

Sedimentology, stratigraphy and chronology of a decantation tank in the sewer network of Orléans (France): new perspectives on the Anthropocene

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Ongoing debates on the definition of the Anthropocene encourage geologists and palaeoenvironmentalists to explore more recent time-windows and new territories. Cities are probably the most emblematic socio-ecosystem of the Anthropocene, with a dominant control of human-driven productions and fluxes of uncommon materials, elements and isotopes ratios, justifying a new sphere of biogeochemical exchanges: the "Astysphere". Sedimentary accumulations resulting from the production, transport, and sedimentation of materials in sewer networks could thus represent efficient archives of the Anthropocene.

We studied a decantation tank that collects wastewaters and rainwaters from the sewer network of Orléans, before any water treatment plant. This original sedimentary basin accumulated 17m of sediments since AD1942, and has never been cleaned out, potentially offering a very high-resolution archive of events that occurred within the catchment over the last 70 yrs. In this context, we retrieved 17 gravity cores before (A, February 2015) and after (B, March 2016) clean out.

The sediment is stratified with coarse and fine mineral layers regularly interrupted by organic-rich black deposits. Abrupt transitions between each facies suggest a succession of sedimentary events. The presence of ⁷Be at the top of cores confirms that top sediments are younger than 6 months. This implies that there is no or few time lag in sediment transport within the catchment. Cores B, which record one year of sedimentation after clean out, are half constituted of mineral (top) and organic (bottom) units. The mineral facies is enriched in ⁷Be whereas the organic one is not. This suggests that the mineral facies is typical of the autumn-winter season, whereas the organic one could be related to the spring-summer period. Organic/mineral successions observed in all cores could therefore reveal a seasonal signal. 30 postbomb ¹⁴C dates performed on cores A are logically organized with depth, with oldest sediments (2.25 m depth) dated from AD1980.

These first results confirm that urban sedimentary archives, as more natural ones, are constituted of deposits chronologically ordered, probably under a seasonal pattern. This reinforces our assumptions that high-resolution sedimentary archives in urban contexts could help unraveling the precise chronology of the Anthropocene.

Obviously, this archive is rich in tracers of anthropic origin (illegal drugs, pharmaceuticals, minerals, heavy metals...). Our next challenge will be to determine the evolution of these numerous tracers through time. Interpreting these variations will be contingent upon our ability to understand their sources, transportation within the catchment, and accumulation into the tank, i.e. perform a source-to-sink approach as it is classically performed in paleoenvironmental studies.