Katastrofalne powodzie morskie na wybrzeżach południowego Bałtyku w późnym Holocenie.
Catastrophic coastal flooding events along the southern Baltic Sea coast during the Late Holocene.

One of the greatest threats to urbanized coastal areas worldwide are catastrophic coastal flooding events. In the times of climatic changes, the frequency and intensity of abrupt marine inundation events is changing in incomprehensible manner. The future changes of the coastal flooding pattern can only be understood, provided that full appreciation of the past events is gained.

Each coastal flooding event is archived within the onshore sedimentary sequence in a form of depositional layer, which consists of coarse particles containing material of marine origin. The deposits of these layers can be used for characterization of marine water inundation events, including their frequency. The branch of science dealing with past coastal flooding events is called palaeotempestology. So far, the research within this new branch of science is restricted only to few areas within the US Gulf coast. So far, there have been no systematic palaeotempestological research undertaken in Europe.

The proposed research is the pioneer palaeotempestological undertaking within the continent. The main aim is to reconstruct the history of coastal flooding, its frequency and intensity for the last few thousand years of the geological history and put it in the context of changing climate and fluctuating sea-level. The area of the southern Baltic Sea is predestined for the research on palaeo-flooding as tides are neglectible and the frequency of both, (north)westerly and (north) easterly storms is high, what increases the probability of sedimentary archives of coastal flooding to be preserved.

During the proposed research we will look for sedimentary traces of coastal flooding within the onshore deposits in the southern Baltic Sea coast in Poland and Germany. Initially we will examine 12 site locations along the Polish and German for detailed information on marsh/coastal mire surface, barrier and coastal lake elevation. From these 12 site locations, 4 will be chose as the main test areas. In the designated key research areas the ground penetrating radar (GPR) and coring survey will allow to detect best locations for the main sediment cores, which will be later analysed in the laboratory. The sediments of the main cores will be described in terms of physical and chemical characteristics, what will aid the identification of layers associated with catastrophic coastal flooding in the past. Micromorphological analysis of impregnated sediments and X-ray radiographs will be used to characterize the internal structure of the sediments. The marine versus terrestrial provenance of deposits will be established based on: heavy minerals analysis, the shape and surface texture of quartz grains, also in microscale from thin sections; the X-ray fluorescence sediment core scanning; carbon and nitrogen stable isotope ratios (δ13C and δ15N, respectively) as well as Total Organic Carbon (TOC) and Total Nitrogen Contents (TNC) analyses. The age of the discrete layers will be delimited using various methods depending of the type of deposit. The last few hundreds years old minerogenic fraction will be dated by means of lead (^{210}Pb) and caesium (^{137}Cs). The age of older minerogenic deposits will be established by optically stimulated luminescence (OSL), while organic fraction will be dated by means of radiocarbon (^{14}C).

The proposed research project is pioneer in that it engages several coastal flooding proxies employing various methods to establish the long-term reconstruction of the frequency and intensity of catastrophic marine inundation events along the coasts of the southern Baltic Sea. Also for the first time the evidence of potential tsunami events in this area will be evaluated. Such an improved long-term record of coastal flooding frequency and their impact is essential to determine the recurrence intervals of this natural, catastrophic, hazardous events in the future, and following from that guide coastal infrastructure development and commercial planning as well as set cost-effective insurance policy. The project is expected to have also a significant impact to paleo-tempestology and paleo-climatology beyond the regional approach.