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Assessment of Tsunami Impacts on the Kocasu Region (Sea of Marmara, Turkey)

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Some of the major historical earthquakes in the Sea of Marmara are tsunamigenic. The tsunamis registered in the recent catalogues are small to moderate and co-seismic. Those were mostly reported from the big cities located in the western and north-eastern parts of the region. Even the southern coastline is relatively far from the main active faults passing through the Sea of Marmara from east to west, and partly sheltered by the islands, the tsunami waves hit the region (e.g. 10.10.123, 06.09.543, 22.05.1766 and 18.09.1963). Along the coast of Mudanya, for example, strong tsunami waves were particularly effective in 1766 and waves reached a height of 1 m in 1963. The tsunami waves observed in Erdek Bay during the 543 event might have also been effective in Bandirma Bay and the study area. The numerical wave models indicate that the moderately high tsunamis can be effective along the coastal strip between the Gulf of Gemlik in the east and the Kapıdağ Peninsula in the west, and overcome the natural sand barriers. Unfortunately urbanization spreads for the last 50 years and causing adverse environmental effects on original sediment successions of coastal facies. A few only excavation sites, suitable for an extensive paleoseismological investigation, were left far from artificial development. Considerably being low-energy depositional environments far from post-depositional erosion, the coastal wetlands and lagoons in the Kocasu region are the best places for tracking tsunami deposits. Under the scope of the EU project TRANSFER (Tsunami Risk ANd Strategies For the European Region), a candidate tsunami deposit was observed in a trench at the Ballikaya district. The trench is located on the Kocasu Delta, behind the natural sand barriers and 410 m far from the modern shoreline. Soil samples were collected from sandy layers which show no grading structure, suggesting rapid deposition of sediments from floods of water. In addition a piston core drilled on the trench site was logged by multi-sensor core logger for every 0.5 cm using gamma density, resistivity, P-Wave, and magnetic susceptibility sensors. Even the core is made up of coarse grained sediments without clear boundaries, some enigmatic stratification was observed 48-51cm below the surface. Comparing to those of overlying layers these units have higher magnetic susceptibility. In addition to the interpretation of sedimentary features, the depositional conditions are often readily inferred from the presence and distribution patterns of biomarkers. In that sense paleoenvironmental assessments were tried to have been elucidated by geochemical properties, marine biomarkers and deterministic ratios. There were no meaningful correlations for major elements (Cu, Cr, Cd, Fe and Al) through the core samples, while slightly increased concentrations of oxide groups (Al2O3, CaO, MgO, Na2O and K2O) were detected for the enigmatic layers. FAMEs are most commonly analyzed using a gas chromatography equipped with mass detection. In this way 30-35 fatty acids can be routinely separated. The identification of marine lipid biomarkers indicates biogenic contributions due to the presence of phytoplankton, zooplankton, bacteria and dinoflagellates. Quantitative estimation of biomarkers and deterministic ratios indicated some evidences for marine-sourced organic matters. The higher ratios of C22:6w3/C20:5w3, for example, imply the presence of dinoflagellates in the samples below 40 cm. Depending on these preliminary results we suggest that further studies are needed.