INFLUENCE OF SEASONAL DISTRIBUTION OF WAVE ENERGY AND STRUCTURE OF LOCAL STORM EVENTS ON SEDIMENT TRANSPORT

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INTRODUCTION

The structure of storm events means the character of the wave energy distribution in time over the storm period. The storm includes three principal phases: increase, stabilization and waning. At the phase of the storm increase the sediments are transported seaward, while during the storm waning part of the loose material returns to the foreshore (beach recovery).

There is an abstract concept that high steep waves of storm increase and stabilization lead to forming of erosive profile and more gentle and low waves of swell lead to forming of accumulative profile. This concept was confirmed by dimensionless parameter Ω that known as Dean's number (Dean, 1973):

$$\Omega = \frac{H_b}{w_s T},$$

where H_b – breaker wave height, T – wave period and w_s – sediment fall velocity. M.Larson and N.Kraus (Larson, Kraus, 1989) suggested that accumulative profile changes to the erosive profile when Ω exceeds 2.

The main idea that resulting morphological effect of storm depends on both quantity of wave energy within every phases and distribution of different storm phases over the time. The post-storm relief in the coastal zone depends heavily on the particularity of hydro- and lithodynamic processes during the storm waning phase.

The structure of separate storm can be compared with the seasonal changes in the wave regime. Low-energy wave regime in summer turns to higher-energy waves in winter gradual. Morphological response to seasonal variance of wave characteristics can be compared with coastal profile deformation during local storm and may be described by two limit states of the shore topography. Winter storm events leads to forming coastal profile with gentle slope in foreshore and sand bar in deeper part. Summer profile is characterized by moving coastline seaward and forming of steeper slope of foreshore.

Field experiment «Shkorpilovtsi-2016» on Bulgaria seacoast shows that one storm cycle can lead to changing of coastal profile that can be characterized as seasonal (fig.1). Actual is to show which storm characteristics leads to these morphological changes and how these features develop during seasons with various wave action.

The main objectives of the study include estimation of seasonal distribution of wave energy and character of structure of separate storm events for different seasons.

INITIAL DATA AND METHODS

The special approach to research of structure of local storms was developed. Special criteria for describing structure of separate storm events include (fig.2):

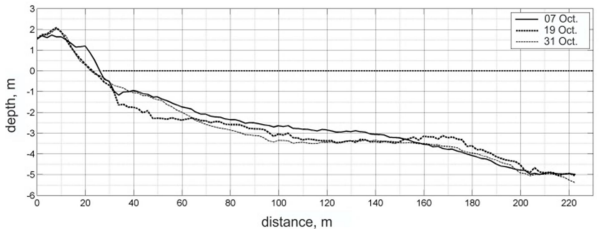

Figure 1 – Deformation of coastal profile during whole storm cycle (Shkorpilovtsi, Bulgaria seacoast, west part of Black Sea).

- summary duration of local storm (time borders of local storms are determined by exceeding the critical value of the wave height);
- peak wave height of phase of maximum development of storm;
- duration of storm waning and relation of duration of storm waning to summary duration of storm development and phase of stabilization;
- features of local peaks after main peak of storm.

The initial data for the research are wave parameters by ERA5 for the 30 years for two different regions – south-east Baltic and west part of Black Sea. There are morphological field data for this regions is shown deformation of coastal profile that can be characterized as seasonal

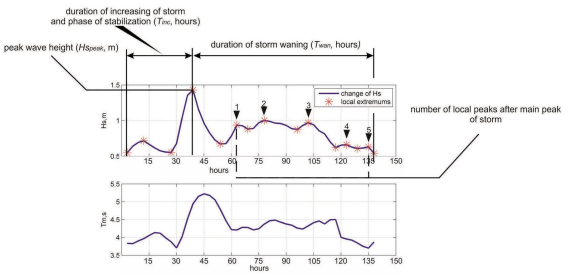

Figure 2 – Determination of criteria that define the structure of storm events.

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