

1. Research activity

Characterization and CO₂ storage capacity estimation of potential structures in Peri-Adriatic Basin.

Objectives

General objective

Estimation of the potential CO₂ storage capacity of the external compressive structures of the central Adriatic Basin (between Pesaro and Vasto) through an evaluation based on the detailed study of some of these structures.

Specific objective

Estimation of the effective CO₂ storage capacity of potential structural traps selected in the onshore and offshore of the Apennine chain of Abruzzo and Marche regions, through the application of the main existing assessment procedures based on seismic interpretation, 3D modeling and evaluation of the petrophysical parameters of the formations involved. The latter will be obtained by analyzing well data and sampling on outcropping analogs.

The aim of my research activity is the characterization of potential structural traps and the estimation of their CO₂ storage capacity in the Peri-Adriatic Basin, while the onshore and offshore of Marche and Abruzzo regions. In the field of the mitigation action to a low-carbon energetic system, the CCS (Carbon Capture and Storage) technology has a great contribution. This process consists in the capture, the compression and the transport of CO₂, generated by the large power plants, and the injection in deep geological formations able to host it (IPCC 2005). Therefore, at the

base of any CCS project there is the research of potential sites and the calculation of the CO₂ volume that can be hosted.

In Italy, the domain of the external Apennines and the Adriatic Sea have already been identified by several projects as potential areas for storage. The national research activities related to CCS have led to the identification of two potential reservoirs, such as calcareous and sandy formations, both very widespread in Italy both onshore and offshore.

The first year will be dedicated to the construction of a database based on existing data to reconstruct the structural setting of the central Adriatic basin area, both onshore and offshore. For this work the database will be built using software with an available academic license (Petrel, Move) that will allow the management of a high number of seismic lines and their interpretation.

At the same time, according to the bibliographic study, the criteria to be used for the classification of the structures and for the selection of the most representative will be defined.

The activities described will be supported by a specific preparation that will be acquired through the attendance of dedicated courses, some provided within the University itself, others specific for the acquisition of skills for software management. A first list includes: Geology of oil, Geological storage, Analysis of reservoirs (Courses Sapienza), "Petrel Reservoir Engineering" of Schlumberger. These courses will allow you to acquire skills in combining three-dimensional models to well data and physical properties of rocks, and will also help in upscaling, volume calculation and modeling in the presence of fluids.

The second year will be dedicated to the construction of 3D models of the chosen structures and their implementation. A part of this period will be spent at the *Zagreb University - Faculty of Mining, Geology and Petroleum Engineering*, where the group of Prof. Bruno Saftić deals with similar research having as its object the eastern side of the same Adriatic basin.

Where the available data will not be enough, during this year it will also try to directly acquire some petrophysical values by direct analysis of superficial analogs. Samples of rocks belonging to outcropping formations like those buried in the Adriatic, will be

subjected to petrophysical tests (porosity, permeability, shear strength, etc.). Among these at the *EOST (School and Observatory of Earth Science - Strasbourg University)*, tests will be carried out on gas permeability and specifically on CO₂. These analyzes are aimed at obtaining direct physical data, which will be used to determine the parameters for possible onshore and / or offshore structural traps.

During the last year of the doctorate three-dimensional models will be completed and the work will be focused on the evaluation of the calculation equations available in the literature. For each structure studied, these equations will be applied, and their effectiveness will be evaluated. In particular, the proposed coefficients will be evaluated and, if necessary, new ones will be indicated according to the results obtained (for example, the factor of induced seismicity will be evaluated). The identified sites will therefore be representative of groups of similar structures present within the basin. This will also provide a theoretical assessment of total capacity. Finally, for the structures studied in detail, the operational aspects will be evaluated, such as the location of CO₂ sources, the presence of infrastructures, regulatory and logistical limits to better define their practical and specific capacity, indicating which of the selected structures represents the most advantages as an industrial storage site.

There are many institutions and projects aimed at characterizing sites and estimating CO₂ storage potential in Europe and the world (ENOS, GeoCapacity, CGS Europe, Enel, ENI and many others). In Italy there are still no active industrial projects, but since this technology is a valuable aid to support the transition from fossil energy sources to other types of energy sources, as also desired by the EU, it is important to have a more precise idea of these estimates. The reaching of this project will represent one of the first real storage capacity estimation in the Adriatic Basin, while there are only theoretical storage capacities but don't exist values of matched capacities. This could be a starter point for the development of future CCS project in Italy and the results could be part in the *European CO₂ Geological Storage Atlas*, a developing database on the storage capacities in Europe.

2. Research products

- a) Publications (ISI journals)
- b) Publications (NON ISI journals)
- c) Manuscripts (submitted, in press)
- d) Abstracts