



Synoptic conditions and hazards in coastal zone

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This work is an approach to the methodology of prediction of hazards in the coastal zone. For the past 60 years, according to the observations and reanalysis, meteorological conditions are rough in connection with the storm waves and strong winds resulting in catastrophic damage in the coastal zone of the Black and Caspian Seas. Forecast of similar events is taken from CMIP3 modeled for the future climate 2046-2065 by general global atmosphere and ocean circulation model MPI-ECHAM5. The research was conducted for the three types of calendar data samples: 1) storm wave and surge from observations (1948-2012), 2) storm simulations with wave height of 4 m and more (1948-2010), and 3) prognostic climate scenarios for 2046-2065. In the first sample especially rare events were chosen, accompanied by a large damage in the coastal zone. Second sample of cases was derived from modeling of SWAN (Simulating WAves Nearshore). The third sample was derived from projections of cases from group 1 in the MPI-ECHAM5 climate forecasts for 2046-2065. For each sample the data of large-scale fields of surface pressure, height 500 hPa isobaric surfaces, 700gPa (Reanalysis NCEP / NCAR) was analyzed. On the basis of statistical techniques (decomposition of fields in the natural orthogonal functions (EOF) and cluster analysis) the synoptic situations associated with these events were classified. Centroids of pressure fields for dominated cases show that there are two basic types of synoptic situations in case of storm waves for the Black Sea. In the first case main role play the Mediterranean cyclones located in the east of the Mediterranean Sea, they are spread over the Black Sea, and often form a local center of low pressure. Their movement is blocked by the high pressure over the European Russia and Eastern Europe. If the center of the cyclone is over Asia and the southern part of the Black Sea, the weather is dominated by the north-eastern, eastern, south-easterly winds. In some cases the movement of the local minimum pressure over the Black Sea complicates the picture - wind direction can vary depending on the position of the cyclone center. The second type of the pressure of the situation is less common, it is characterized by the so-called diving trough or cyclone from the north of Europe, in the south-east of the East European Plain to the possible formation of a local deep cyclone in the northern part of the Black Sea. At this time, the Balkans dominated hypertension. This situation can lead to the development of strong storm winds northwest, west, south-west. Similar work was done on the Caspian Sea. Developed methodology allows to assess the frequency of synoptic events accompanying by hazards, not only in the past, but in the future climate, too. Atlas prepared for some very strong storms to evaluate the individual characteristics of extreme events. The work is done in Natural Risk Assessment Laboratory under contract G.34.31.0007.