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Impact of wave action on the structure of material on the beach in Calypsobyen (Spitsbergen)

Karolina Mędrek (1), Agnieszka Herman (2), Mateusz Moskalik (3), Jan Rodzik (1), and Piotr Zagórski (1)

(1) Maria Curie-Sklodowska University in Lublin, Faculty of Earth Science and Spatial Management, Poland (karolina.medrek@vp.pl), (2) Institute of Oceanography, University of Gdansk, (3) Institute of Geophysics Polish Academy of Sciences, Warszawa

The research was conducted during the XXVI Polar Expedition of Maria Curie-Sklodowska University in Lublin on Spitsbergen. It involved recording water wave action in the Bellsund Strait, and taking daily photographs of the beach on its shore in Calypsobyen. The base of polar expeditions of UMCS, Calypsobyen, is located on the coast of Calypsostranda, developed by raised marine terraces. Weakly resistant Tertiary sandstones occur in the substrate, covered with glacigenic sediments and marine gravels. No skerries are encountered along this section of the accumulation coast. The shore is dominated by gravel deposits. The bottom slopes gently.
The recording of wave action was performed from 8 July to 27 August 2014 by means of a pressure based MIDAS WTR Wave and Tide Recorder set at a depth of 10 m at a distance of about 1 km from the shore. The obtained data provided the basis for the calculation of the significant wave height, and the corresponding mean wave period . These parameters reflect wave energy and wave level, having a considerable impact on the dynamics of coastal processes and the type and grain size of sediments accumulated on the beach.
Material consisting of medium gravel and seaweed appeared on the beach at high values of significant wave height and when the corresponding mean wave period showed average values. The contribution of fine, gravel-sandy material grew with an increase in mean period and a decrease in significant wave height. At maximum values of mean period and low values of significant wave height, the beach was dominated by well-sorted fine-grained gravel. The lowest mean periods resulted in the least degree of sorting of the sediment (from very coarse sand to medium gravel). The analysis of data from the wave and tide recorder set and their comparison with photographs of the beach suggest that wave action, and particularly wave energy manifested in significant wave height, has a considerable impact on the type and grain size of material occurring on the shore of the fjord. The mean period is mainly responsible for sorting out the sediment, and the size of gravels is associated with significant wave height.
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