

## Sedimentary records of heavy metals in the Ambarli Harbour Area, Istanbul

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Ambarli harbour area lies the geographical border of the Istanbul, and located in the north-eastern part of the Marmara Sea. This harbour has served for 43 thousand vessels for the last ten years. Their pollution effects on sediments have not yet been known. To investigate heavy metal contamination associated with the harbour activities, three sediment core were collected from the seabed of the Ambarlı Harbour area with a gravity corer mounted on the research vessel R/V ARAR in May 2009. Al, Fe, As, Ba, Cr, Cu, La, Mo, Ni, Pb, Se, Sr, V and Zn elements were scanned though the sediment core in 1 mm intervals using XRF core scanner at the İstanbul Technical University EMCOL laboratories. Additionally, the upper 5 cm of the each core were subsampled at 5-mm resolution and the metal concentrations were measured with ICP-MS in Department of Geology at Mersin University. Top sediment dating was finalized at the Çekmece Nuclear Research Centre via <sup>210</sup>Pb analysing method. Degree of metallic pollution was carried out by way of enrichment factor (EF), geoaccumulation index (Igeo) and sediment quality guidelines (SQGs). The levels of metals appear to be uniformly distributed with depth except in the upper 2cm for Al, As, Cr, Cu, La, Mo, Se and Zn. The levels are generally low or comparable

with the exception of intervals 0-2cm below sea floor (bsf) and do not indicate any significant anthropogenic input, thus are derived predominantly from lithologic material. Average concentrations for each element in the upper 5cm of are; Al 5.4%, Fe 3%, As 6.6 $\mu\text{g.g}^{-1}$ , Ba 485  $\mu\text{g.g}^{-1}$ , Cr 100  $\mu\text{g.g}^{-1}$ , Cu 50  $\mu\text{g.g}^{-1}$ , La 37  $\mu\text{g.g}^{-1}$ , Mo 2  $\mu\text{g.g}^{-1}$ , Ni 65  $\mu\text{g.g}^{-1}$ , Pb 41  $\mu\text{g.g}^{-1}$ , Se 2  $\mu\text{g.g}^{-1}$ , Sr 299  $\mu\text{g.g}^{-1}$ , V 116  $\mu\text{g.g}^{-1}$  and Zn 155  $\mu\text{g.g}^{-1}$ . The maximum concentration of Al, Cu, La, Mo, Pb, Se and Zn was observed in the upper layers of sediment cores (0-2cm). According to <sup>210</sup>Pb dating, the average sedimentation rate was 0.5mm.y<sup>-1</sup>. Based on this assessment, the 0-2cm interval was deposited between 1979 and 2009. This indicates that anthropogenic contamination of Al, Cu, La, Mo, Pb, Se and Zn in sediments should be no earlier than 1979 as the Ambarli Harbour has been in service since 1989. EF and Igeo analyses revealed significant anthropogenic pollution of As, Cu, La, Mo, Se and Zn in the surface sediments of the cores whereas Fe, Ba, Ni and Sr in all sediment samples could be considered as unpolluted. Levels of Cr, Cu and Pb in most of the samples can occasionally be considered to reach toxic biological effects, according to the effects "range-low" and "effects-range" median values for Cr, Cu and Pb.

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