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Sedimentary record of flood events in the Gulf of Gdańsk, Baltic Sea

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Sedimentary record of flood deposits forms important source of information on frequency and magnitude of flood events and is important for flood hazard assessment. The flood deposits are mostly studied in the river valleys, where the preservation potential is limited. However, flood deposits may be preserved in some continental shelf environments. One of such potential environments is Gulf of Gdańsk (southern Baltic Sea) supplied with sediments by Vistula (Wisła) River - the largest river in Poland. The last big flood of Vistula River took place in May 2010 and was considered to be the biggest during at least the last 100 years. During the flood sediments were transported as far as 70 km from the river mouth (Zajączkowski et al. 2010). The purpose of the present study is to investigate the modern sediments left by the 2010 flood and older sedimentary record from the Gulf of Gdańsk in order to identify potential flood layers and reconstruct flooding history during the Late Holocene.

The study is based on box cores collected during the maximum phase of the Vistula River flood in May 2010 (Zajączkowski et al. 2010) and resampled in 2011. Moreover two over 2 m long piston cores were collected in 2011 within the limit of the 2010 river flood impact. All the cores were X-rayed and cut into 1 cm thick samples for grain size distribution, moreover selected samples were analysed for TC, TOC, δ13C and clay minerals. Age control and sediment accumulation rate were assessed by 210Pb, 137Cs datings and 10 AMS 14C dates.

The datings revealed that the sedimentary record spans the period from 4035$\pm$35 14C years BP. The sediments were composed mostly of unimodal muddy sand. Within the record also thin layers characterised by bimodal distribution were identified and interpreted as flood record. The additional secondary mode is in silt fraction and is interpreted to be result of direct deposition from hypopycnal river flood plume. The carbon isotopic composition of the flood layers also suggested bigger contribution of terrigenous organic matter. Similar sediment properties were found in samples from the 2010 flood.

The presented result showed that the detail analyses of the sedimentological (grain size) and geochemical (carbon stable isotopes) characteristics may provide insights into large flood history recorded in the coastal sea deposits. The results revealed that the flood frequency is at least in order of one flood per few hundred years, however, one must take into account changes in the position of the Vistula River mouth.

Zajączkowki M., Darecki M., Szczuciński W., 2010. Report on the development of the Vistula river plume in the coastal waters of the Gulf of Gdańsk during the May 2010 flood. Oceanologia, 52: 311-317