

Title: *Facies and Architecture of Sedimentary Rocks for Carbon Sequestration, Storage and Utilization*

Name of the supervisor: **Cirilli Simonetta**

Fieldwork: Facies analysis, distribution, vertical and lateral variations of sedimentary intervals.

Laboratory activity: Laboratory analyses will be performed on representative samples. These will be analysed by several approaches such as petrography, mineralogy and geochemistry, by X-ray Computed Tomography (XRCT) analysis, X-ray Powder Diffraction (XRPD) analysis, synchrotron X-ray, X-ray phase-contrast microtomography (μ -CT), among others.

Prerequisites: It is preferred (but not mandatory) have been attended the course on Sedimentary Petrography.

Brief description of the planned research

The potential storage of CO₂ into geological formations fundamentally depends on their permeability and on chemical and mineralogical composition. Sedimentary rocks may be frequently characterized by high values of porosity and permeability but these values can abruptly change during the diagenetic history. Any tool that can predict the final distribution of the most important textural parameters, chemical and mineralogical composition will increase the success of a CCS project. Furthermore, the future implementing of this technology on a large scale, needs the confirmation of its viability regarding injectivity, containment and long-term safety for both humans and environment. CO₂–water–rock interactions play an important role in assessing this viability as the reactivity is mostly driven by the mineralogy of the hosting rocks. Additionally, CO₂ utilization, in which CO₂ is converted by catalysis into more valuable products such as carbon monoxide, formic acid, methanol, methane, ethylene, fuels, carboxylic acids, and polymers could play a valuable complementary role in the strategy to reduce carbon dioxide emissions. For this aspect also detailed study on the chemical composition in order to detect catalyst elements for chemical conversion of CO₂ will be performed.

