Distinguishing tsunami and storm deposits affected by postdepositional processes – a multi-proxy approach (TSUNASTORM)

The project concerns a very important problem - how to recognize storm deposits from tsunami deposits in the coastal environments. Both are our basic sources of knowledge for estimation of the frequency and extent of catastrophic marine floodings. Their presence informs us which parts of the coast are potentially endangered and with what frequency. They are also indirectly a source of information about - respectively - seismic activity (generating a tsunami) and climate change (responsible for changes in the frequency and intensity of storms and hurricanes). However, despite more than a decade of intensive research (mainly after the 2004 and 2011 tsunamis), there are still no reliable ways to distinguish the sedimentological record of storms and tsunamis in sediments preserved in coastal zones. In addition, the situation is complicated by postdepositional changes (e.g. erosion, soil processes) that blur and modify the sedimentary record. These sediments, which we manage to find, e.g. in coastal peat bogs, often differ significantly from their original deposits left by storm or tsunami. Hence, among the aims of the project are:

- determination of postdepositional changes of sediments formed after catastrophic marine floodings for decades and centuries (on the example of the 2004 tsunami sediments in Thailand and older sediments on the same coast),
- the application of comprehensive multiproxy analysis for the coasts where both tsunami and storm deposits are preserved (on the example of the coasts of Portugal affected, among others, by the dramatic tsunami in 1755),
- the use of novel molecular (fossil DNA) methods that have the potential to become a key way to recognize tsunami and storm deposits, as tsunami waves may transport the remains of the genetic material of organisms living at greater depths than storms.

The methods include both field research and analysis of thin sections deposits, which can reveal structures formed during their formation (deposition), as well as advanced geochemical, molecular (DNA), mineralogical and micropaleontological analyzes. The main effect of the project is to find a way to differentiate between tsunami and storm deposits. The results of the project will have both purely scientific and application significance because the ability to correctly identify storm and tsunamis deposits is extremely important for hazard assessment on the sea coasts. It is particularly important if we consider that as much as 40% of the world's population lives in low-lying coastal areas.