
Anthropogenic stratigraphic signals downstream of a metropolis: Extracting Vienna's impact from Danube river plain archives

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Abstract

The Anthropocene describes a potential new chronostratigraphic unit of the Geological Time Scale and is defined by the intensified anthropogenic influence on the environment and geological processes, and its traces in geological archives. Even though this human impact can be seen on a global scale, regional studies characterizing the growth and extent of anthropogenic influence, are scarce, especially for urban or peri-urban environments.

In this project, we investigate the anthropogenic impact of the metropolis Vienna on its peri-urban environment and the proposed beginning of the Anthropocene epoch in the 1950s CE by applying sedimentological and geochemical methods. The human influence in urban sedimentary archives of Vienna has already been successfully detected in previous studies by Wagreich et al. (2022) using artificial isotopes and anthropogenic trace metals as Anthropocene stratigraphic markers on anthropogenic coarse sediments. We extend the study area from Vienna to the city of Hainburg to investigate Vienna's urban anthropogenic impact in both anthropogenic and natural sediments downstream of the Danube river. In this area, in the National Park Donau-Auen, direct human intervention into the archived sediments is nil, thus presenting an 'Urban Anthropocene Field Lab' to trace and quantify the anthropogenic stratigraphic fingerprint and to search for correlation to the proposed GSSP base of the Anthropocene.

Within flood plain sediments of the Danube, sedimentological, geochronological and chemostratigraphic markers are applied to characterize and date the anthropogenic strata in this area: The archive of fine-grained natural Danube deposits, i.e. erosional profiles and sediment cores, is analysed for trace metals, artificial radiogenic isotopes, and (micro-)plastics with the aim (i) to disentangle the anthropogenic fingerprint of Vienna from the sediment, (ii) to identify and evaluate the proposed Holocene-Anthropocene geological boundary around 1950 CE, and (iii) to evaluate a potential correlative stratigraphic reference section/point for the Anthropocene downstream of Vienna.

Keywords: chemostratigraphic markers, anthropogenic fallout, (micro)plastic, Holocene, Anthropocene, Vienna

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