**PhD project**

## GEOMORPHOLOGICAL EVOLUTION OF NORTH EAST GREENLAND

*Summary: We seek a dynamic and motivated PhD student to investigate the Cenozoic landscape dynamics of East Greenland by coupling field work, thermochronological dating and numerical modelling.*

*Advisors:* Kerry Gallagher, Philippe Steer (University Rennes 1, France), David Egholm (Aarhus University, Denmark) and CASP.

*Rationale*: The fjords of East Greenland are the widest and more pronounced fjords worldwide. Because fjords are a unequivocal morphology associated to ice erosion, they represent a fantastic archive to understand the co-evolution of ice, landscape and climate during the Cenozoic. Indeed, characterizing and dating the shaping of these fjords and of other morphological markers provides unique insights into both the geological evoltion of the East Greenland margin and the dynamics of the Greenland ice-sheet and its growth over time. If the age of the ice-sheet was previously inferred ranging from about 5 to 45 million years, a recent publication with new data from our group strongly supports an onset of ice at 30 million years. This timing coincides with a major worldwide climatic cooling event at to the Eocene-Oligocene transition. However, the morphology of these fjords and the amplitude of their incision since this cooling event vary spatially in a pattern that is not yet understood. Are these variations associated to the initial extent of the ice-sheet or to its dynamics, to the initial pre-glacial topography, to lithological or geomorphological variations? Answering these questions are fundamental to characterize the state and extent of the ice-sheet throughout the Cenozoic and to better constrain paleo-oceanographic –climatic and -tectonic models on the regional to global scales.

*Objectives:* To explore these issues, the PhD candidate is expected to:

1. undertake thermochronological analyses of existing and newly collected bedrock and detrital samples from East Greenland, using both apatite fission track analysis and (U-Th)/He dating. This may involve at least one field season to collect samples in Greenland in association with the Cambridge Arctic Shelf Program (CASP), based in Cambridge England.

2. development and application of modelling approaches to infer the temperature-time histories of the sampled rocks;

3. make a quantitative analysis of East Greenland landscape geomorphology to characterize the links between fjord morphology, exhumation history, climate change, and other environmental factors;

4. investigate the evolution of fjords and landscapes on the border of a dynamic ice-sheet using the iSOSIA landscape evolution numerical model. This will involve some time working with colleagures from the University of Aarhus, Denmark.

*Candidate Profile:* The project will involve a combination of modelling, model development, laboratory analyses, and fieldwork. Consequently, we are looking for numerate candidates with a strong background in earth sciences/physics and ideally experience in numerical simumation. Some knowledge of thermochronology and geomorphology is also desirable. Although prior knowledge of French is not mandatory, spoken and written English proficiency is needed. Visits to other institutions and field trips in abroad will form a key part of the project.

*To Apply/Practical Information:* The position will last 3 years and start in September/October 2017, will be hosted by the Geosciences Rennes department of the University of Rennes 1. **To apply, please contact Philippe Steer** (philippe.steer@univ-rennes1.fr) **or Kerry Gallagher** (kerry.gallagher@univ-rennes1.fr) **with your CV and a letter of motivation.**