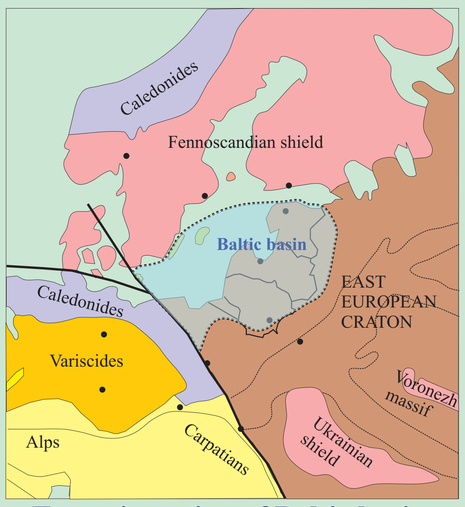
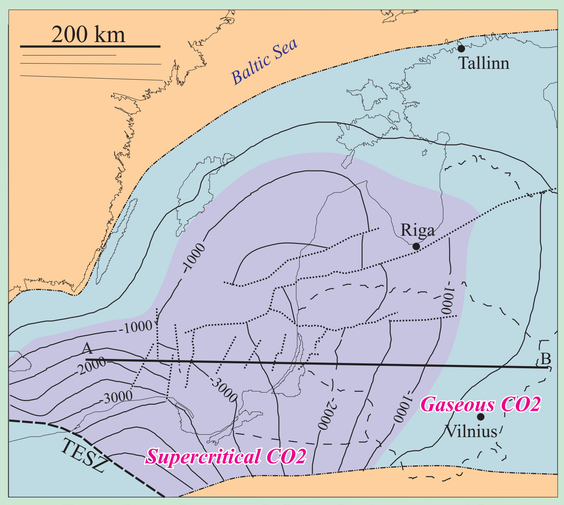
CO_2 storage potential of Lithuania

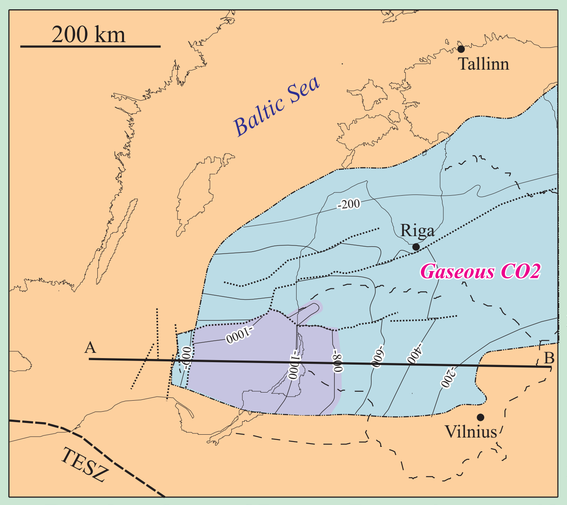
Rasa ŠLIAUPIENĖ, Saulius ŠLIAUPA, *Nature Research Cente, Lithuania*



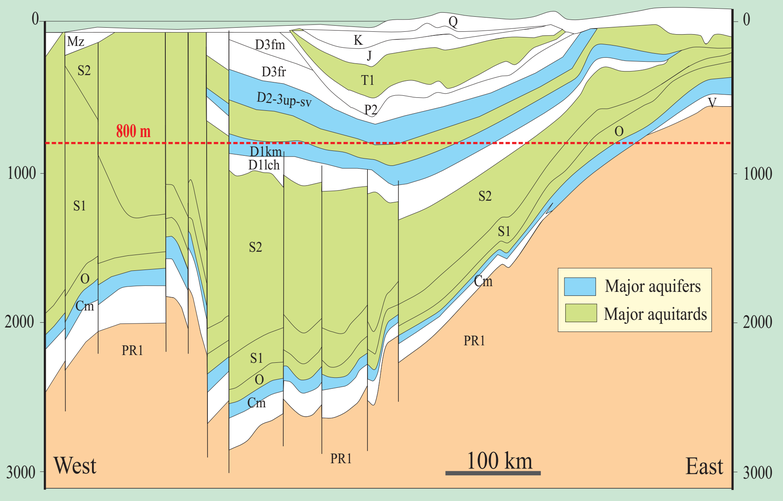
Tactonic setting of Baltic basin



Depths of top of Cambrian aquifer



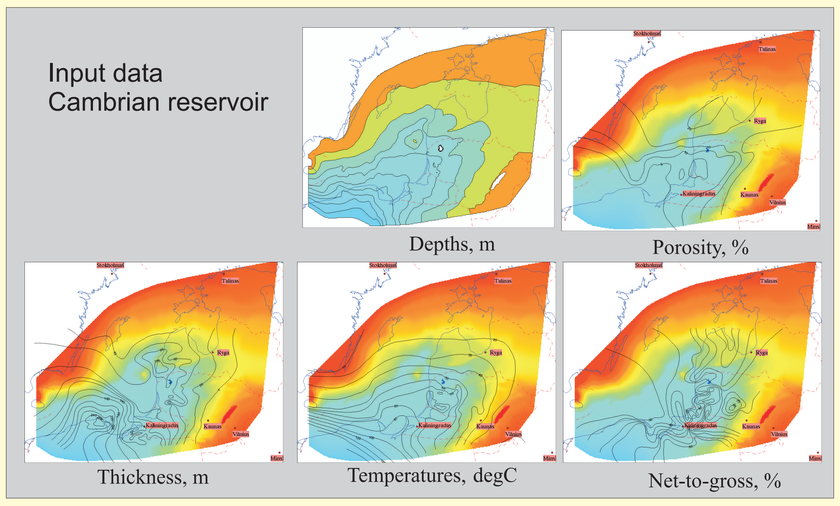
Depths of top of Lower Devonian aquifer



Geological corss-section across the Baltic basin

Lithuania is situated within the Baltic sedimentary basin (400*650 km). The basin comprises and is surrounded by a number of countries (Lithuania, Latvia, Estonia, Finland, Sweden, Denmark, Germany, Poland, Russia). Despite of the minor variations in the sediment stratigraphy and lithologies, the geological sequestration potential varies considerably across the basin that causes different CCS strategies to be considered for particular countries.

The Baltic basin is located in the west of East European Platform. All Phanerozoiz systems are present in the sedimentary pile. However, only two regional deep saline aquifers meet requirements for the safe CO2 storage (depths, seal, large volume of reservoir). The Cambrian and Lower Devonian aquifers are identified as potential reservoirs for geological sequestration of CO2.



Prospective deep saline aquifers

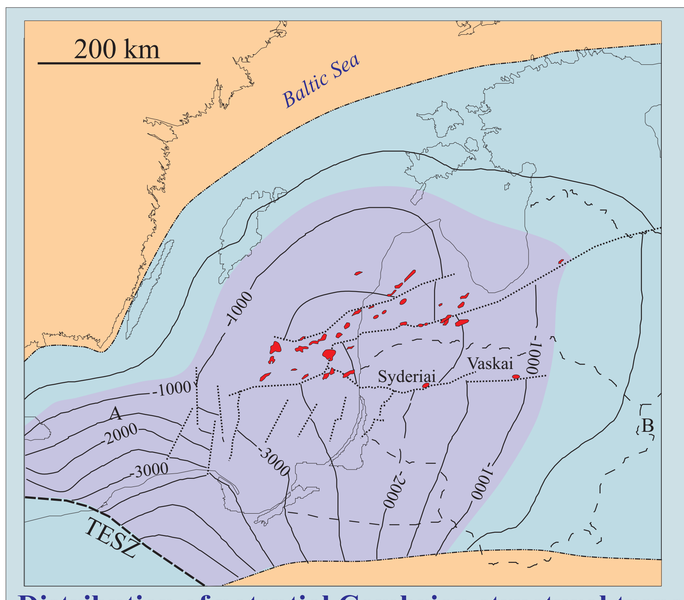
A number of deep saline aquifers are defined in the sedimentary cover of Lithuania. However, only two reservoirs, i.e. Cambrian and Lower Devonian match the basic requirements for the Co2 storage - large enough, P-T conditions, isolation from other aquifers.

The Cambrian reservoir is about 50 m thick and is composed of quartz sandstones. The porosity is in the range of 5-25%, decreasing to the west. P-T conditions are favorable for Co2 storage in west and central Lithuania and adjacent Baltic Sea area.

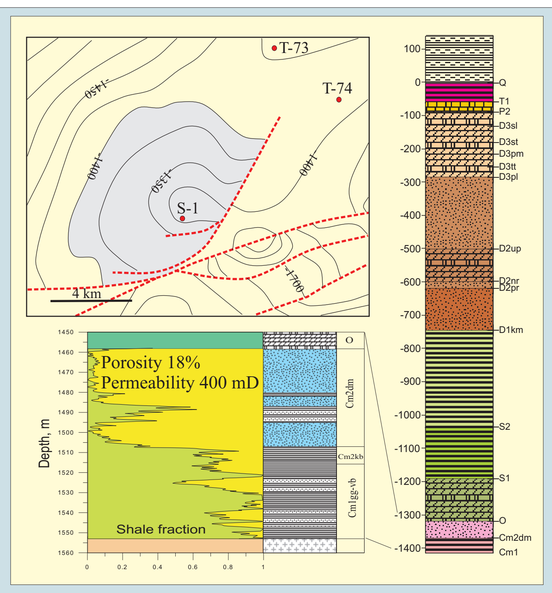
The Lower Devonian aquifer is composed of feldspar-quartz sandstones of up to 150 m thick. Sandstones are characterised by high porosity (average 25%) and permeability (2-4 Darcy). Due to shallower setting, P-T conditions are favourable for carbon dioxide storage in west Lithuania and adjacent Baltic Sea only.

Regional aquifer potential.

GIS systems were applied to assess the regional CO2 storage potential of Cm and D1km aquifers. The pore and solubility storage capacities were calculated that takes into account hydrostatic pressure, temperature, porosity, thickness, net-to-gross information. **Results**: Theoretical solubility trapping capacity of Cambrian reservoir is 4.4 Gt, Lower Devonian reservoir 12.9 Gt.



Distribution of potential Cambrian structural traps



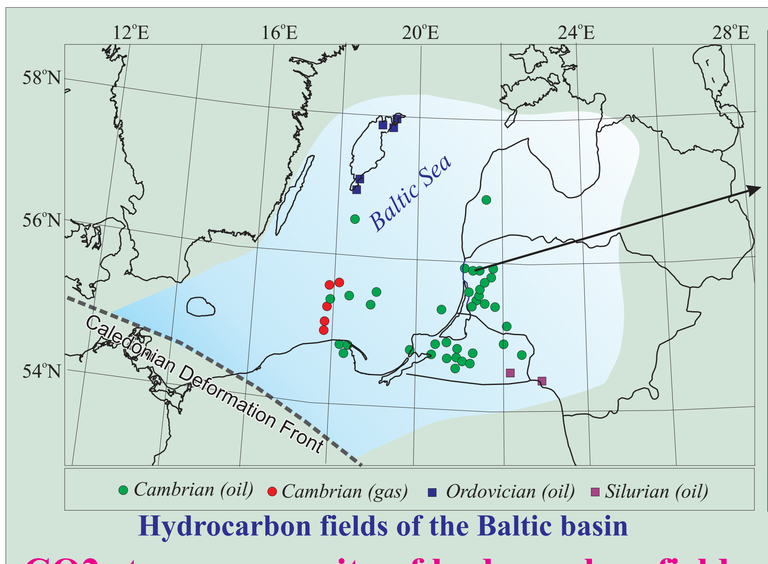
Syderiai Cambrian structure

Structural traps

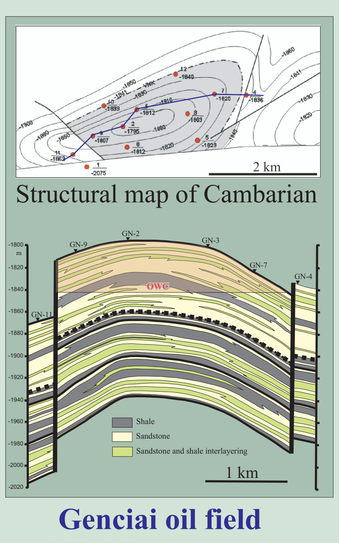
The short term storage option is application of hydrodynamic traps.

The potential traps are related to only Cambrian structures. Only two structures exceed 2 Mt CO2 storage potential in Lithuania (e.g. Syderiai and Vaskai) of investigated more than 100 structures. Both structures are related to largest Telsiai fault crossing the territory of north Lihtunaia from the west to the east. The uplifts were studied by seismic profiling and drilling. The Vaskai structure is essentially well studied. Yet, there are uncertainties related to the closure of the structure along the bounding Telsiai fault.

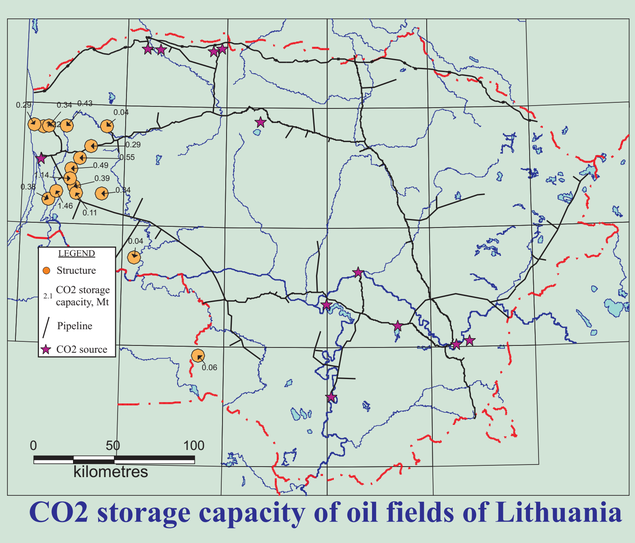
The Cambrian reservoir has rather simple architecture, the porosity varies from 15% to 22%, permeability is in the range of 100-1000 mD. The aquifer is sealed by thick Ordovician-Silurian shaly package.



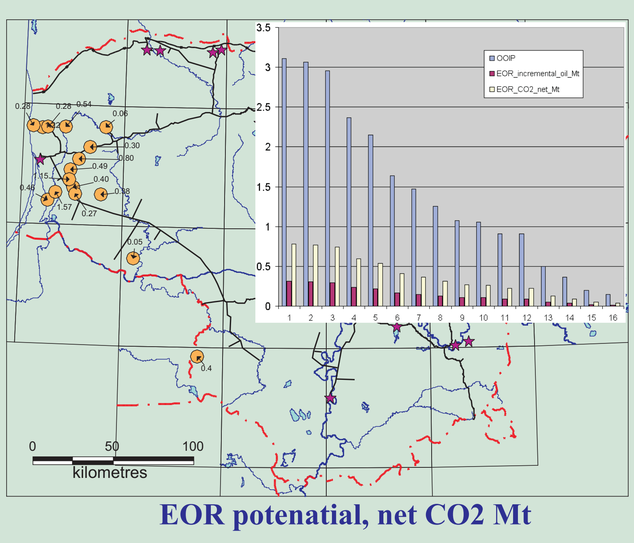
Hydrocarbon fields of the Baltic basin



Genciai oil field



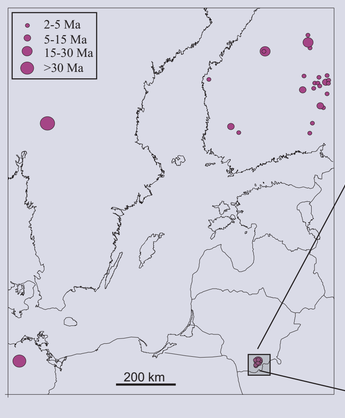
CO2 storage capacity of oil fields of Lithuania



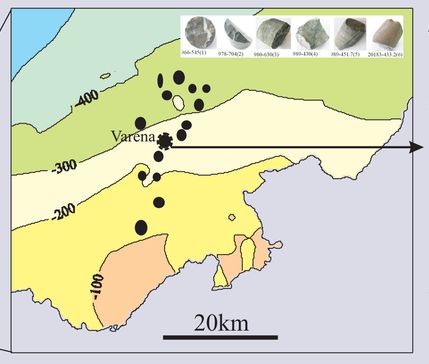
EOR potenatial, net CO2 Mt

CO_2 storage capacity of hydrocarbon fields and EOR prospects

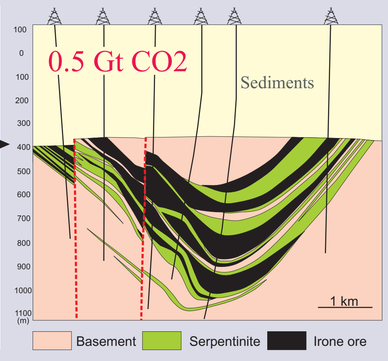
HC fields are distributed in the western part of the Baltic basin. They are mainly related to Cambrian Sandstone reservoir, some minor fields are discivered in Ordovician and Silurian organogenic build-ups. The production is declining, essentially in Lithuania. Depleted oil and gas fields may become an option in the near future, as most of the hydrocarbon fields reached the tail production stage. The CO_2 storage potential is evaluated 7.6 Mt in Lithuania, which is a low volume. Therefore this technique has only EOR potential.



Distribution of ultramafic rock formations



S.Lithuanian serpentinite Area



Varena Iron Ore

Mineral trapping

Mineral sequestration is considered as the only potential large-volume storage method in Lithuania. It is related to ultramafic bodies in the crystalline basement. It is important that they associate with iron ore, therefore can be used in a cascade way. In Lithuania the Co2 storage potential is evaluated 0.5-1 Gt CO_2.

CONCLUSIONS

Different storage technologies can be applied in Lithuania.

The short-term prospects are related to structural trapping in Cambrian saline aquifer. The onshore potential is about 30 Mt CO2 and is related to two structures.

Hydrocarbon fields are too small for development of CO2 storages in depleted HC fields. There is some potential for EOR, capacity of which is however miserable in terms of GHG emissions.

Some research should be focused on development of mineral trapping technology employing ultramafites (in particular, serpentinites) that have a considerable potential.