

BOTTOM SEDIMENTS ON EROSIONAL SHOREFACE OF THE LAPTEV SEA

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Bottom sediment sampling on the erosional shoreface of the Laptev Sea was carried out during 1999-2002 on 15 coastal key sections. Altogether 151 samples along 22 shoreface profiles off the coasts composed of ice complex (7), ice complex on the bedrock basis (5), sand (7), and bedrock (3) were taken at every meter of water depth and analyzed by laser-granulometry. Preliminary results of these analyses were presented at the 4th ACD workshop. After that, processing of the data was continued, and some new results were obtained. A part of them is published in "Reports on Polar and Marine Research", 482 (2004).

The distribution of the sediment grain-size across the shoreface was examined for all types of coasts using average and median grain diameters. A typical example is given in Fig. 1. The average and median are changing almost equally, decreasing regularly in offshore direction with water depth increase until the outer boundary of the shoreface (water depth about 8-9 m). However, this regularity gets broken outside of the shoreface.

All data at our disposal are plotted in Fig. 2. This diagram shows a very large spread of average diameter values. The relationship between sediment grain-size and water depth manifests itself very poorly if at all. It should be noted that the absolute majority of the average diameter values fall in the sand range (63-2000 μm), despite the fact that the sampling was carried out off the coasts composed of different sediments from silt to bedrock.

Fig. 3 show that the relationship between sediment grain-size and water depth manifests itself much better for geologically uniform coasts. Each point in the diagram of Fig. 3 represents a mean value of the median or average diameter for a given geological type of coast. In general, the linear dependence of the sediment grain-size on the water depth is fairly well seen from Fig. 3. This dependence is very weak off the coasts composed of ice complex and gets stronger in the sequence ice complex, sand, ice complex on bedrock, bedrock. The coefficient of determination R^2 increases in the same succession.

This study showed that sand prevails on the shoreface off all geological types of coast investigated. The sand content in bottom sediments is mostly in the range of 50-90% and exceeds 90% off the sandy coasts. The clay content nowhere exceeds 5-6%. The silt content does not exceed 10%, mostly 2-5%.

The average grain-size for sediments sampled off the coastal of a certain type has been calculated. The results show that all 4 median diameter averages fall into the range of fine and very fine sand (63-250 μm).

The prevalence of sand in the bottom sediments on the shoreface off the ice complex coasts is important for the general understanding of Arctic coastal dynamics. The mineral fraction of the ice complex is characterized by very high silt content (40-90% by volume), but on the shoreface the silt content is only 10-40%. This means that waves and currents remove almost all silt from the shoreface. Therefore the high silt content in perennially frozen unconsolidated sediments significantly favours coastal retreat in the Arctic.

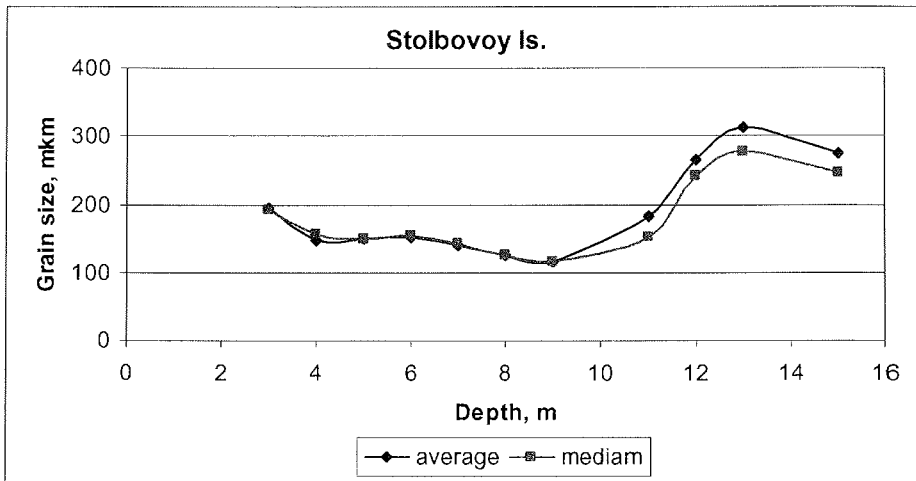


Figure 1. Distribution of the sediment grain-size across the shoreface.

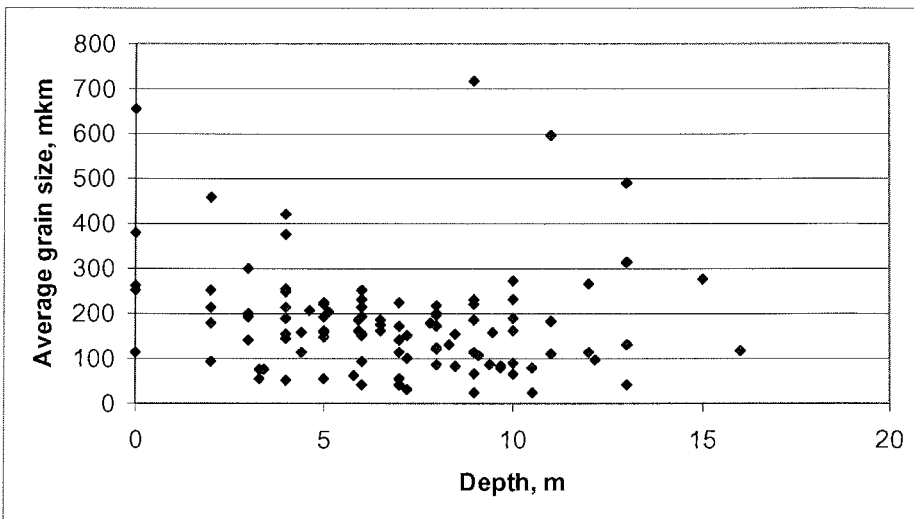


Figure 2. Relationship between average grain-size and water depth.

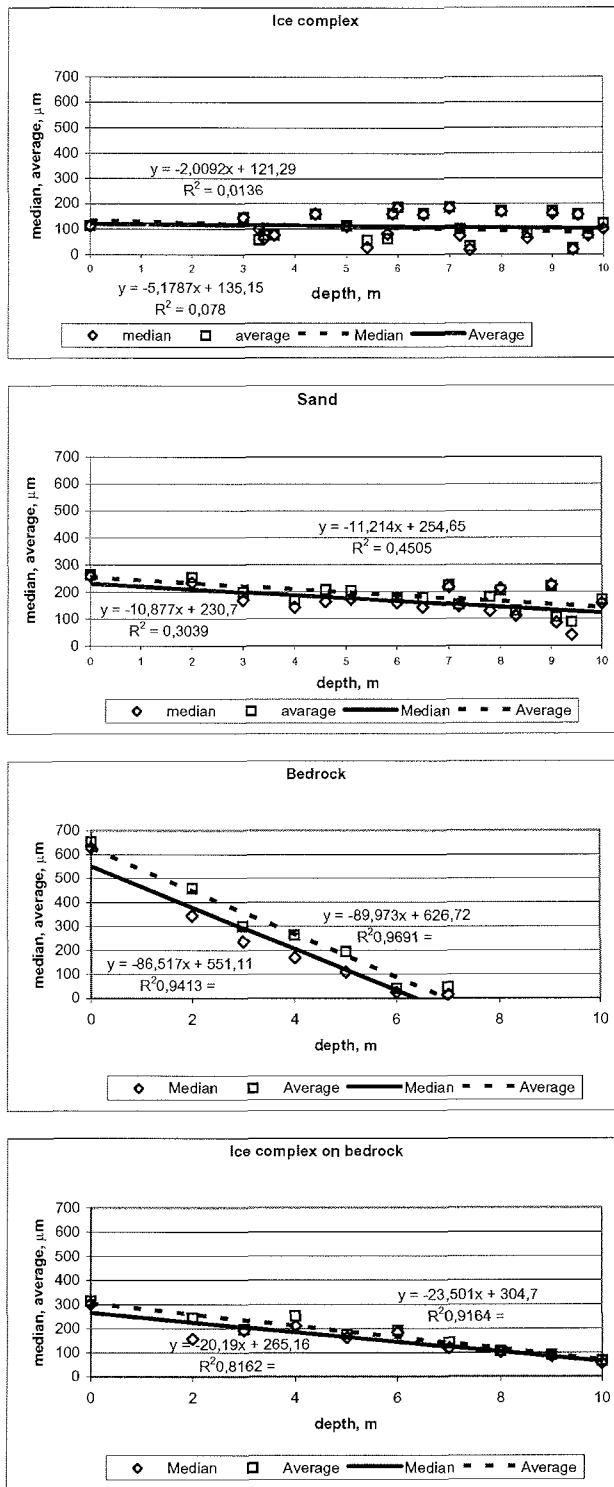


Figure 3. Relationship between median grain diameter and water depth.