Perspective

The ‘Anthropocene’ is seen for sentencing

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Abstract: A proposal for the formalization of the ‘Anthropocene’ as a new geological epoch following the Holocene has just been submitted (31 October 2023) to the International Commission on Stratigraphy (ICS). This proposal, prepared by the Anthropocene Working Group (AWG) after 13 years of discussions, places the beginning of the ‘Anthropocene’ in the mid-20th century, and considers that the better-suited Global Stratotype Section and Point (GSSP) would be placed on the varved sediments of the Canadian Crawford Lake. The primary stratigraphic marker is considered to be the radioactive fallout resulting from the first nuclear weapon tests carried out in the 1940s and 1950s. These dates coincide with the Great Acceleration, characterized by an abrupt increase in the indicators of planetary anthropization. The AWG proposal is now being considered by the ICS Subcommission on Quaternary Stratigraphy (SQS), which can endorse or reject it, or ask for modifications. If endorsed, the proposal will be submitted to the ICS Executive for approval and, if approved, it will be sent to the International Union of Geological Sciences (IUGS) for ratification. The formalization of the AWG proposal is not guaranteed due to potential inconsistencies with the requirements of the International Stratigraphic Guide (ISG). Possible alternatives to an eventual rejection are briefly discussed.

Keywords; Anthropocene, Holocene, series/epoch, stratigraphy, formalization, International Chronostratigraphic Chart, Earth system, human impact

1. Introduction

Nearly 25 years since it was first coined, the 'Anthropocene' remains an informal stratigraphic (hence the use of quotation marks) with its exact definition and duration yet to be determined. Despite this, numerous academics continue to employ the term loosely as though it were a formal epoch of the Geological Time Scale (GTS). Maintaining scientific accuracy is crucial in geology just as it is in any field, requiring that the terminology and ideas applied undergo a process of being standardized and formalized.

The units of the Geological Time Scale (GTS) are displayed on the International Chronostratigraphic Chart (ICC) (Figure 1). To add a new unit (for instance, an erathem/era, a system/period, or a series/epoch) to the chart, it must adhere to the criteria set out in the International Stratigraphic Guide (ISG) [1] and receive approval from the International Commission on Stratigraphy (ICS), followed by ratification from the International Union of Geological Sciences (IUGS). This procedure mirrors the method used to introduce a new element into the Periodic Table of Elements (PTE), which is managed by the International Union of Pure and Applied Chemistry (IUPAC). Just as the PTE is essential for grasping the fundamental nature of matter, the ICC plays an equally crucial role in the field of Earth science and the understanding of evolution, regarded as one of humanity's significant accomplishments [2]. Without the ICC, comprehending the geological past of Earth and the development and progression of life on it would be unachievable, underscoring the need for meticulous scientific precision.

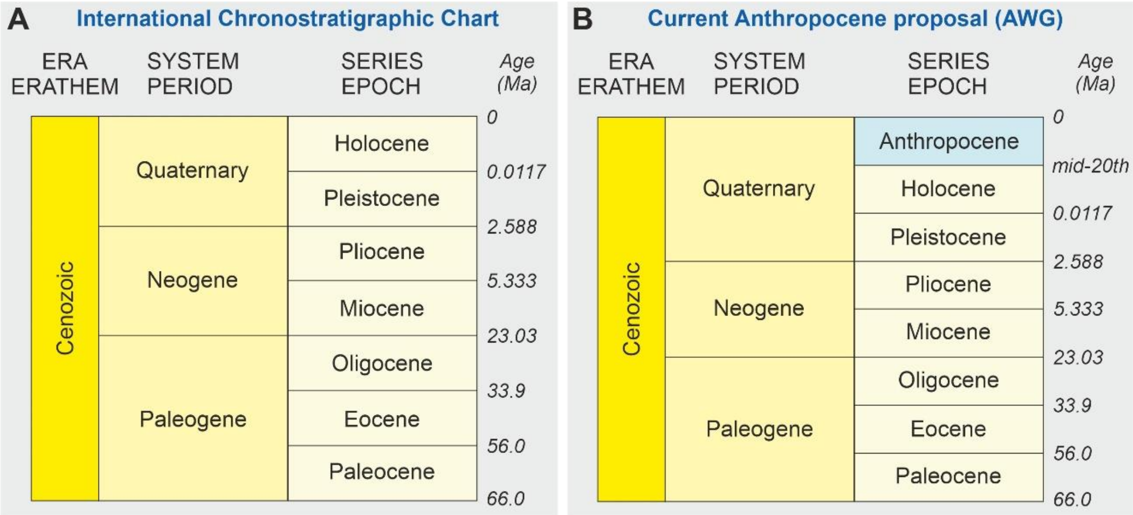

Figure 1. Part of the International Chronostratigraphic Chart (ICC) corresponding to the Cenozoic era/erathem. A) Current status (simplified from Ref. [3]). B) Proposal of the Anthropocene Working Group (AWG) for the 'Anthropocene' epoch (simplified from Ref. [4]).

The 'Anthropocene', as a prospect for a new geological epoch, was evaluated by the Anthropocene Working Group (AWG), which prepared a proposal that has recently been submitted to the ICS Subcommission of Quaternary Stratigraphy (SQS) for approval, as a first step for formalization. Until recently, the proposal was in a relatively embryonic state, but in the last years, a significant boost has occurred leading to its completion. This paper summarizes the main developments that have precipitated such recent acceleration, and presents the main traits of the proposal, as depicted in the most recent AWG publications. The proposal itself remains unpublished and the author has no access to its content, which remains confidential to the AWG and SQS members. Some alternatives to an eventual rejection of the current AWG proposal by the ICS/IUG are also briefly discussed. Other non-stratigraphic considerations around the term 'Anthropocene' are beyond the scope of this paper.

2. The AWG proposal: progress and critiques

The story began in the dawn of the 21st century, when Paul Crutzen, a Danish environmental chemist and Nobel laureate, alongside Eugene Stoermer, an American ecologist, introduced the term 'Anthropocene.' They did so to highlight that the worldwide impact of human actions on the Earth's system has exceeded the natural fluctuations observed during the Holocene era [5,6]. According to these authors, unless a major catastrophe of the magnitude of a global nuclear war, an asteroid impact, or a new ice age drastically reduces humankind on the planet, this situation will persist for millennia, possibly millions of years. Therefore, the establishment of a new geological epoch, the 'Anthropocene', would be needed following the Holocene.

According to Crutzen & Stoermer [5,6], the preferred starting date for the 'Anthropocene' epoch would be the beginning of the Industrial Revolution, in the late 18th century, and the main geological footprints would be the growth in the atmospheric concentrations of greenhouse gases (CO_2, CH_4) recorded in polar ice cores, along with dramatic shifts in biotic assemblages, as recorded in lake sediment cores (Figure 2). These manifestations would be the consequence of the ongoing anthropogenic global change, notably the global warming, and coincided chronologically with the invention of the steam engine by James Watts. Therefore, these authors proposed using an environmental concept to define a new unit of the GTS. It is important to mention that the suffix '-cene' in the name of this new unit explicitly indicates its classification as a series/epoch, since this suffix is specifically allocated for the series/epochs within the Cenozoic erathem/era, such as the Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, and Holocene.

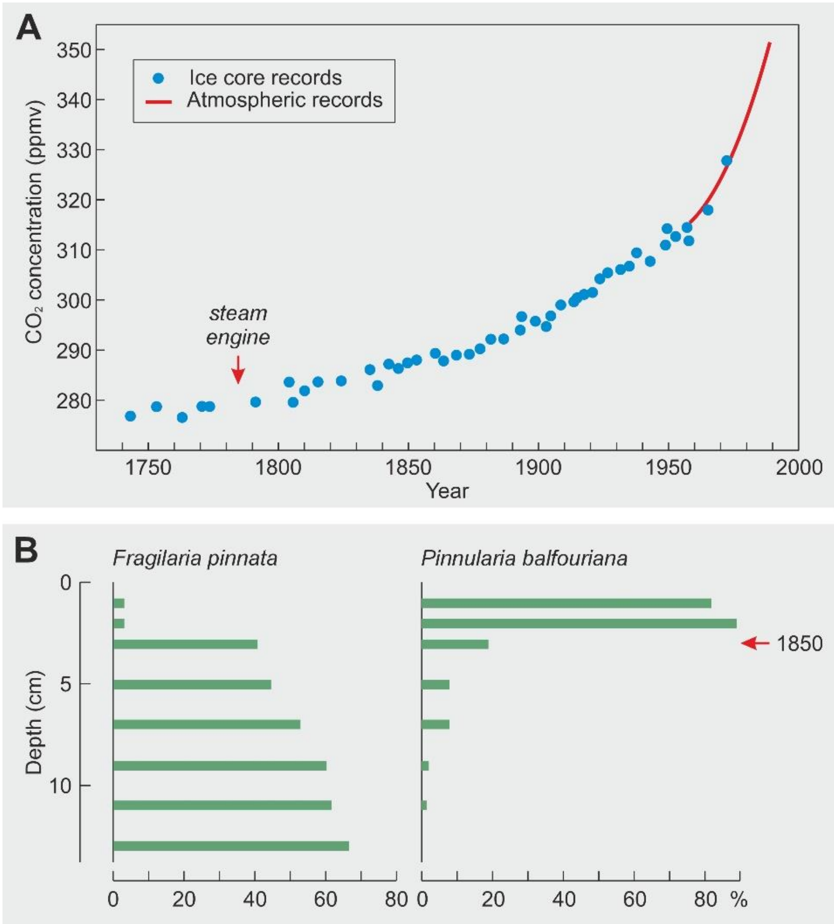

Figure 2. Examples of geological imprints cited by Crutzen & Stoermer [5,6] to situate the beginning of the ‘Anthropocene’ in the Industrial Revolution. A) Increase in atmospheric CO_2 concentration during the last two centuries, as measured in ice-core records from Siple Station (Antarctica). The red line represents instrumental measures from Mauna Loa (Hawaii). Modified from Ref. [7]. B) Changes in the dominance of diatom assemblages in the transition from 18th to 19th centuries, as recorded in the sediments of Ellison Lake (Ellesmere Island, Canada), and attributed to global warming. Simplified from Ref. [8].

This idea of a new ‘Anthropocene’ series/epoch began to be analyzed in 2009 by the AWG, which was created specifically for this purpose and was led by the British geologists Jan Zalasiewicz (2009-2019) and Colin Waters (2019 onward). Presently, the AWG has 34 members, and the decisions are taken by voting, with a supermajority of 60% required. Usually, the ICS grants four years to the working groups to complete a proposal, but in the case of the ‘Anthropocene’, the process has taken approximately 13 years [4,9-11]. Among the potential causes for this delay, there has been an intense debate between the AWG and influential members of the ICS and the IUGS on several aspects, such as the nature of the stratigraphic unit to be defined and its starting point, that is, the time when the Earth system, as a whole, became primarily anthropogenic.

The ‘Anthropocene’ critics – including key figures such as the ICS Secretary General, British geologist Philip Gibbard, and the IUGS Secretary General, American geologist Stanley Finney, both of whom playing a central role in the approval and ratification process of the AWG proposal – emphasize that this new epoch is currently defined as a historical phase based on environmental criteria. However, for a chronostratigraphic unit to be officially recognized, it needs to be identified by unique and defining rock formations according to the standards set by the ISG [12-15]. Following these guidelines, the initial phase involves pinpointing the rock layers that signify the new unit along with the specific characteristics that set it apart from the unit below it, known as stratigraphic markers. Subsequently, the base of the new unit is determined through geological dating techniques to establish the temporal context.

Altogether, this body of evidence is known as the Global Stratotype Section and Point (GSSP) and should be recognizable globally. Usually, the GSSP is marked in the field, at the base of the chronostratigraphic unit that defines, by a ‘golden spike’ (Figure 3). Although the type of rock and the stratigraphic markers could be different depending on the site and its specific environmental features, the new unit must represent the same global phenomenon. For example, the GSSP of the Holocene series/epoch is in a Greenland ice core and the stratigraphic markers are changes in the deuterium and oxygen isotopes that mark a clear shift from glacial to interglacial conditions. Other equivalent locations around the world, the auxiliary stratotypes, have been found that are based on different rocks (lacustrine and marine sediments) and stratigraphic markers (physicochemical and biological proxies) but all of them record the same phenomenon, i. e. the end of the last glaciation, and are globally isochronous, which means that they occur at the same time across the globe [16].

Figure 3. Golden spike for the Campanian GSSP (Upper/Late Cretaceous; 83.6±0.2 Ma) in Gubbio (Italy). Composed from Ref. [17].

Without a (GSSP), gauging geological time becomes unfeasible, rendering the delineation of a new chronostratigraphic unit meaningless. It's crucial to understand that rock layers are the sole evidence for assessing geological time. In the absence of rocks, time may elapse, but its passage cannot be quantified through geological techniques. This scenario is akin to a sandglass devoid of sand, where time's progression cannot be tracked.

For the 'Anthropocene,' both the GSSP and its worldwide representation have yet to be established. During the 35th International Geological Congress in Cape Town, South Africa, in August 2016, the Anthropocene Working Group (AWG) agreed to mark the beginning of the 'Anthropocene' in the mid-20th century. This period aligns with the so-called Great Acceleration, characterized by a sharp rise in several indicators of human impact on the Earth [18] (Figure 3). The primary stratigraphic indicator suggested was the fallout of radionuclides, especially plutonium (^{239}Pu) and radiocarbon (^{14}C), from nuclear weapons testing during the 1940s and 1950s [4]. Thus, a preliminary date and environmental-based stratigraphic markers were proposed prior to the formal identification of a GSSP. This approach deviates from the guidelines of the ISG and the empirical foundation of stratigraphy, a point of contention highlighted by critics.

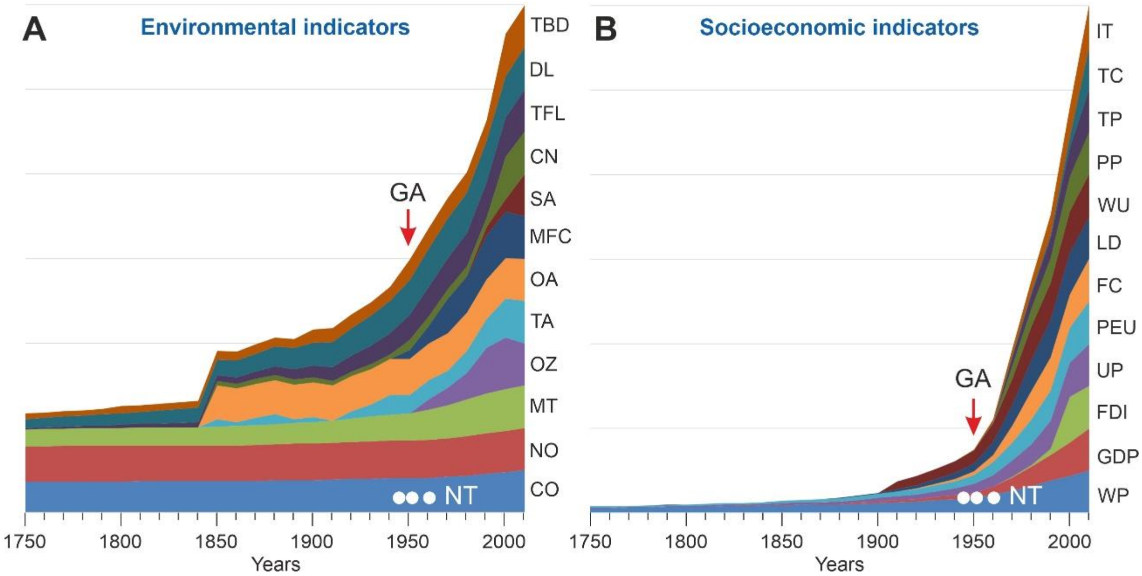

Figure 4. Relative trends of environmental and socioeconomic indicators since 1750. Data scaled to 2010 value for each category. The Great Acceleration (GA; 1950) onset is marked by a red arrow, and the first nuclear weapon tests (NT; 1945, 1952, 1961) are indicated by white dots. Environmental indicators: TBD, terrestrial biosphere degradation (3,53 to >28.57% decrease of mean species abundance); DL, domesticated land (0.08 to >0.38 of total land area); TFL, tropical forest loss (0.96 to >27.6 of total compared to 1700); CN, coastal nitrogen (0 to >79.7 Mt/y); SA, shrimp aquaculture (>3.77 Mt); MFC, marine fish capture (>64.14 Mt); OA, ocean acidification (>5.21 nmol/kg); TA, temperature anomaly (>0.47°C); OZ, Ozone depletion (>54.09%); MT, methane 705.34 to 1744.07 ppb); NO, nitrous oxide (271.39 to >322.46 ppb); CD, carbon dioxide (276.81 to >384.27 ppm). Socioeconomic indicators: IT, international tourism (0 to >939.9 10^6 arrivals); TC, telecommunications (0 to 6.48 10^9 landlines); TP, transportation (0 to 1281.35 10^6 vehicles); PP, paper production (0 to 398.77 Mt); WU, water use (0 to 3.87 10^3 km^3); LD, large dams (>15 m height; 0.06 to 31.63); FC, fertilizer consumption (171.46 Mt); PEU, primary energy use (16 to 533.37 exajoule); UP, urban population (0.05 to 3.5 10^9); FDI, foreign direct investment (0 to 1.3 10^{12} USD); GDP, real gross domestic product (0.35 to 50.15 10^{12} USD); WP, world population (0.73 to >6.9 10^9). Modified from Ref. [19].

The proposal by the AWG has faced significant criticism, not just for the method employed but also for overlooking other suggested start dates. Initially, Crutzen and Stoermer [5.6] had proposed that the 'Anthropocene' might cover the recent centuries, millennia, or even the entirety of the Holocene. Subsequently, a variety of studies have offered a broad spectrum of possible dates within this period, such as the Middle Holocene increase of greenhouse gases due to the global neolithization, also known as the ‘early Anthropocene hypothesis’ [20,21], or the worldwide cultural and biotic exchange initiated with the Columbian arrival to America, also known as the ‘Orbis hypothesis' [22], among others. These studies have also emphasized the heterogeneous and diachronic nature of human impact across the globe and the difficulty of identifying a particular starting point of global reach for the anthropization of the Earth system [22,23]. This introduced a new drawback because, according to the ISG rules, a new chronostratigraphic unit of the ICC cannot be defined based on a diachronic boundary.

In 2019, at the request of the ICS, the AWG reaffirmed its chronological definition, which confirmed that the proposal for the 'Anthropocene' series/epoch to be submitted to the ICS/IUGS will consider the mid-20th century as the starting date (Figure 1). Although opponents argue that, so defined, the available sedimentary record accumulated in barely 70 years is insufficient to characterize a geological series/epoch, the AWG concentrated on identifying the GSSP representative of this time period, that is, a rock body that met the pre-established conditions.

3. Latest developments

In the last few years, the AWG prospect has undergone a significant boost that has been decisive for the development of the final proposal. Following an exhaustive examination of the evidence [11,24], the working group determined that the optimal sites for the 'Anthropocene' GSSP are paleoarchives capable of offering high-resolution (annual or seasonal) data from the 20th century. These include (i) sediments with yearly layers (varves) found in lakes, coastal seas, and anoxic marine areas; (ii) yearly growth layers observed in trees, corals, mollusks and speleothems; and (iii) annual/seasonal accumulation layers from glacial ice caps. These archives can provide the chronological reliability and resolution needed for a precise identification of the first appearances of the appropriate markers and hence of the beginning of the 'Anthropocene'.

The most suitable (primary) markers should meet the condition of being widespread and globally correlatable. This is the case for the previously mentioned radionuclides (^{239}Pu and ^{14}C) and the ^{13}C stable isotope, which are found worldwide across most sedimentary environments. Other supporting (secondary) markers identified were fly ash, lead (Pb), biological proxies for significant turnovers and anthropogenic introductions, and stable isotopes such as $\delta^{15}N$ or $\delta^{18}O$, among others (Table 1).

Table 1. The localities of Figure 4, with indication of the type of archive, the date suggested for the beginning of the 'Anthropocene' in each site (A-onset), the thickness of the 'Anthropocene' sediments (A-thick) in cm, and the stratigraphic markers used. AAs, anthropogenic artifacts; BTIs, biotic turnovers/anthropogenic introductions; HD, historical documentation; LT, lithology; SCPs, spheroidal carbonaceous particles (fly ash). Raw data from Ref. [25].

Site	A-onset	A-thick	Stratigraphic markers
East Gotland (anoxic marine basin)	1956±4	26.5	LT, ^{239}Pu, ^{241}Am
San Francisco (estuary)	Mid-20th	230 (?)	Unclear
Searsville (lake)	1948	366	^{239}Pu, SCPs, Pb, BTIs
Crawford (lake	1950	15.6	^{239}Pu, SCPs, $\delta^{15}N$, BTIs
Sihailongwang (lake)	1953	8.8	LT, ^{239}Pu, ^{129}I,^{14}C, SCPs, PAHs, $\delta^{13}C$
Flinders (coral reef)	1958	36.9	^{239}Pu, ^{14}C, Sr/Ca, $\delta^{18}O$, $\delta^{15}N$
West Flower Garden (coral reef)	1957	28.4	^{14}C, ^{239}Pu
Palmer (ice sheet)	1952	3490	^{239}Pu, SCPs
Ernesto (cave speleothem)	1960±3	0.4	^{14}C, S
Śnieżka (peatland)	1950-1955	39.5-44.5	^{239}Pu, ^{14}C, BTIs
Beppu (bay)	1953	64.6	LT, ^{239}Pu, ^{210}Pb, $\delta^{15}N$
Vienna (urban deposits)	1945-1959	30	^{239}Pu , AAs, HD

Merging the most appropriate archives and markers, a total of 12 sites worldwide were identified for detailed examination as potential GSSP locations (Figure 4; Table 1).

By analyzing the geological records from these sites alongside the previously mentioned stratigraphic indicators, the onset of the 'Anthropocene' was preliminarily identified to be between 1945 and 1968, with a majority of the dates falling in the 1950s. Consistent with earlier predictions, plutonium emerged as the predominant primary marker of the 'Anthropocene' across these locations [25]. Following an in-depth analysis of each site, the AWG determined that the most suitable candidate for the GSSP was Crawford Lake in Canada, whereas the other candidates could serve as supporting localities useful for global correlations. The announcement was intended for the 4th International Congress on Stratigraphy celebrated on July 2023 in Lille (France), but this was not allowed and was finally made in parallel in a press conference specially organized for this purpose by the AWG and the German Max Plank Society.

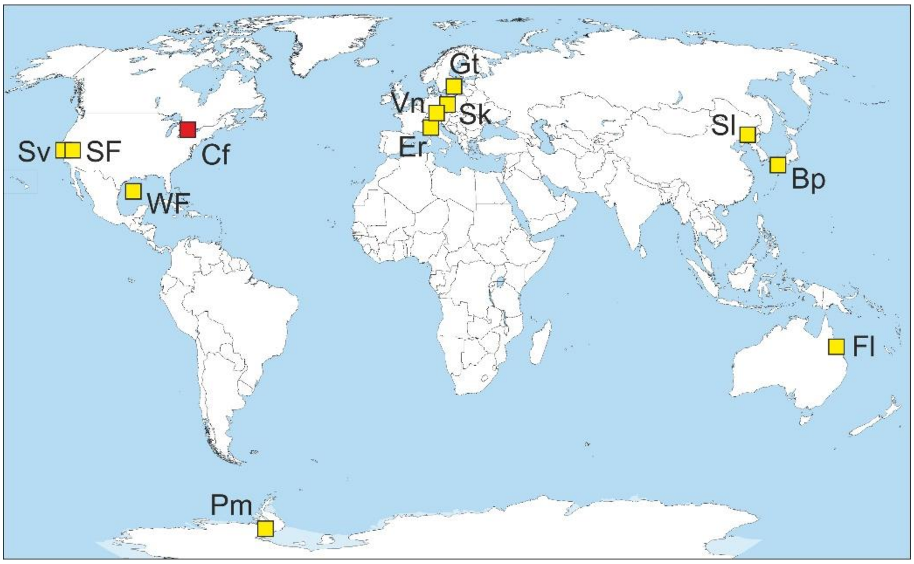

Figure 5. The 12 localities selected by the AWG to determine the most suitable GSSP for the 'Anthropocene'. The locality selected by the AWG as the best GSSP candidate (Crawford Lake; Cf) is highlighted in red. Bp, Beppu (Japan); Cf, Crawford (Canada); Er, Ernesto (Italia); Fl, Flinders (Australia); Gt, Gotland (Baltic Sea); Pm, Palmer (Antarctica); SF, San Francisco (USA); Sk, Śnieżka Poland); Sl, Sihailongwang (China); Sv, Searsville (USA); Vn, Vienna (Austria); WF, West Flower Garden USA). Redrawn from Ref. [25].

The Crawford Lake sediments are formed by clearly visible annual laminations consisting of dark (organic)/light (calcite) seasonal couplets, which provide a continuous and detailed chronology for the 20th century (Figure 5). Within these sediment layers, the signal from nuclear bomb tests, particularly ^{239}Pu), is distinctly evident at a depth of about 15 cm, dating back to 1950. This demarcation is identified by a notably slender layer of calcite, attributed to an increased influx of terrestrial material from the surrounding basin, a consequence of the swift industrial growth during the Great Acceleration. This period also saw a sharp decrease in elm pollen, linked to a well-documented epidemic affecting this species of tree. Other stratigraphic markers of the GSSP horizon included a ^{137}Cs peak; increases in fly ash and elements such as Fe, K, Ti, Cu and Pb; and declines in $\delta^{15}N$ and Ca [26].

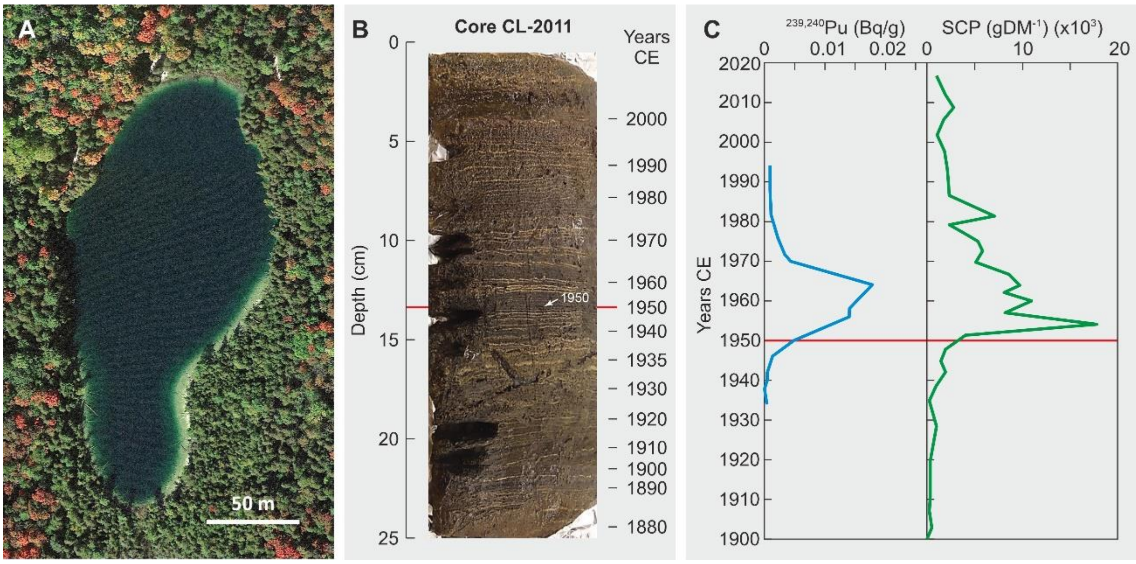

Figure 6. The sediments of Crawford Lake as the 'Anthropocene' GSSP with the lower 'Anthropocene' boundary marked by a red line. A) Google-Earth image of the lake showing its small size. B) The top-25 cm from core CL-2011 representing the last century, as dated from varve counting. C) The main stratigraphic markers, plutonium fallout (^{239,240}Pu) (blue) and spheroidal carbonaceous particles (SCP) (green), showing the significant peaks at the beginning of the 'Anthropocene'. Composed from Ref. [26].

Critics, notably American geologist and former ICS member Lucy Edwards, contend that a mere few centimeters of loose lake sediments could easily be disturbed or even entirely removed – with the potential for the entire lake to evaporate within a few hundred years or millennia, thus permanently eliminating the 'Anthropocene' GSSP. Similar concerns apply to other proposed locations, taking into account factors like changes in sea level and erosion from exposure to air, among other destabilizing elements [27]. Nonetheless, the AWG has reached a decision, and the final proposal, which has yet to be published, is expected to appear in the 2023 AWG Newsletter, accessible through the task group's website [28].

Summarizing the AWG-published information, the 'Anthropocene' as a new geological epoch following the Holocene would have commenced in 1950 and its GSSP would lie in the sediments of Crawford Lake, at a depth of 15.6 cm. The primary stratigraphic marker would be the radionuclide fallout (^{239}Pu), which resulted from mid-20th century bomb tests. Other localities widespread worldwide may serve as auxiliary sections, and other proxies signaling the global influence of human activities (notably ^{14}C, fly ash, heavy metals and stable N/O isotopes) could be used as auxiliary stratigraphic markers.

4. Last-minute complications

In the last couple of years, while the AWG was finalizing the analysis and selection of GSSP candidates, a new development has arisen that could potentially undermine the advancements achieved by this working group over the past ten years. Indeed, all the work developed to date by the AWG has been based on the idea of the 'Anthropocene' as a prospective geological series/epoch, as initially proposed by Crutzen & Stoermer [5,6]. However, a team of stratigraphers now proposes that the 'Anthropocene' might be more accurately described as an event. This perspective could impact the formalization process, especially since this team encompasses the most prominent critics of the ICS/IUGS mentioned earlier.

A geological event represents a concept that transcends specific time frames and is not recognized within the GTS/ICC; hence, it doesn't require standardization to a precise moment in time like a GSSP. This allows for the recognition of the diverse temporal and spatial impacts of human activity on the planet. Events in geology are significant, potentially leading to major global changes, surpassing even those effects attributed to human actions. An illustrative example is the Great Oxidation Event (GOE), which significantly altered evolutionary paths, paving the way for multicellular life forms and terrestrial ecosystems. The GOE unfolded over a broad time span of around 300 million years (2400-2100 Ma), highlighting its nature as a prolonged transformation rather than a singular moment.

Gibbard et al. [29,30] suggest that the term 'Anthropocene Event' could cover a wider array of human-induced changes across both time and space than the term 'Anthropocene Epoch' might imply. In response, the Anthropocene Working Group (AWG) pointed out that the 'Anthropocene Event' framework encompasses a broad spectrum of human activities with effects ranging from local to global, spanning the last 50,000 years. This, they argue, dilutes the focus on the recent, sudden changes affecting the entire Earth system, which is the primary focus of the 'Anthropocene Epoch.' Furthermore, they noted that the suffix '-cene' is traditionally used for epochs within the Cenozoic era and argued that it is not suitable for naming an event, highlighting a terminological inaccuracy.

5. Potential outcomes

The AWG) proposal was officially presented to the ICS on October 31, 2023, and is currently undergoing review. The initial review process involves the SQS, co-led by prominent AWG figures Zalasiewicz (Chair) and Martin Head (Vice-Chair) from Canada. If approved, for which a minimum 60% majority is needed, the proposal will be evaluated by the ICS Executive Committee, where Phil Gibbard, a known critic of the proposal, serves as Secretary General. The review process, particularly at the SQS level, is expected to be thorough and may not proceed swiftly, as there is no predetermined timeline for the evaluation. Should the ICS approve the proposal, it will then be forwarded to the IUGS for final ratification, where another significant critic of the AWG proposal, Finney, holds the position of Secretary General. Again, a detailed re-evaluation may be needed. If the ICS and the IUGS reach an agreement before summer this year, the final decision could be announced in the 37th International Geological Congress to be held at Busan (South Korea) in late August, 2024. Waters, the present chair of the AWG, has stated that the success of these stages is not assured, and there has been no initial response from the ICS. This lack of feedback is due to the ICS Executive prevented AWG members from engaging in discussions about the matter with members of the SQS.

The risk of the 'Anthropocene' proposal not being formalized, in its current status, is real, and the AWG is aware of this. The fact that several relevant ICS/IUGS members, who should vote for final approval/ratification, have repeatedly questioned AWG decisions strongly suggests this possibility. Significantly, the AWG consistently maintained its stance and responded to criticisms without reevaluating the points in question. [33,34], which did not help in altering the viewpoint of the opposition. This situation fostered the interest of the author in potential alternatives to the eventual rejection of the current 'Anthropocene' prospect and approached a number of AWG, ICS and IUGS members to ask for their input on this matter [35]. The IUGS members who were contacted declined to comment on the issue arguing that, as members of the organization responsible for the final decision, they preferred not to express their personal opinion on the subject.

AWG members, notably Zalasiewicz and Head, were reluctant to revise their proposal to reclassify the 'Anthropocene' as merely another stage or age within the Holocene, despite suggestions from Gibbard and other detractors. They argued that the alterations attributed to the 'Anthropocene' far exceed the scope of changes defined by existing subdivisions of the Holocene. Curiously, the possibility of a chronostratigraphic unit of higher rank – such a system/period, the ‘Anthropogene’ [36], or an erathem/era, the ‘Anthropozoic’ [37] – has not been considered by the AWG, as emphasized by Edwards. When asked for an eventual plan B, Zalasiewicz responded that no such alternative exists and affirmed the AWG commitment to the 'Anthropocene' concept, as originally defined by Crutzen (who was also a member of the AWG) and Stoermer. ICS members, including Gibbard and Edwards, remarked that the term 'Anthropocene' will persist in a cultural context to highlight human impact on global environmental challenges, an issue they noted falls outside the expertise of stratigraphic bodies.

The debate is detailed in Ref. [35], yet the overriding sentiment is that both supporters and critics of the 'Anthropocene' proposal are steadfast in their views, showing little inclination towards altering their stance. The AWG has already crossed its Rubicon, and the focus now shifts to awaiting the outcome from the SQS. This Subcommission can approve, reject, or suggest changes to the proposal. It is crucial to understand that a rejection would not negate the 'Anthropocene' as a stratigraphic term and concept but rather the specific proposal put forth by the AWG. Thus, the door remains open for a new proposal. Waters has noted that opinions among SQS members are divided, with some strongly in favor and others firmly against the AWG proposal, making the outcome unpredictable, especially given the requirement for a 60% majority. *Alea iacta est*.

6. Final remarks

Should the AWG proposal receive approval and ratification from the ICS and IUGS, individuals over the age of 74 years (born before 1950) would be classified as having been born in a previous geological epoch, the Holocene. Consequently, this categorization implies that over 310 million people, nearly 4% of the global population (raw data from Ref. [38]), might be regarded as authentic living fossils from the Holocene epoch, whereas the remaining 96% would be of Anthropocene origin. The fossils would correspond to the so-called Lost Generation (Gen) and part of the Greatest Gen, whereas most Silent Gen, and all Boomers, Gen X, Millennials, Gen Z and Gen Alpha would be Anthropocene (Figure 7). According to this, some famous Holocene living fossils would be the Dalai Lama, Pope Francis, King Charles III, Hilary Clinton, Paul McCartney, Barbra Streisand, Mick Jagger, Yoko Ono, Bob Dylan, Cher, Arnold Schwarzenegger, Jack Nicholson, Meryl Streep, Clint Eastwood, Sophia Loren, Robert de Niro, Billie Jean King, Mark Spitz, Eddy Merckx, Emerson Fittipaldi or Kareem Abdul-Jabbar, among many others.

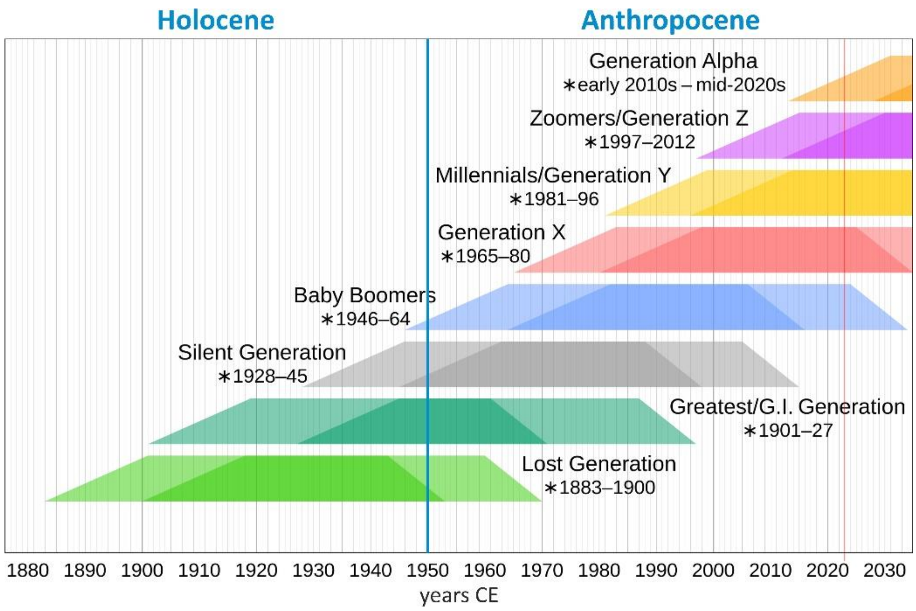

Figure 7. Timeline of generations in the Western World showing the Holocene/Anthropocene boundary (blue line) according to the current AWG proposal. Modified from Ref. [39].

This situation would be similar to the first century of the Holocene, when Pleistocene and Holocene humans coexisted. The main difference is that, in those times, the GTS had not been created yet and these humans were unaware that, according to the current standards, they were crossing a geological boundary. Today, we have the opportunity to experience how a situation like this could be but, as the Early Holocene humans, we ignore how future scholars from the next millennia will subdivide geological time (or whether they will do this at all) and whether the 'Anthropocene' geological footprint will grow and consolidate, as expected by the AWG members, will remain stationary or will be removed by natural and/or anthropogenic agents.

The 'Anthropocene' will only make sense in the first case and under the current chronostratigraphic standards. In other words, the 'Anthropocene' will consolidate as a true geological epoch only if we keep deteriorating the planet and this is manifested in sedimentary rocks. If this is the case, our species may disappear from the face of the Earth or may undergo a global collapse, as anticipated by Crutzen & Stoermer [5,6]. In both cases, the continuity of the current chronostratigraphic framework is not guaranteed and the 'Anthropocene' could be the last unit of the ICC [40]. If, on the contrary, we are capable of deeply changing our life standards and attaining a sustainable planet in time (say, in the next centuries), the geological footprint of the 'Anthropocene' will remain as a fragmentary witness of an ephemeral historical phase insufficient to define a geological epoch, or will eventually vanish, thus losing any geological entity. Therefore, defining the 'Anthropocene' as a new geological epoch implicitly accepts that we will be unable to stop our harmful impact on the planet for millennia or millions of years, provided we persist that long and keep using the ICC.

As stratigraphy is concerned with the past and not with the present or the future [14,15], this possibility cannot be evaluated using stratigraphic methods. Therefore, the formalization or not of the current AWG 'Anthropocene' proposal is a big challenge, whose final outcome is totally unpredictable and may deeply affect the future developments of the current chronostratigraphic framework [41].

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Data Availability Statement

No new data are provided.

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Conflicts of Interest

The author declares no conflict of interest.

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