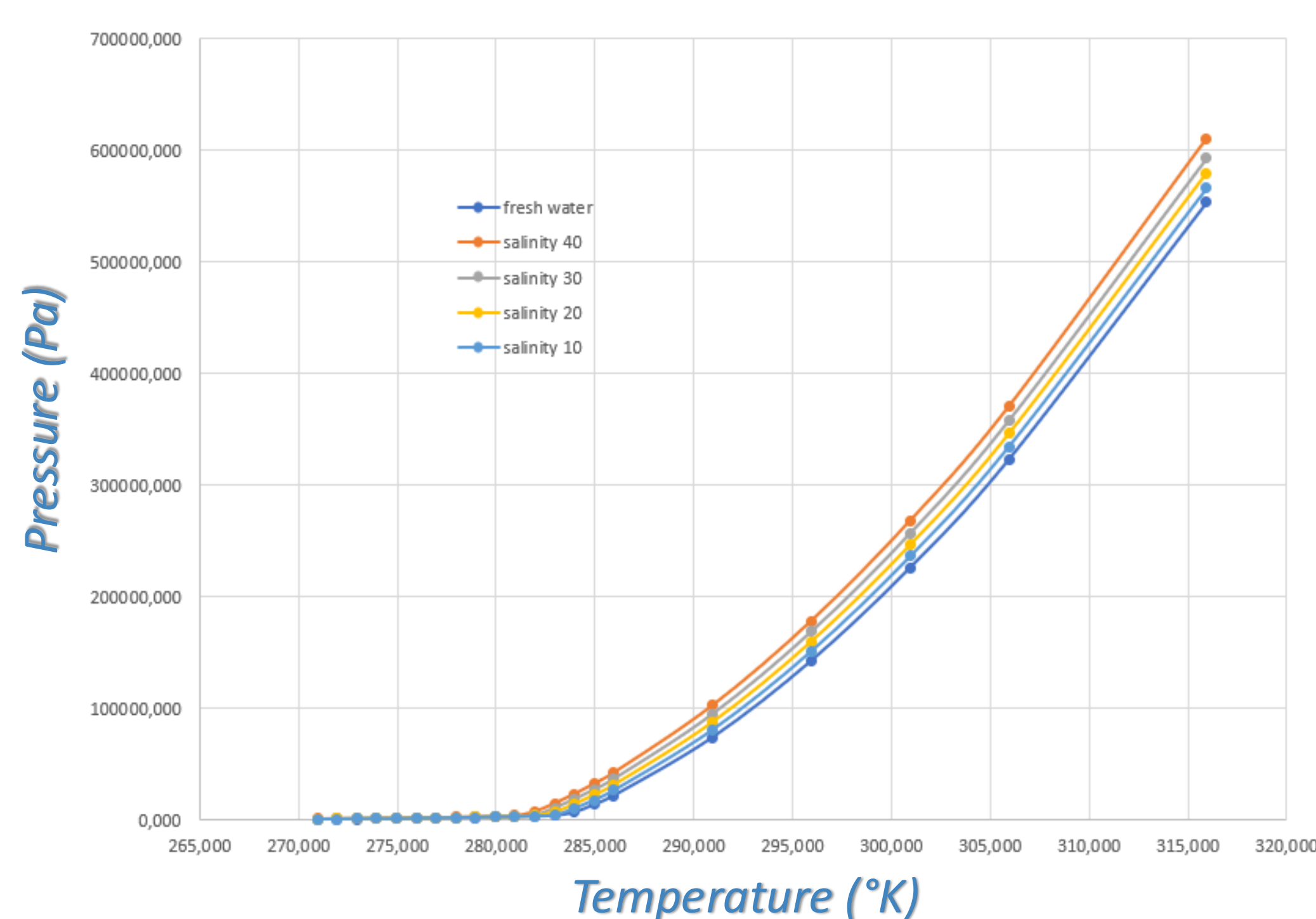


Reliable long-term CO₂ storage as clathrate hydrates in seawater and marine sediments: the CO₂-RESTO project

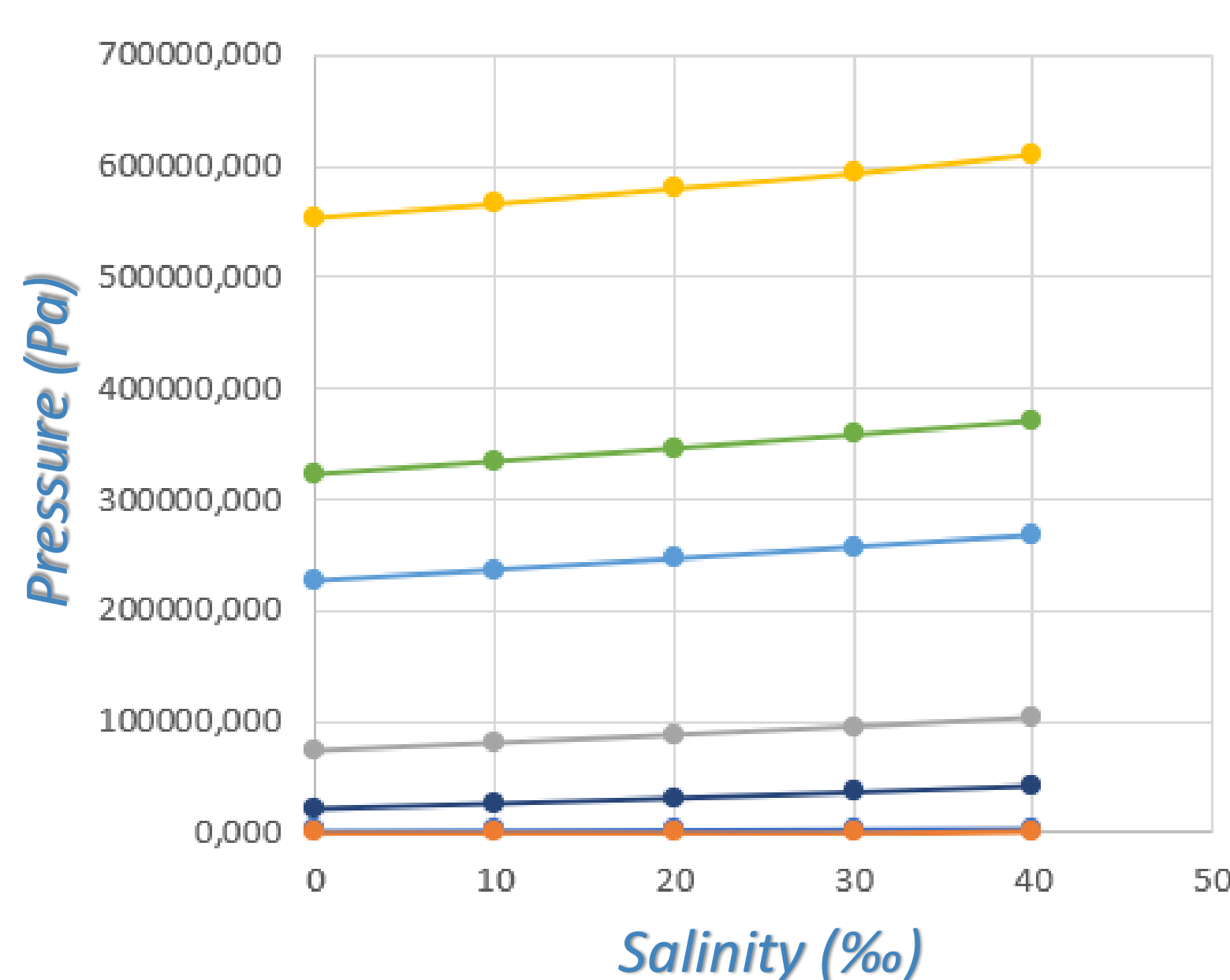
Tinivella U., Giustiniani M., Castellani B., Giovannetti R., Zannotti M., Nicolini A. & Rossi F.

Carbon capture and storage refers to the separation and capture of carbon dioxide (CO₂) from anthropogenic emissions and its permanent storage. Recently, the possibility of storing CO₂ as clathrate hydrate (CH) has been investigated. CO₂ storage as CH is supported by the millennial stable occurrence of natural gas hydrates in marine sediments and permafrost that have been extensively studied. This is an important starting point for the feasibility of the hydrate-based CO₂ storage solution. In this context, the CO₂RESTO project aims to develop a technological solution for CO₂ sequestration in the form of CH both in seawater and under the seafloor.

OBJECTIVE 1: Theoretical survey of the approaches for CO ₂ storage as clathrate hydrates	→	WHO: OGS, UNICAM, UNIPG HOW: Theoretical studies RESOURCES: Personnel
OBJECTIVE 2: In-lab reproduction of CO ₂ CH in water and determination of the effect of chemical and thermodynamic parameters	→	WHO: UNIPG, UNICAM HOW: Experimental studies on lab apparatuses RESOURCES: Personnel, lab facilities, lab materials
OBJECTIVE 3: In-lab reproduction of CO ₂ CH in under-seafloor sediments and determination of the effect of chemical and thermodynamic parameters	→	WHO: UNIPG, UNICAM HOW: Experimental studies on lab apparatuses RESOURCES: Personnel, lab facilities, lab materials, consulting services for mechanical properties tests
OBJECTIVE 4: Theoretical model applicable on CO ₂ CH formations and energy/environmental evaluations on the proposed technological solution	→	WHO: UNIPG, OGS, UNICAM HOW: Theoretical studies, design processes, lab tests RESOURCES: Personnel, new equipment, lab materials
OBJECTIVE 5: Management and Dissemination	→	WHO: UNIPG, OGS, UNICAM HOW: Theoretical studies RESOURCES: Personnel, Plans



CO₂ hydrate stability versus salinity by using HYDOFF code



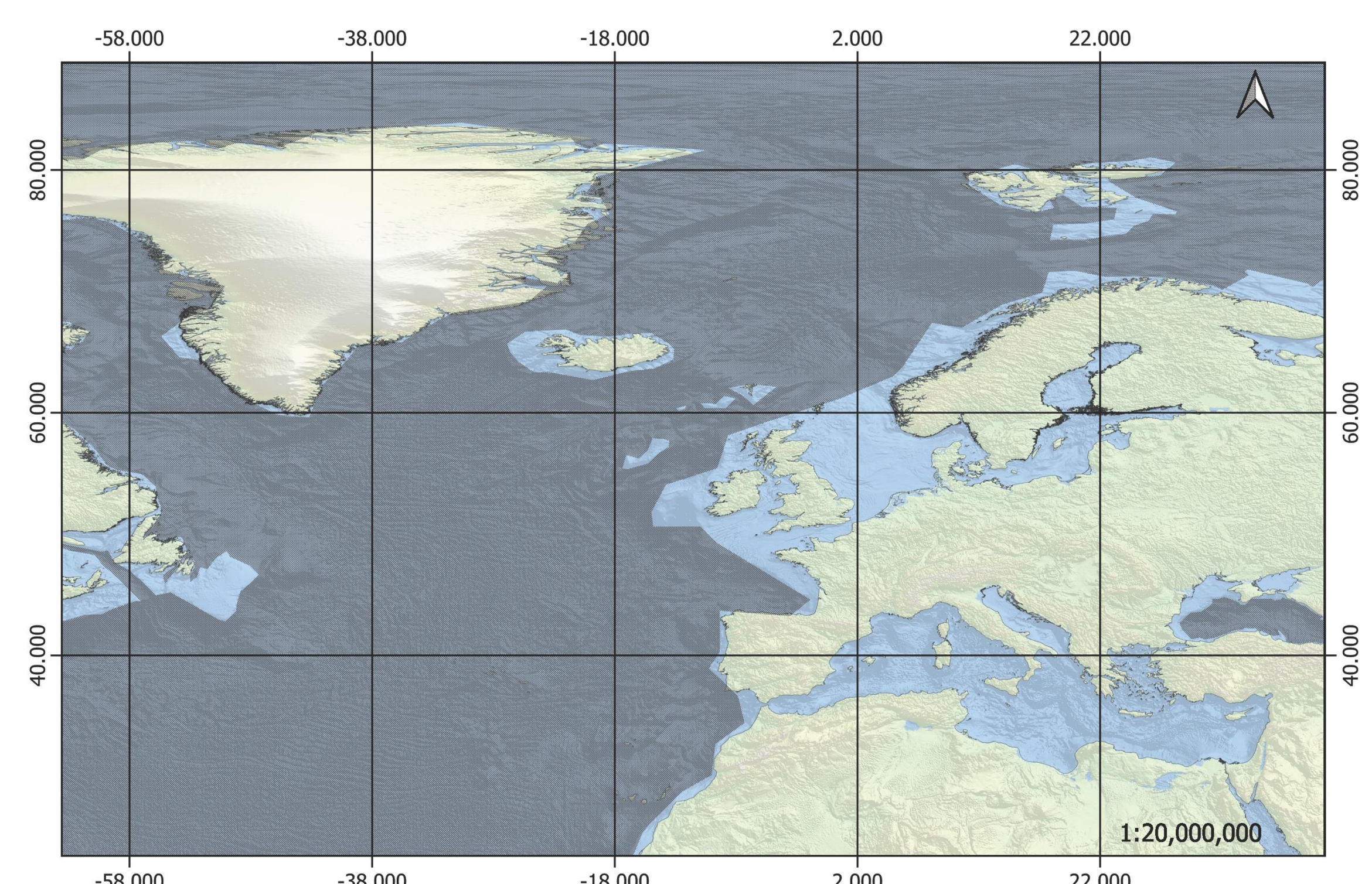
CO₂ hydrate stability versus salinity at different temperatures (°K)

The expected results will be:

- New knowledge on the CO₂ CH stability in natural conditions;
- Development of an efficient technological solution for CO₂ injection in the sediment.

The following activities are planned to achieve this goal:

- Theoretical survey of the approaches for CO₂ storage as clathrate hydrates;
- Laboratory reproduction of CO₂ CH in water and determination of the influence of chemical and thermodynamic parameters;
- Laboratory reproduction of CO₂ CH in under-seafloor sediments and determination of the influence of chemical and thermodynamic parameters;
- Theoretical model applicable on CO₂ CH formations and energy/environmental evaluations on the proposed technological solution.



The black dots indicate the area in which CO₂ hydrate is stable