

DIABASE

Disclosing the Antarctic basement by sampling ice field moraines

DURATION

15/01/2017 - 15/04/2019

BUDGET

69.117 €

PROJECT DESCRIPTION

A thick layer of ice currently hides from view and samples about 98% of the basement lithologies that compose the Antarctic continent. Only a few outcrops are exposed and, albeit intensively studied, only provide a scarce and disparate window into the Antarctic geological history. Understanding this history is however of primary importance to address not only fundamental problems of modern geosciences (such as the mechanisms of continental crust formation, the complementary depletion of the mantle and their evolution in the early Earth), but also more local aspects such as the geological processes that contributed to build the Antarctic continent.

In this project, we propose to sample the circular moraines encountered during previous expeditions in the Nansen Blue Ice Field. In blue ice fields, the ice movement has a vertical component because of obstacles blocking the gravity-driven flow. As such, blue ice fields of Antarctica have yielded more than 40,000 meteorites to date, all concentrated by this specific movement. During previous Belgian-Japanese expeditions, several unexpected moraine fields, which most likely sampled the underlying rock formation, have been observed within the Nansen Blue Ice. Even though brought-up blocks and boulders that constitute the bulk of these moraines are no longer in place, they represent the only basement samples retrievable from this section of the Antarctic continent (Sør Rondane area). Among these moraine samples, several types of sedimentary, metamorphic, acidic and basaltic igneous rocks have been observed so far. After a preliminary petrological examination of the samples recovered from these moraines, the DIABASE project will study the zircons recovered from these moraine lithologies. We plan to perform detailed and extensive U-Pb dating using the SHRIMP instrument at the NIPR partner institute, as commonly done for detrital zircons, complemented by O isotopes as well as Hf isotopic analyses using LA-MC-ICP-MS. In a second phase, after having been familiarized with the lithologies already collected from previous field campaigns in the Sør Rondane, a new sample collect will be organized to complete the existing sampling. This highly novel approach of moraine sampling will provide new insights on the hidden deep basement of the Sør Rondane area of East Antarctica, possibly unveiling peaks in the geological activity of the Southern continent, and shedding light on tectonic processes not detectable in the few available outcrops within the area.

This project constitutes an exploratory investigation of the moraines in the Nansen Blue Ice Field in order to evaluate their potential in improving our current understanding of the hidden Antarctic basement. Concerning the expected impact of the project, first, this proposal will lead to the identification, characterization and interpretation of past volcanic/magmatic events that affected the Antarctic continental lithosphere and thus, definitely broaden our knowledge of the Antarctic crust hidden underneath the ice. Second, from a methodological point of view, the results of our study will provide a direct evaluation of the potential of moraines located in blue ice fields to sample the rock basement in regions covered by ice caps or inlandis. Finally, the impact of the results will outreach the scope of geological sciences and apply to glaciology. Indeed, the comparison of the circular moraines samples investigated in this project with the bedrock samples from the Sør Rondane Mountains will help to characterize and better understand the ice flow in that area, where it is known to be particularly complicated. The finished product will be published as peer-reviewed articles, and results will be presented in scientific conferences. Moreover, science popularization will be expected in broad audience conferences, in order to promote geosciences in Antarctica.



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