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# Organic-geochemical investigations on soil layers affected by theTohoku-oki tsunami (March 2011)

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Geochemical investigations on tsunami deposits, in particular palaeotsunamites, have mainly focused on inorganic indicators that have been used to distinguish between terrestrial and marine matter in sedimentary archives. Observable tsunami deposits may also be characterised by organic-geochemical parameters reflecting the mixture and unexpected transport of marine and terrestrial matter. The application of organic substances with indicative properties has so far not been used, although the approach of using specific indicators to determine prehistoric, historic and recent processes and impacts (so-called biomarker and anthropogenic marker approach) already exists. In particular, for recent tsunami deposit the analysis of anthropogenic or even xenobiotic compounds as indicators for assessing the impact of tsunamis has been neglected so far.

The Tohoku-oki tsunami in March 2011 showed the huge threat that tsunamis, and subsequent flooding of coastal lowlands, pose to society. The mainly sandy deposits of this mega-tsunami reach more than 4.5 km inland as there were run-up heights of ca. 10 m (wave height). The destruction of infrastructure by wave action and flooding is accompanied by the release of environmental pollutants (e.g. fuels, fats, tarmac, plastics, heavy metals, etc.) contaminating the coastal areas and ocean. To characterize this event in the sedimentary deposits, we analyzed several soil archives from the Bay of Sendai area. Soil layers representing the tsunami deposits have been contrasted with unaffected pre-tsunami samples by means of organic-geochemical analyses based on GC/MS.

Natural compounds and their diagenetic transformation products have been tested as marker compounds for monitoring this recent tsunami. The relative composition of fatty acids, n-alkanes, sesquiterpenes and further substances pointed to significant variations before and after the tsunami event. Additionally, anthropogenic marker compounds (such as soil derived pesticides, source specific PAHs, halogenated aromatics from industrial sources) have been detected and quantified. Concentration profiles of distinct terrestrial pollutants revealed shifts either to increasing but for selected compounds also to decreasing contamination levels.

Generally, this preliminary study points to the usefulness of organic indicator compounds for characterising the two-dimensional expansion of recent but in particular historic tsunami events as well as its time scales.