

PhD opportunity in Ifremer, Brest, FRANCE (October 2016-October 2019)

Study of the mechanical behaviour of hydrate-bearing clayey sediments based on in situ measurements.

Background and aim:

Gas hydrates in marine sediments are considered to be a potent source of greenhouse gases but also an unconventional energy resource. Central to both of these topics is the understanding and mitigation of the consequences of the destabilisation of these solid compounds in response to changes in pressure and temperature conditions. Their destabilisation is indeed recognised as a factor increasing the susceptibility of submarine slopes to deform and ultimately to fail. Ifremer has conducted several cruises aiming at assessing such a geohazard in the Gulf of Guinea and in the Black Sea based on the recovery of sediment cores and in situ acoustic and mechanical measurements. The study here proposed aims at fully exploiting the dataset thus obtained to answer the question of how do the quantity and distribution pattern of naturally occurring gas hydrates influence the consolidation, permeability and strength properties of clayey sediments. Answering this question with both engineering and geological implications will rely on the following three-phase research approach:

Phase 1: Building petrophysical models by integrating density, mineralogical, geochemical and in situ acoustic measurements in order to determine gas hydrate concentrations in sediments

Phase 2: Combining in situ acoustic and mechanical measurements to develop a classification system distinguishing clayey sediments with varying gas hydrate concentrations and morphologies.

Phase 3: Running triaxial tests on synthetic gas hydrate-bearing clayey sediments in order to refine empirical relationships classically used to derive geotechnical parameters from in situ mechanical measurements.

This last phase will be carried out in collaboration with partners of the project in the Laboratoire National des Ponts et Chaussées (Paris Tech) with the final aim of developing constitutive laws accounting for the behaviour of sediments with various hydrate contents.

Requirements:

For this 3 year project we are looking for an enthusiastic PhD candidate with a Master degree in geosciences, geotechnics or civil engineering and good knowledge/experience in soil testing. Applicants with skills in scientific computing, geophysics, thermodynamics and marine geology are especially encouraged to apply.

Interested candidates are invited to submit their resume with a cover letter motivating their interest in the study to Sebastien Garziglia (sebastien.garziglia@ifremer.fr) before 31 May 2016.