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Complex hydrates in the Sea of Marmara: Formation mechanisms, kinetic and thermodynamic property study from Experiments and Modelling

Summary :

Marine hydrate deposits represent one of the largest methane reservoirs on Earth. They are very sensitive to changes in chemical flux, as well as the temperature and pressure of the seafloor.

Recent studies carried out in the Sea of Marmara (SoM), along the submerged part of the North Anatolian Fault (NFA), show that one of the segments crosses a hydrate deposit sourced by thermogenic gas-charged bodies located in the seismogenic zone. These hydrates are peculiar because they contain a large number of molecules other than methane (non-methane molecules such as heavier hydrocarbons and carbon dioxide) accounting for between 12-17%-mol. As a result, their formation mechanism is a complex phenomenon that considerably changes (1) the chemical composition and thermodynamic properties of the source gases, and (2) the mechanical properties of the sediment near the fault segment. To date, detailed studies on the formation process and the stability field of such complex hydrates are lacking, especially the formation mechanisms and the kinetics.

This PhD fellowship proposes to study the physicochemical properties of the Marmara hydrate deposit, by applying an integrated approach combining laboratory experiments and modelling. The results will allow a better understanding of their formation mechanisms, their stability field, their gas storage capacity and the heat required to destabilize them.

Key-words:

Complex gas hydrates, formation mechanisms, high-pressure experiments, kinetics, modelling, stability field, thermodynamics

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