
Stratigraphic enrichment into the Anthropocene: a proliferation of proxies allowing ultra-high resolution of a transformed Earth System

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Abstract

In the science of stratigraphy, correlation of strata and palaeoenvironmental interpretation is enabled by a large and growing number of proxy signals, some of which are novel in nature, such as fossils, while others have been developed as a result of advances in analytical capabilities, such as chemical patterns including isotope ratios. Such proxy evidence provides the basis for the characterization and definition of chronostratigraphic units. The Quaternary, and in particular the Holocene, has seen impressive development of the variety and range of stratigraphic proxy signals. A key innovation was the use of (for stratigraphy) novel strata, of Greenland ice, for the Holocene GSSP, with 6 proxy signals detailed including some not previously used in timescale definition, such as deuterium excess, while 24 proxy signals were quoted in total, including for the five auxiliary stratotypes. In subdivision of the Holocene, the Northgrippian GSSP (also Greenland) used a comparable range of ice signals, though the Meghalayan GSSP, in a speleothem in India, is based upon oxygen isotope analyses calibrated by U-series dates.

In analysing 12 candidate sites and other reference sections for potential formalization of the Anthropocene (Waters et al., 2023), this innovation and diversification of stratigraphic proxies has continued, and markedly accelerated. In total, more than one hundred separate proxy signals were used to characterise the stratigraphy at decadal to annual, in some cases sub-annual, level. These include signals which are simply the result of ongoing technical development, and which are available to older (even if not always very much older) successions, such as eDNA. Many of the signals are novel, though, and reflect a proliferation of new forms of stratigraphic evidence associated with the Anthropocene. These include several artificial radionuclides, microplastics, industrial fly ash, various kinds of synthetic persistent organic compound and novel biostratigraphic signals, notably the rapid and near global spread of introduced species. Their rapid development and wide (commonly global) dissemination have allowed a step change in stratigraphic resolution that, uniquely integrated with detailed observational process records, allow analysis of an Earth System undergoing evolution in an unprecedented rate, scale and manner.

*Speaker

Reference

Waters, C.N., Turner, S.D., Zalasiewicz, J. and Head, M.J. (2023). Candidate sites and other reference sections for the Global boundary Stratotype Section and Point of the Anthropocene series. *The Anthropocene Review* <https://doi.org/10.1177/20530196221136422>

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