PARAMETRISATION AND EMPIRICAL MODEL FOR BEDLOAD MOVEMENT IN THE MULTIBAR COASTAL ZONE ON THE BASE OF FIELD RADIOTRACER STUDY

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The near-shore zone is the most interesting sea region is coastal engineering. In this region the most effective changes in coastal morphodynamic takes place due to intensive sediment transport generated by waves and currents. The processes occurring in this zone are of great importance for coast protection and hydrotechnic activities as well as recreation. They are extremely complicated due to their stochastic character in the time and space domain.

The most valuable information concerning the dynamics of bedload transport and its local character is provided by the field surveys. Such investigations are carried out under natural conditions and take into account the characteristic properties of the region.

The subject of the work was the study of bedload movement for the multibar conditions. The aim was determination of the main characteristics of this movement:

- critical. velocities of single grains motion and mass transport beginning;
- thickness of the mobile sediment layer,
- mean velocities of bedload sediment motion,
- intensity of sediment transport.

The field study was carried out in a multibar (4-5 bars) coastal zone 700 m long and about 1000 m wide at Coastal Laboratory near Lubiatowo (southern coast of Baltic sea). Sediment transport in this region was the object of intensive and complex field studies by the use of radiotracer method [1].

The most effective way to investigate the sediment transport processes under natural conditions is a tracer technique. The characteristic advantage of this technique is non-invasive observation and measurement of parameters of the bedload or pollutant transport in Seabed floor. Especially the radioactive tracers provide the most reliable information concerning of examined process due to measurement of nuclear radiation (continuous detection, no sampling necessity). The isotope of ^{192}Ir was used as a radiotracer in the work. The ^{192}Ir was a component of specially prepared glass grains of the diameter of 0,020 - 0,025 cm and density of 2668 kg/m3. The tracer was introduced at selected points of the coastal zone in order to cover its most interesting regions. As a result of interaction of waves and current on the sea bottom, bedload motion was evaluated on the base of measured tracer distribution within a region under test [2].

During the experiment run the basic meteorological and hydraulic parameters were recorded;

- wind (direction and velocity),
- wave (amplitude and period),
- current (direction and velocity).

It has been obtained that the motion of single grains of the bedload appears at the water velocity equal to 8 - 12 cm/s. The staff of mass transport occurs at the water velocity of 30 - 40 cm/s.

Core sample were analysed, and result obtained indicates the stratified structure of bedload transport. The two layers of bedload move with different velocities. The mass transport in the layer of

some centimetres occurs simultaneously with the surface motion in the very thin layer (some several diameters of bedload grains). In the cases of small interaction between the wave and the bottom the transport of sediment occurs in the Surface layer only. Relationship between mean velocities of Surface and mass bedload transport and water current velocity was obtained.

The results obtained give the possibility to elaborate empirical model of the global Sediment transport rate for the multibar conditions. The solution of the model for the different conditions has been presented in the form of nomograms [3] Example nomogram have been shown at Fig 1.

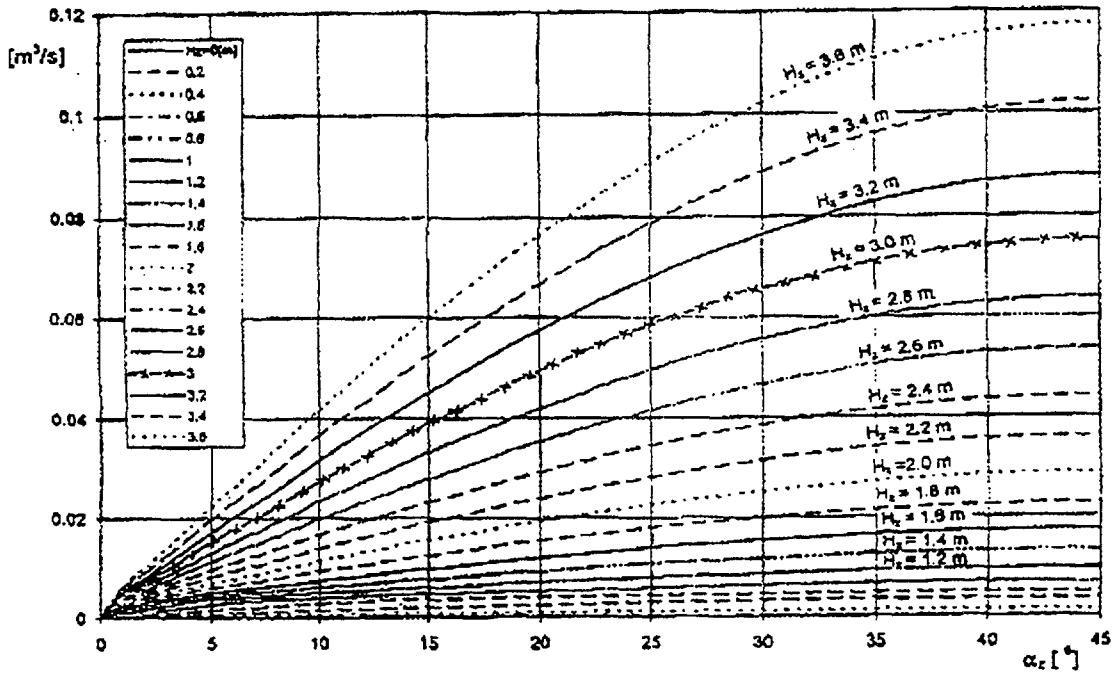

FIG. 1. The global sediment transport Q versus angle of breaking waves α_z for different values of breaking waves height H_z.

References

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