Preliminary studies on potential rock samples for CCS in the Pannonian Basin, Hungary

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Introduction

Europe's efforts to cut GHG emissions, as well as the EU directives are major policy drivers in all the countries of the EU. In Hungary CCS is considered to be one of the main possibilities to reduce CO_2 emissions, mostly in the energy sector. That is why preliminary studies have been carried out by Eötvös Loránd Geophysical Institute (ELGI) in the frame of the EUGeoCapacity Consortium to assess the available storage potential. The results show that the main storage potential of Hungary is in deep saline aquifers (2000 Mt), and hydrocarbon reservoirs (400 Mt), therefore a potential site for CO_2 storage can be a regional saline aquifer in the northeastern part of the Great Hungarian Plain (Figure 1). This poster presents two major topics:

1) The results of our preliminary research summarizing the information collected from literature, well-log databases, and hydrocarbon exploration about the potential storage and sealing formations (Figure 2).

2) Our recently started lab experiments with samples from the provisional storage and sealing formations from a selected core sample.

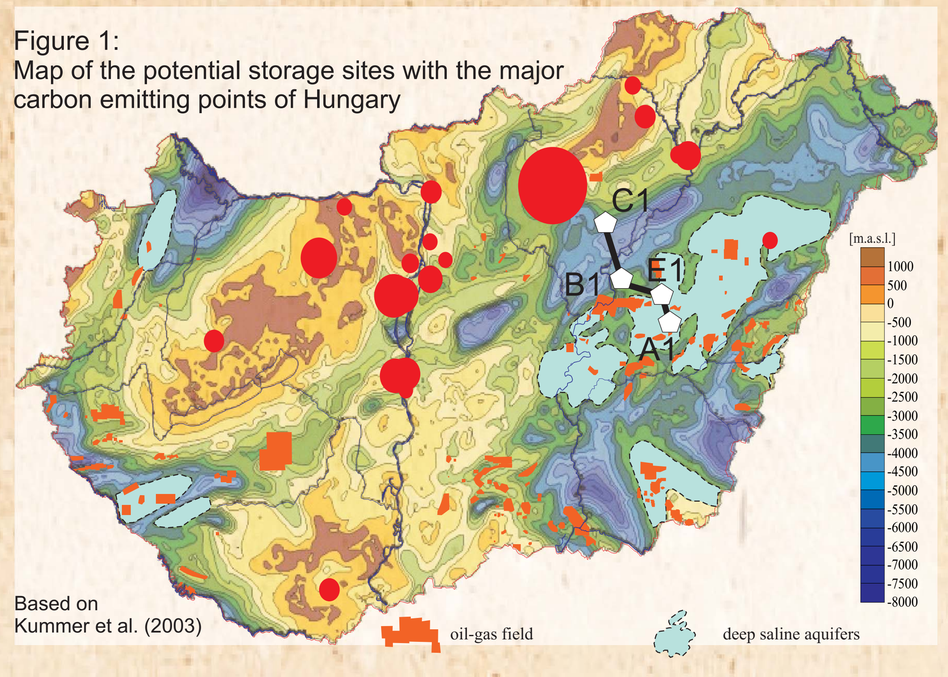

Figure 1:
Map of the potential storage sites with the major carbon emitting points of Hungary

Background

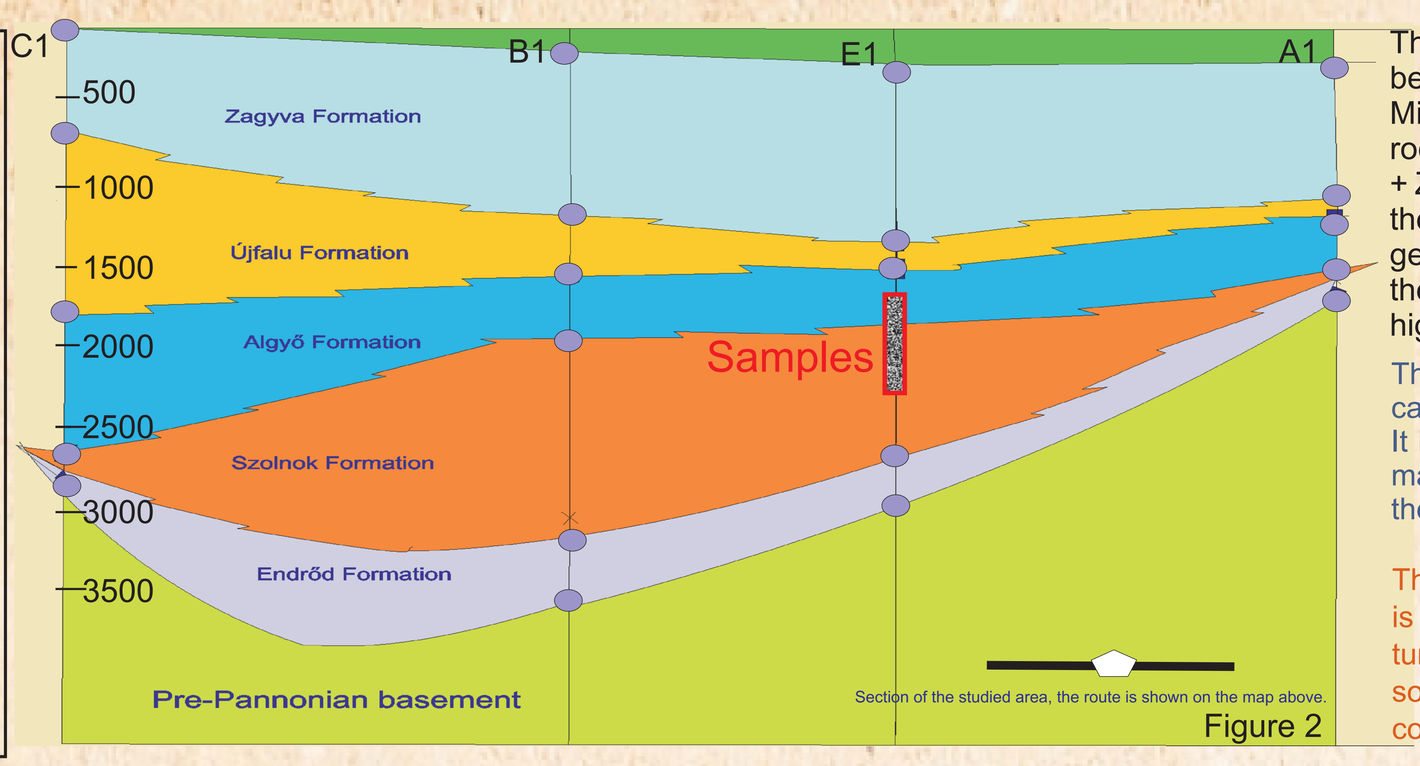

Figure 2

The Pannonian Basin is a system of several subbasins. Most of them had been filled by the Pannonian Sedimentary Sequence (starting from Middle Miocene). In our study area we have two pairs of potential reservoir-cap rock couples: Szolnok+ Algyő Formations (Lower Pannonian), and Újfalu + Zagyva Formations (Upper Pannonian). Previous studies suggest that the Lower Pannonian system is more suitable for storage because of generally better reservoir geological parameters. Moreover, the depth of the Lower Pannonian sedimentary sequences correspond to pressures high enough to maintain the supercritical state of CO_2.

The thickness of the Algyő Formation at some points of the Pannonian Basin can reach 900 m, and it provides a regional cover for the Szolnok Formation. It is an association of sublitoral and slope facieses of the delta, containing mainly siltstone and clay marl, but there are some blocks of sandstone. From the aspect of the storage process it is considered to be the sealing formation.

The thickness of the Szolnok Formation in the study area can reach 1000 m, it is composed mainly of sandstone, siltstone. This formation is a thin-layered, turbiditic series, the layers are sharply separated from each other and sometimes contain charred plant pieces. For sequestration purposes it is considered to be used for storage.

Experimental work

After we sampled the selected drilling cores (Figure 3), we have started preliminary tests with samples presenting the geological formations described above. These formations are potential CO2 storage and cap rocks, and by simulating realistic reservoir p-T-x conditions on these actual storage and cap rock pieces collected from the selected area we can monitor the processes in this potential future reservoir. To create a base for comparison, first we used SEM to observe the pores and the original morphology of cracked surfaces of the experimental materials (Figure 4), then we used thin sections to determine mineras and their modes.

Figure3

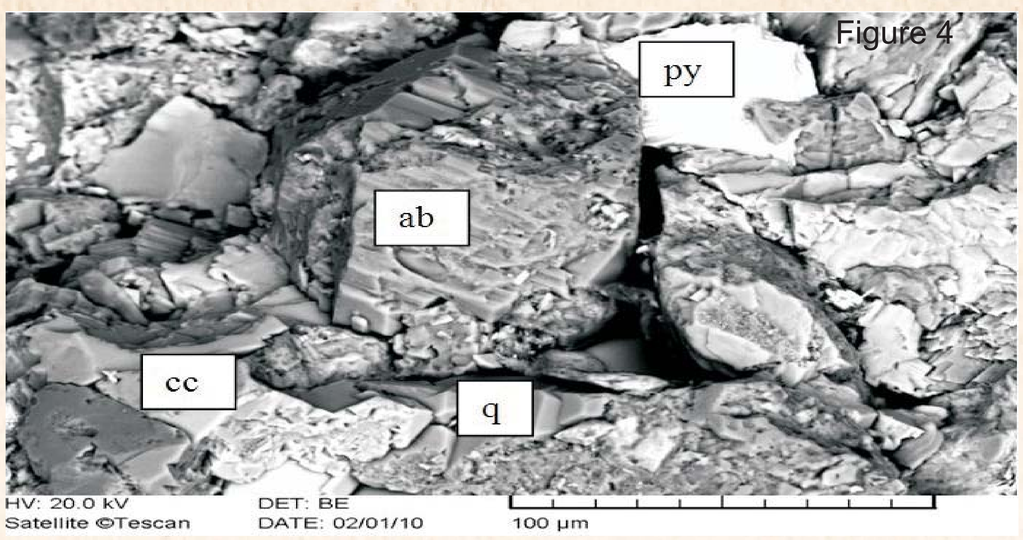

Figure 4

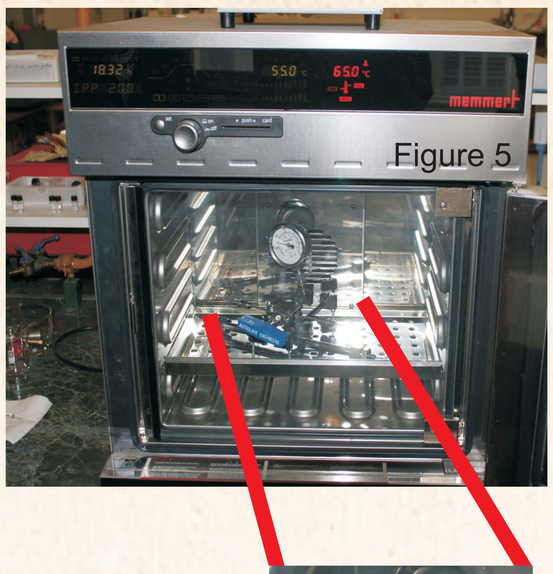

Figure 5

As a next step, we have started a test run with a selected rock samples collected from the core shown on the Figure 3. First the rocks were saturated, in vacuum, with brine similar in composition to that observed on the field (5% NaCl eq.), then we enclosed the saturate rock sample in an INOX, pressure resistant tube and flooded the system with supercritical carbon-dioxide keeping it at 150-170 bar and 55 °C. The experiment is running while this poster is being presented. (see Figure 5)

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