Is the Mosselhalvoya thrust (Ny Friesland) a major boundary between different terranes of the Caledonian basement of Svalbard?

The Svalbard Archipelago is a group of islands, the largest of which is Spitsbergen, located in the Arctic Ocean, north of Norway and east of Greenland. Due to its location in the polar climate zone, the Svalbard Archipelago is characterized by specific landscape, which is dominated by mountains and glaciers. As a result of the limited flora's presence, most of the area of Svalbard is sparsely covered with tundra, which makes it very attractive for geological research.

The geological structure of the Svalbard Archipelago is complicated. The rocks cropping out here are of Proterozoic up to Quaternary age. Metamorphic, igneous as well as sedimentary rocks occur on Svalbard. Numerous episodes of tectonic and volcanic activity as well as periods of calm sedimentation affected the area. The oldest Svalbard's rocks can be treated as equivalents of rock units cropping out in northern Greenland. Therefore, the study of these oldest units is very important for understanding the evolution of the whole Arctic region.

This project focuses on crystalline basement of the Svalbard's Eastern Caledonian Province. Within this Project, main emphasis will be given to the metasedimentary and metamagmatic rocks occurring within the Atomfjella Complex.

This province is divided into two sub-terranes, namely Norduastlandet and West Ny Friesland. The study of the Norduastlandet terrane revealed the presence of Grenvillian (Mesoproterozoic) rocks covered by platform-type deposits (from the Neoproterozoic to early Paleozoic). Two stages of deformation and metamorphism have been documented in this sub-terrane. On the other hand, West Ny Friesland is dominated by the Atomfjella Antiform, extending in a north-south direction over approximately 150km, and composed primarily of metamagmatic rocks and metasediments. In one area, namely Mosselhalvøya, numerous bodies of ultramafic rocks have been observed. This suggests that a contact between the rock units cropping out within the Atmofjella Complex and surrounding monotonous metasedimentary succession is a major tectonic discontinuity.

In order to reconstruct the detailed history of the oldest rocks in Svalbard, including the Atomfjella Complex, it is necessary to implement numerous mineralogical and petrological studies, as well as analyses of the chemical and isotopic composition of minerals and rocks. The basic research method used for deciphering history of the metamorphic rocks should be geothermobarometry. It describes well metamorphic conditions (pressure and temperature) under which the rocks were formed. It is based on the chemical composition of minerals and rocks, as well as their structural characteristics. The method of absolute dating should be used to find the timing of the geological processes described above. This includes "in situ" monazite dating using an electron microprobe and zircon geochronology using an ion microprobe. Chemical and isotopic diagrams will help to identify the origin of the studied rocks.

The application of such methods to the Atomfjella Complex will solve a number of intriguing geological problems. This project will derive a broad range of new, comprehensive data on origin and evolution of the studied area.

Furthermore, the results obtained during this project will allow for correlation and comparison of the Atomfjella Complex with the better-characterized Nordaustlandet Terrane as well as with northern Greenland. This will help to better understand the relationships between the different orogenic phases recorded in the High Arctic. Svalbard's basement rocks are a key for understanding the regional history of orogenic belts in this part of the Arctic, i.e. at the "crossroads" of Eurasia and Greenland and the Atlantic and Arctic oceans.