has been completed giving increased confidence in the suitability of the site. The consortium has been expanded and members have pledged substantial additional funds to cover the costs of CO₂ supply and drilling costs. Significant additional funding was granted from German Federal Government to co-finance the CO₂ supply and drilling. Funds to inject a volume of 60,000 t CO₂ are available now.

Surface baseline survey: Results of two years monitoring

Monitoring of the microbial diversity and carbon dioxide flux in the surface area above the future gas store in Ketzin have been carried out since January 2005. The main objective of these investigations is to characterise the existing natural conditions before pumping CO₂ into the underground reservoir.



Fig. 1 Baseline survey: soil sampling for biological monitoring of the seasonal background variability

These values will serve as baseline data for comparison with performance measurements during and after the CO₂ injection procedure and will thus allow for the detection of possible changes during the process.

In general, all measured CO₂ fluxes are in the range of degassing rates of “normal” cultivated and forest soils between 1 $\mu\text{mol}/\text{m}^2\text{s}$ and 10 $\mu\text{mol}/\text{m}^2\text{s}$. Significantly varying flux rates have been measured depending on season and soil composition. The CO₂ flux was 5 to 10 times higher during the summer period in comparison to during the winter months.

Well Drilling

The contracts for drilling the CO₂SINK wells and associated operations (such as mud service, sampler service, casing etc.) were awarded at the end of 2006. The well casing has been procured and is already stored at the Ketzin site. The necessary planning documents have been filed with the mining authorities and approval for the drilling has now been obtained. The basic schedule of operations for the CO₂ injection is under preparation. The construction of the three drilling sites started in January 2007. Everything is now in place to allow drilling operations to proceed. Within CO₂SINK three wells will be drilled. One will serve as the injection well with the other two serving as observation wells. The depth of each well will be about 800 m.

It is planned to core parts of the cap rock (Weser Formation) and the complete reservoir rock (Stuttgart Formation) which will be investigated immediately to identify and characterize the expected reservoir section. The logging program will provide additional and necessary data about the formation properties as well as the condition of the wellbores. Furthermore, logging tools able to measure through the borehole casing will be deployed to provide baseline measurements prior to CO₂ injection.

After completion of each individual well, hydraulic tests will be performed to determine the injectivity of the selected storage rock and also the connectivity of the reservoir between the wells.



Fig. 2 Start of Drilling

This will provide geologists with sufficient information to update the geologic model as the basis for future numerical simulation studies to enhance our knowledge of the long term behaviour of the CO₂ storage.

Interpretation of surface seismic

The interpretation of the seismic survey carried out in 2006 has been completed and the results of this have been summarized in a paper to be published in *Geophysics*. The topography, thickness and depth of cap-rocks and reservoir rocks are clearly imaged. Seismic tools proved to be very sensitive in monitoring the faults of the geological structure as well as in tracing the residual gas distribution in an abandoned gas storage.

Faults whose existence was inferred from pressure measurements in bore holes during the period of gas storage at the site. Nevertheless they could not be imaged using the earlier 2D seismic. They are now clearly imaged from the new 3D data and indicate a central East-West running Central Graben Fault Zone (CGFZ)

above the anticline. The main faults show throws of up to 30 metres in the Jurassic section. These main faults are also clearly recognisable at the top Weser Formation, where the same magnitude of throw is observed. Despite low overall reflector continuity around the target reservoir, the faults can occasionally be traced down to the Stuttgart Formation about 1.5 km north of the planned CO₂ injection site. Some faint faults having throws of about 1.3-3 meters are seen on top of the Weser Formation nearer to the injection site but none are closer than 250 meters. However, such faults are expected to be sealed.

The current geological model predicts that the Stuttgart Formation will contain higher permeability sand channels 100-1000m wide and 5 – 30m thick. There are faint indications from maps of summed amplitude anomalies that such channels exist in the expected NE-SW direction. As one such anomaly is present at the injection site there is a good chance that a suitable reservoir sandstone will be encountered. Drilling and coring will resolve the current uncertainty as to the reservoir quality.

Construction of the injection facilities and CO₂ supply

The injection plant will be set up after the drilling operations are finished in summer 2007. The installation will take a few months which should enable injection to commence before autumn this year. Linde AG has been awarded a contract for the supply of CO₂. This will be highly pure (> 99%) and will come mostly from the Leuna refinery some 150km away. This CO₂ is a byproduct of H₂ production.

Spud in event

On 27th February members of the CO₂SINK consortium, guests from the local community and members of the press attended a spud in event at the site. Information about the project was presented and the drilling was symbolically initiated by State Secretary Wolfgang Krüger of the German Ministry of Economics. Despite the cold and showery weather there was a large turnout and the guests were sustained by goulash soup served by the Ketzin fire brigade. Photos of

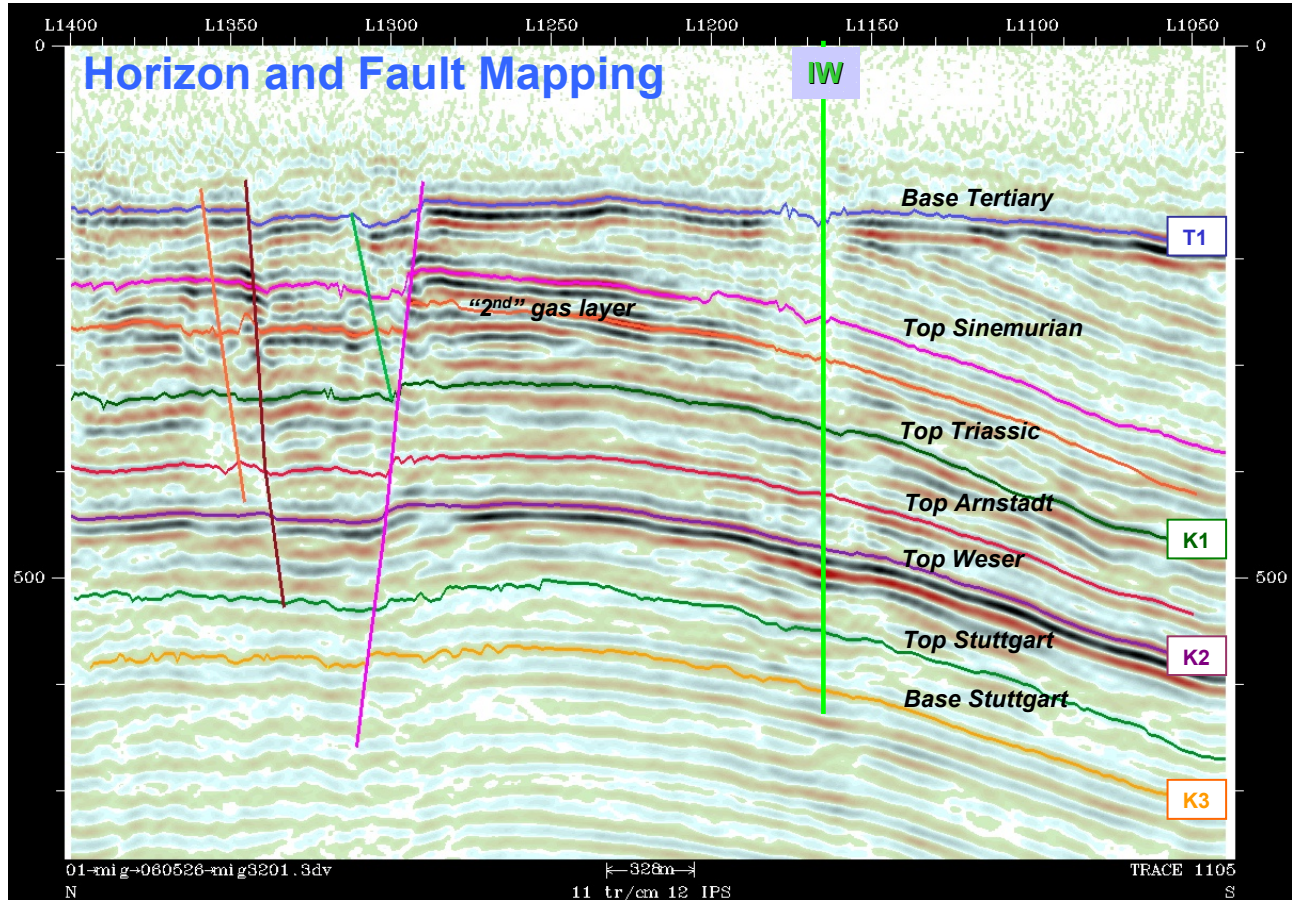


Fig.3 Seismic section with horizon and fault mapping (Juhlin et al., 2007).

Site information centre

The CO₂SINK project is setting up an information centre to the public. This centre will be set up at the injection site in February 2007 to be equipped with posters, videos and demonstration objects relating to the wider context of climate change mitigation and CO₂ storage. Visitors to the information centre will be welcome and prospective visitors should, for the time being, contact the CO₂SINK project office at GFZ Potsdam to register their interest in a site visit.

the event and the first cores are shown on the last page of this handout.

Stop press. At time of going to press the Consortium is able to announce the successful drilling of the first well which has been completed as an injection well. Adequate reservoir rock in the Stuttgart formation with sufficient permeability for CO₂ injection was encountered at the expected depths.



Fig 4 Spud in event – Ceremonial start of the drilling



Fig 4 Cores retrieved for investigation



Fig 6 Cores being packed for shipping to the laboratory for further investigation

617.7 metres →

Fig 7 Core sections from the first well



625 meters →

642.2meters →

661.7 metres →