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Seven centuries of atmospheric Pb deposition recorded in a floating mire from Central Italy

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Floating mires generally consist of emergent vegetation rooted in highly organic buoyant mats that rise and fall with changes in water level. Generally speaking, the entire floating mass (mat) is divided into a mat root zone and an underlying mat peat zone.

Floating mires are distributed world-wide; large areas of floating marsh occur along rivers and lakes in Africa, the Danube Delta in Romania, the Amazon River in South America, and in the Mississippi River delta in USA, whereas smaller areas occur also in The Netherlands, Australia and Canada.

While peat cores from ombrotrophic bogs have been often (and successfully) used to reconstruct changes in the atmospheric deposition of several metals (including Pb), no studies are present in literature about the possibility to use peat profiles from floating mires.

To test the hypothesis that peat-forming floating mires could provide an exceptional tool for environmental studies, a complete, 4-m deep peat profile was collected in July 2012 from the floating island of Posta Fibreno, a relic mire in the Central Italy. This floating island has a diameter of *ca.* 30 m, a submerged thickness of about 3 m, and the vegetation is organized in concentric belts, from the *Carex paniculata* palisade to the *Sphagnum palustre* centre.

The whole core was frozen cut each 1-to-2 cm (n =231), and Pb determined by quadrupole ICP-MS (at the ultraclean SWAMP lab, University of Alberta, Canada) in each sample throughout the first 100 cm, and in each odd-numbered slice for the remaining 300 cm. The ^{14}C age dating of organic sediments (silty peat) isolated from the sample at 385 cm of depth revealed that the island probably formed *ca.* 700 yrs ago.

Lead concentration trend shows at least two main zones of interest, i.e., a clear peak (ranging from 200 to 1600 ppm) between 110-115 cm of depth, probably corresponding to early 1960's – late 1970's, and a broad band (80-160 ppm) between 295-320 cm of depth, corresponding to approximately AD 1480-1650.

Lead concentrations were normalized to those of Th, a conservative, lithophile element often used as an indicator of the abundance of mineral particles. Crustal enrichment factor values, calculated by normalizing the Pb/Th ratio in peat samples to the corresponding ratio for the Upper Continental Crust, clearly show that almost all the Pb reaching this floating isle in the last seven centuries is of anthropogenic origin. In particular, while the big peak around 100-115 cm of depth is associated with that of Sb, the band around 300 cm characterized also the trend of several other major and trace elements (i.e., Ag, Al, Ba, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sr, Th, Tl, U, V, Y, Zn) with the exception of Sb.

Although γ-spectrometry measurement (^{210}Pb, ^{137}Cs and ^{241}Am) for the first 100 cm of this core is still on-going, at the best of our knowledge, this work may provide the first Pb chronology obtained from a (4 m) deep floating mire.

Furthermore, it is to note that a) this floating mire could consist of the southernmost European population of *Sphagnum*, and b) this core shows a great potential to be used as archive of environmental changes, especially considering its high resolution (1 cm = 0.5 yr in the first 100 cm, and 2-2.5 yrs in the remaining 300 cm of depth).

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