

Coastal processes of the Russian Baltic – modern trends, driving forces and human impact

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In frame of EMODNET-geology project and Russian Science Foundation (project 14-37-00047), the Coastal Behavior maps for the Russian parts of Baltic were compiled. Several areas of the Baltic Sea coastal zone were chosen as case studies for more detailed mapping and analyses. According to annual observations rates of coastal erosion within some areas of the easternmost part of the Gulf of Finland are recently accelerated due to both natural (increasing of the extreme storm events frequency, accompanied by high water level) and anthropogenic (impact of St. Petersburg Flood Protection Facility, submarine sand mining, ineffective coast protection etc.) factors. The geological and geomorphic factors determine the long-term coastal zone development. The coasts mostly consist of easily erodible Quaternary deposits (clays and sands). They evolve under overall sediment deficiency. Moreover, some specific, small-scale features of the near-shore bottom, found by investigations using multibeam and side-scan sonar study, play a very important role in the entire erosion process. Average rates of coastal erosion is 0.5-1.0 m/year, but during the extreme storms, coastal escarpment can retreat for the distance up to 5 m at once. During late autumn and winter seasons of 2006-2007, 2011-2012 and 2013 years severe storms caused extreme erosion events damaged the coastal dunes with forming of active escarpment, destruction of coast protection and recreation infrastructure, complete transformation of sand accretion spits. In the southern coastal zone of the Gulf processes of long-shore sand waves occurred. Prognoses of coastal processes development based on annual observations (since 2004), remote sensing data analyses and modeling has shown that depending on different climate change scenarios coastal line of the study area can retreat for the distance from 50 to 100 m. The most intense coastal processes of the Russian part of the South-Eastern Baltic are observe within attached part of the Curonian Spit and along the coasts of Sambia Peninsula. As a result of long-term Amber Factory waste product dumping, during second part of 20th century along 200-300 wide sand accretion forms accumulated along former cliff western coasts of Sambia Peninsula. Since 1990s mining waste input to the sea stopped and coastal processes trend has changed. Since 2000 average rate of coastal erosion rate reached 15-18 m/year. Detailed geophysical studies (e.g. full coverage multibeam and side-scan profiling) of off-shore areas around the Curonian Spit and Sambia Peninsula allowed to establish areas of submarine erosion, where preQuaternary deposits and glacial till are outcropped and to estimate the volume of sediment deficiency.