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In search of the “Golden Spike”: On the role of microplastics in defining the Anthropocene

In a recently published discussion paper, Juliana Ivar do Sul and Matthias Labrenz, environmental scientists at the Leibniz Institute for Baltic Sea Research Warnemünde (IOW), focus on the topic of microplastics from a geological perspective. They discuss whether the omnipresent plastic particles could be used to identify the beginning of a new, not-yet formalised geological epoch, the Anthropocene, in geo-archives such as sediment cores. Moreover, microplastics could be used at a suitable location to establish the so called Golden Spike, which, by definition, is used in geology to document the beginning of an epoch, period or era.

Slowly but steadily, it has become commonplace: journalists and politicians like to talk about the “Anthropocene”, when they want to emphasize how strongly our world is being influenced by humans. However, the term Anthropocene originates in earth system science, in accordance with the geological time scale, where “epochs” or “systems” ending in “-cene” are parts of the Earth’s history, which can be identified across clearly defined boundaries worldwide. This definition has not yet been finalised. The current epoch of earth’s history still is the Holocene, however, a group of scientists, the “Anthropocene Working Group (AWG)”, has been collecting information and discussing worldwide within the geoscientific community, by which markers the new epoch “Anthropocene” should be defined and when it starts.

The two Warnemünde authors Juliana Ivar do Sul and Matthias Labrenz summarise the most recent discussion of the AWG in relation to potential Anthropocene boundary markers and review current literature on the topic, emphasising in particular the importance of microplastics. Ivar do Sul, a member of the AWG since 2015, reports: “There is already an agreement that the primary marker for the Anthropocene are the artificial radionuclides released by the atomic bomb detonations in the 1940s and 1950s. However, we are still gathering evidence for suitable auxiliary markers that support a global correlation.” In this study, Ivar do Sul and her colleague Labrenz demonstrate that microplastics can be used for stratigraphic zonation similarly to fossils in biostratigraphy.

Only last year, scientists from the IOW demonstrated in a large overview study that plastic is not degraded by microorganisms in the marine environment. Consequently, plastic will remain in the ocean for a very long time. Their ecologically negative properties make them a suitable technofossil and thus a good auxiliary marker for defining the start of the Anthropocene.

In addition, a type locality is still missing for the Anthropocene – a site that contains the boundary in question as a physical reference level and is referred to as the “Golden Spike”. These are usually geological profiles in marine sediments, but also ice cores. For the Holocene, for example, the Golden Spike, which marks its beginning, was agreed to be the abrupt changes in deuterium excess values found in a certain Greenland ice core at a depth of 1,492 meters. The shift in values indicates relatively warmer water surface temperatures in the ocean and thus the end of the ice age.



Suitable candidates for the “Golden Spike” of the Anthropocene are still being sought worldwide. Among them, seafloor deposits in the “dead zones” of the central Baltic Sea are also in the running. Juliana Ivar do Sul: “There, we find relatively undisturbed sediments, where we can detect the radionuclides that indicate the start of nuclear bomb testing, and we potentially find microplastics in the layers in question. There is a very strong case for the Baltic Sea.”

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