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Title: *Investigation of coastal permafrost using geophysical methods (SW Spitsbergen)*

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The aim of this study was to determine the spatial distribution of permafrost in the coastal zone from the shore to the mountain slope. The measurements were performed on two raised marine terraces in the vicinity of the Polish Polar Station in Hornsund, Southern Spitsbergen. The lower marine terrace is elevated about 2-6 m a.s.l., and the upper one is located at 8-12 m a.s.l.; their width reaches 650-800 m. Two geophysical methods, i.e. electrical imaging and seismic refraction were used to determine permafrost distribution. For each method two profiles were obtained according to limitations imposed by the terrain. The maximal distance of 35 m between the current electrodes allowed the identification of electrical properties variability of the ground to a depth of 15 m. The electrical resistivity values varied in the range 25 Wm – 12.5 kWm (lower terrace) and 25 Wm – 278 kWm (upper terrace). The array between the geophones was 5 m and the spread of the seismic profile was 55 m. The obtained seismic velocity of the ground varied from 510 m/s to 4 000 m/s for both terraces. Along two profiles, a wide diversity of both terraces was observed which can have an effect on permafrost distribution. On the lower terrace a layer of high resistivity is underlain by a layer of very low resistivity. This differentiation is not visible in the seismic velocity profiles. High values of electrical resistivity (r > 7 200 Wm) and seismic velocity (v > 2 500 m/s) can indicate the presence of permafrost. The effect of very low resistivity is caused by the internal structure and high level of rock saturation with water with high mineralization. Very low electrical resistivity can also be an effect of unfrozen pore water in the sediments and rocks, a feature probably determined by the distance to the sea and its effect on the ground. Observed electrical anomalies are strongly related to water content and geological setting of the area. The results can indicate the presence of discontinuous permafrost in the coastal zone of Hornsund, but it should be complemented by the study of ground temperature and drillings. The study presented here shows the importance of the geomorphology, geology and mostly marine impact on permafrost distribution.

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