

# The Earth-System Humanization Event (ESHE)

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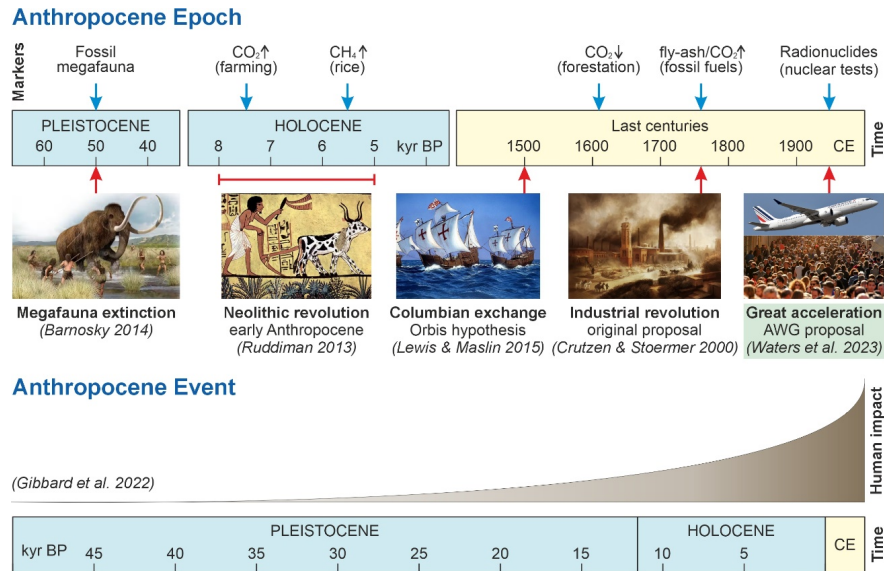
Currently, an intense debate exists over whether the Anthropocene should be considered a formal series/epoch on the International Chronostratigraphic Chart/Geological Time Scale (ICC/GTS) or a geological event. Recent developments have cast doubt on the former option, with the rejection of a proposal submitted to the Subcommittee of Quaternary Stratigraphy (SQS) of the International Commission on Stratigraphy (ICS) (Voosen, 2024; Witze, 2024). This rejection, which was further ratified by the International Union of Geological Science (IUGS, 2024), has strengthened the notion of the Anthropocene as a geological event, as proposed in recent years (Gibbard et al., 2022a, b). However, the term Anthropocene, originally coined to define an epoch (Crutzen & Stoermer, 2000), may be deemed unsuitable for naming an event. This commentary briefly reviews the most recent developments regarding the rejection of the Anthropocene as a new geological epoch, and suggests a more appropriate name for an alternative event.

The idea of an Anthropocene Epoch emerged at the beginning of this century with the famous proposal by Crutzen & Stoermer (2000). They argued that human activities had introduced variability into the Earth System surpassing natural Holocene variability, thus necessitating the definition of a new geological epoch, which they called the ‘Anthropocene’. They proposed that this epoch could have commenced during the Industrial Revolution, with geological manifestations such as increased atmospheric greenhouse gases recorded in polar ice caps and biotic turnovers in recent lake sediments. Nevertheless, these authors did not dismiss the possibility that the Anthropocene might be older, potentially extending to encompass the entire Holocene Epoch.

In 2009, the SQS established a task group, the Anthropocene Working Group (AWG), to evaluate the possibility of the Anthropocene as a new series/epoch following the Holocene. As is customary in defining new chronostratigraphic units, the primary task of the AWG was to identify a rock body overlying the Holocene, characterized by differential stratigraphic markers, and to assess the age of its base by geological methods. For a prospect to be considered a genuine chronostratigraphic unit, such as a series/epoch, it must represent a planetary-scale phenomenon evident in globally synchronous rock strata. With all this information, the proposal should be submitted for approval to the SQS and the ICS Executive, and then to the IUGS for ratification.

After analyzing several possibilities – including the Late Pleistocene megafaunal extinction (50 thousand years before present; kyr BP), the Neolithic Revolution (8-5 kyr BP; depending on the region), the Columbian exchange (1500 CE), and the Industrial Revolution (1760 CE) (Lewis & Maslin, 2015) (Fig. 1) – the AWG concluded that the only globally synchronous geological manifestation of human disruption began with the

Great Acceleration (mid-20th century) (Head et al., 2022). This was marked by increases in radionuclides emitted by the first atomic bomb tests (1950s), as well as other stratigraphic markers such as fly ashes resulting from the combustion of fossil fuels, microplastics, pesticides, novel contaminants, and others. The AWG identified the first centimeters of sediments in Lake Crawford, Canada, as the type section for the Anthropocene Global Stratotype Section and Point (GSSP), or “golden spike”, along with other sediments and localities across all continents showing similar synchronous stratigraphic signals (McCarthy et al., 2023; Waters et al., 2023). The AWG proposal remains to be published but is available as a preprint (Waters et al., 2024).



**Figure 1.** Main prehistoric and historical features considered as potential starting points and stratigraphic markers for the onset of the ‘Anthropocene Epoch’, compared with the continuous increasing trend of the ‘Anthropocene Event’. The current AWG proposal is highlighted in green. Pleistocene and Holocene time scales (blue) are in thousand years before present (kyr BP) and last-centuries scale is in calendar years (CE).

This proposal was not without internal and external controversy. The main points of debate included the diachronic nature of human disturbance across the globe, hindering the identification of a single date for the beginning of the Anthropocene, and the argument that a mere 75 years could not represent a geological epoch, which typically spans tens of thousands to millions of years (Edwards, 2015; Finney & Edwards, 2015; Ellis et al., 2016). Additionally, concerns were raised about the vulnerability of the GSSP, consisting of only 10-15 cm of unconsolidated lake sediment, to removal by erosion or environmental changes such as lake drying. The AWG did not consider the diachronism in human disturbance across the planet, as this would have threatened its primary objective, which was to define a globally synchronous chronostratigraphic unit. The AWG was also reluctant to consider other possibilities, notably the ‘early Anthropocene’ as defined by Ruddiman (2003, 2013), which attributes mid-Holocene atmospheric greenhouse gas increases to large-scale deforestation and farming ( $\text{CO}_2$ ; 8-7 kyr BP) and rice cultivation in SE Asia ( $\text{CH}_4$ ; 6-5 kyr BP). These omissions resulted in internal conflicts and led to the resignation of some AWG members.

As the AWG was finalizing its proposal for submission to the SQS, a group of stratigraphers, including relevant members of the ICS and the IUGS, suggested a different proposal based on the spatiotemporal variability of human impact on Earth. They argued that the Anthropocene was better defined as a geological event (Gibbard et al., 2022a, b). Geological events are characterized by their time-transgressive and multi-temporal nature, ranging from seconds to millions of years and from local to global scales. Such events do not require GSSPs or formalization and can cause significant disruptions in the Earth System. For

instance, the Paleoproterozoic Great Oxidation Event (GOE), which lasted 4 billion years (2.4-2.0 Ga), fundamentally altered life on Earth by introducing an aerobic atmosphere. Other notable events include the Great Ordovician Biodiversity Event (GOBE; 485-455 Ma) and the Middle-Late Devonian forestation of continents (DeFE; 390-360 Ma).

In October 2023, the AWG finally submitted its Anthropocene proposal to the SQS, including the aforementioned GSSP (Lake Crawford), stratigraphic markers (radionuclides, fly ashes, etc.), and starting point (1952 CE) (Waters et al., 2024). Four months later, the proposal was rejected by the SQS with 12 votes against (66%, more than the 60% required), 4 in favor, and 2 abstentions. Consequently, progress toward approval by the ICS Executive and ratification by the IUGS was halted, and the case was considered closed by most SQS members. However, the AWG is currently seeking to declare the voting null due to procedural irregularities (Voosen, 2024; Witze, 2024). Finally, in March 2024, the rejection was ratified by the IUGS Executive (IUGS, 2024).

It is evident that the focus of scrutiny lies not in the magnitude of anthropogenic disturbance on the Earth System, widely accepted as fact, but rather on the specific proposal put forth by the AWG. Therefore, there is also the possibility of submitting another proposal. However, opponents argue that the outcome of the initial vote suggests that any subsequent proposal would likely face similar rejection (Gibbard, pers. comm.).

The difficulty of finding a globally synchronous starting point to define a formal series/epoch has led to reinforced support for the idea of the Anthropocene as an event, considered the most suitable term to encompass the full range of anthropogenic cultural and environmental effects (Walker et al., 2023). The only drawback is terminological. The termination ‘-cene’ was initially chosen by Crutzen & Stoermer (2000) because it is reserved for epochs of the Cenozoic Era (i.e., Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, Holocene). Therefore, referring to the Anthropocene as a geological event could be misleading and terminologically incorrect (Head et al., 2023).

Several years ago, I proposed the term ‘Humanized Earth System’ (HES), a name devoid of chronostratigraphic meaning, to describe the new physical and functional state of the planet under global human influence (Rull, 2016). By using the term ‘Earth System’ instead of simply ‘Earth,’ it underscores that human impact has extended beyond local and regional scales to affect the components of the Earth System (i.e., atmosphere, hydrosphere, lithosphere, biosphere, cryosphere) and their global interactions. This perspective has been consistently emphasized by the AWG in its publications (e.g., Zalasiewicz et al., 2019). Employing this concept, the recently proposed ‘Anthropocene Event’ could be more accurately termed the ‘Earth-System Humanization Event’ (ESHE), aligning with the current terminology for other events such as the aforementioned GOE, GOBE, DeFE, and others.

The term ‘humanized’ is preferred over the prefix ‘anthropo-’ because the latter simply refers to the human condition (from the Greek ‘anthropos’ meaning ‘human’), while the former emphasizes the impact of humans on the Earth System. The prefix ‘anthropo-’ had already been used in the late 18th century by Stoppani (1873) to define the prospective ‘Anthropozoic Era’, characterized by the occurrence of human fossils and objects linked to human presence. This author did not consider modern human ancestors such as *Australopithecus* and the extinct *Homo* species – he was a priest and, as such, did not believe in evolution – and was unable to date the beginning of this purported human era. Modern evolutionary knowledge and the use of current dating methods showed that Stoppani’s ‘Anthropozoic’ coincided almost perfectly with the current Quaternary Period, initiated approximately 2.6 million years ago (Rull, 2021). However, human influence on the Earth System, which is what the ‘Anthropocene’ concept – regardless of whether it refers to an epoch or an event – wants to emphasize, is much more recent and restricted to the last tens of thousands of years, at most (Lewis & Maslin, 2015).

In summary, if we must consider the human influence on the Earth System as a geological event, as defined by Gibbard et al. (2022a, b) and Walker et al. (2023), then the term ‘Earth-System Humanization Event’ (ESHE) – or alternatively the ‘Humanized Earth System Event’ (HESE) – appears more appropriate than the ‘Anthropocene Event’ from both terminological and conceptual points of view. In this context, the

prefix ‘anthropo-’ could be used to designate Stoppani’s ‘Anthropozoic Era’, which is based on qualitative (presence/absence) evidence, whereas the ESHE could be viewed as a quantitative feature, in terms of the intensity of human impact. If this were the case, then the ‘Anthropozoic Era’ would follow the Cenozoic, which would have ended with the appearance of the first remains of modern humans or hominins (Rull, 2021).

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