ABSTRACT

This thesis work presents a study on a fluid flow simulation in the Cornelia reservoir, located in the Adriatic Sea that hosts a deep saline aquifer that represents a possible CCS site. Deep saline formations are one of the most suitable storage sites due to the large potential capacity in all over the world.
The fate of carbon dioxide (CO_2) injected into a deep saline aquifer depends largely on the geological structure within the aquifer.
Cornelia reservoir is an anticline structure that represents an ideal structural trap for carbon dioxide sequestration as it limits lateral spreading of CO_2 ; in this study 3 fluid flow simulation scenarios were performed to evaluate this structure for a possible CCS site.

Matlab and, in particular, Matlab Reservoir Simulation Toolbox (*MRST*), allowed us to perform fluid flow simulation and quantify the total injected volume and the leaked CO_2 from the structure.
Simulation scenarios are performed to investigate the effects of well number, location and spacing. Scenarios are ranked by volume of CO_2 stored, pressure increase due to injection and CO_2 immobilized by dissolution or residual trapping

Our simulation are based on vertically-integrated modelling that adopt a vertical equilibrium (VE) assumption, which states that due to strong buoyancy effect, fluids can be assumed to have essentially hydrostatic pressure distributions in the vertical direction.

The results obtained highlight that Cornelia anticline structure is suitable to store CO_2 in particular the top-structure, where CO_2 migrate driven by buoyancy effect. CO_2 leakage is less than 1% when injection takes place in that part of the reservoir, and the amount of storable CO_2 goes up to 24 Mt.