

**Antarctic Permafrost: its composition, structure, temperature field, conditions and processes of its formation.**

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Objectives

To study the profile of rocks that are free from glacier ice; to find out their composition, structure, state; to collect actual data for better understanding of condition and processes of rocks formation in interaction with atmosphere, snowfields, glaciers and sea waters of Antarctica.

Brief rationale

Antarctic landscape structure is a very peculiar one. Along with prevailing glacier landscapes some part of it (about 6000 km<sup>2</sup>) is glacier free polar desert - barren areas in a range of climatic zones that have scant vegetation cover. Those territories (Victoria, Banger hills, Schirmacher Ponds) are specific permafrost landscapes. Their geological section consist of gneisses and schists with gabbro dykes and pegmatite veins, sometimes overlaid with sandstones, carboniferous shales and discontinous cover of quaternary deposits with the thickness that quite rarely riches 15-25 m.

Peculiarities of material composition, cryogenic structure and thermal condition of the rocks, which are the main foundation of Antarctic polar desert, are poorly studied yet. Due to this fact, there are several alternative hypotheses that explain the origin of Antarctic oases. It is supposed that they originated due to underground ignitions of black coal or due to radioactive heat or due to relief conditions that caused glaciers' reflux from those areas.

There is also an opinion that burnout power of land ice (when temperature at the glacier foot is equal to the temperature of ice thawing) at the Central Antarctic is lower than true power of its ice shield. That is why its lower part undergoes permanent dissolving. Burnout power of ice shield around its periphery and at the areas of polar deserts exceeds the true power of the shield. That is why it is supposed that the bedrock of land ice along its boundary with polar deserts of Antarctic oases is frozen to a depth of about 500 m. However, there are still no geothermal data for the territory of that boundary.

Cryogenic layer of rocks that comprise polar desert's landscapes is closely connected to atmosphere, snowfields and glaciers as well as with sea and surface waters of Antarctica. But the processes of their interaction with the layer are lack of study. It means that the given project is scientifically actual and expedient.

Expected results

Thermograms of rock section of permafrost landscape foundations of polar deserts will be acquired; values of heat flux and thermal conductivity of these rocks will be measured and their cryogenic processes will be described. There will be also a reconstruction of the formation history of the studied layer in Pleistocene and Holocene and the classification of coasts and rates of their dynamics in Antarctic shelf areas will be made.

Main types of research activities

Geothermal researches (thermal measurements; determination of thermalphysic characteristics of rocks and underground heat flux); rocks testing by their core samples; studies of cryolithogenic layers of quaternary deposits (for example layers of show-sand

dunes); grain-size, geochemical, isotopic, diatomaceous, palinological analysis and absolute dating of geological sediments; geomorphological, lithologic, landscape and regional geocryological researches.

Timing, location and recourses of Field Work 2006-2008

Possible places of field works – Northwest part of Antarctic Peninsula including subantarctic islands, Banger (Mirny Station) and Schirmacher (Novolazareyskaya Station) Hills. Resources of the work will be determined depending on the rate of additional financing that is necessary for geogryological probe hole boring of needed depth.