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Environmental Conditions in the Werenskiold Glacier Basin (Spitsbergen, Arctic): Magnetic Study

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A b s t r a c t

For the recognition of the glacier dynamics, it is important to determine its drainage type. For this purpose, hydrological models are applied, that show direction of subglacial water movement, based on supraglacial topography and the results of radar-sounding of the glacier bed. This enables distinguishing main catchments, flow patterns and the main drainage pathway. To define main sources of eroded material we performed independent and multidisciplinary experiments: magnetometry and granulometry providing wider interpretation that include phenomena connected to glacier movement.

Surface sediment and water samples were carried out from the Nottingham Bay and the Werenskiold Glacier basin in Spitsbergen, Arctic Ocean. Magnetic analyses such as measurements of mass magnetic susceptibility, anhysteretic susceptibility, hysteresis parameters and volume magnetic susceptibility dependence on temperature, served to determine the magnetic properties and identify the magnetic carriers of investigated material. Results of magnetic method have been supported by grain size and mineralogical analysis. We selected two main groups of deposits. The first group consists of magnetite and pyrrhotite with predominantly finer grains of single-domain structure. In the second group only magnetite occurs with larger multi-domain grains. The obtained results allowed to recognize different source rock of studied material.

Heterogeneous magnetic susceptibility distribution along streams and the bay, independent of the magnetic composition, suggests the inhomogeneity of the parent rock, including different sources of the investigated material. On the other hand, variations in the speed of glacier melting might be responsible for differentiated sorting of the material. In this research, we tried to answer on these new questions.

Keywords: environmental magnetism, glacier environment, surface sediments, Svalbard.