The Urban Anthropocene of Karlsplatz, Vienna (Austria), a reference section for the Anthropocene Series

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Abstract

Anthropogenic strata form the layered urban archive in the underground of large cities. In a transdisciplinary project involving geosciences, isotope physics and urban archaeology, we looked for artificial isotopes and anthropogenic trace metals. The tested archaeological site Karlsplatz is situated in the City of Vienna in a park area. Archaeology and historical data set age constraints around 1922 (building of a sales hall), WW2 post-1945, and at 1959, with the opening of the Wien Museum. A layer on top of the WWII rubble that covers foundations of a 1922 building post-dates 1945, and pre-dates the levelling of the artificial park ground in front of the Wien Museum of 1959. The fine-grained sediment matrix of these layers is mixed with backfilled soil material. Samples were analysed for trace elements like lead, copper and zinc, and prepared for chemical separation of actinides analysed by Accelerator Mass Spectrometry (AMS). Several artificial radionuclides including the plutonium and uranium isotopes 239Pu, 240Pu and 236U were found in the post-1945 layer, and the 240Pu/239Pu isotope ratio clearly point to the presence of atmospheric atomic bomb fallout material of the 1950s. Thus, the bomb-spike can be identified and used as a primary stratigraphic marker even in coarse urban anthropogenic sediments exemplifying the correlation potential of these radionuclide markers and demarking a reference section for the base of the chronostratigraphic Anthropocene. These urban deposits, including rubble from World War II and anthropogenic soils as at Karlsplatz, show no continuous record as required for a GSSP. There are no annual layers in anthropogenic sediments since deposition rates are highly variable, and the layers get mixed and reworked during different construction and renovation phases. However, the Karlsplatz site may be used to define an auxiliary stratotype section and/or point of the Anthropocene, as the stratigraphic markers and technofossils in the urban rubble contain signals that have potential correlations with findings from other GSSP sites, namely the fallout radionuclides like plutonium, the trace metal concentrations, although strongly locally affected, and the technofossil record.

Keywords: Anthropocene, urban reference, Plutonium, technofossil

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