Progress in assessment of the Anthropocene Series in the Geological Time Scale (GTS)

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The Anthropocene as a concept originated in 2000, suggested by Paul Crutzen in an Earth System science context. Only later was it considered as a putative geological series, including in GTS2012 (Zalasiewicz et al. 2012). This was barely three years after the establishment of the Anthropocene Working Group (AWG), tasked by the Subcommission on Quaternary Stratigraphy to examine the Anthropocene for potential inclusion in the GTS and to formulate a definition. In GTS2012 a likely generalised stratigraphic signature was postulated to comprise: a) lithostratigraphic signals, both direct modification of the landscape and indirect influences on sedimentary facies through rapidly modifying drivers; b) sequence stratigraphic signals due to modern sea-level rises, envisaging a near-future marine transgression; c) biostratigraphic signals through increased extinction rates, range changes especially through unprecedented rates of species invasions; and d) chemostratigraphic signals including inorganic and organic contaminants, isotopic shifts of carbon and nitrogen and fallout from nuclear bomb testing. By the time of GTS2020 (Zalasiewicz et al. 2020), not only could specific examples of temporal variations in many of these proxies be demonstrated, but also numerous new proxies, such as inorganic crystalline mineral-like compounds, microplastics, fuel ash and black carbon had been demonstrated and more information was available on the scale of human terraforming of landscape and anthropogenic modification of river systems. Further, the intervening eight years had seen a strengthening of the evidence of climate warming, sea-level rise and ocean acidification.

In GTS2012, three levels for the beginning of the Anthropocene were considered: the Early Holocene; the onset of the Industrial Revolution; and the mid-20th century, and only the first option was definitively excluded. GTS 2020 was able to report the findings of the AWG that the Anthropocene represented “geological reality”, was best considered at epoch level, should be linked with the plethora of proxies that initiate or show marked perturbations at around the 1950s and is best defined using a GSSP. In GTS2020, the ongoing task of researching potential GSSP candidate sections for the Anthropocene Series was also outlined and this work is anticipated to be completed by 2022. The eleven current sites encompass diverse environments that will best preserve the extensive range of proxies suitable for characterising the prospective Holocene–Anthropocene transition. All sections will be in borehole/drill cores, most showing annually resolved laminations that can be independently dated radiometrically to confirm a complete succession extending back to pre-Industrial times. The strengths and weaknesses of
distinct environments are discussed in GTS2020 for lake deposits, marine anoxic basins, estuaries and deltas, speleothems, glacial ice, coral reefs, trees and peat. The evidence collected already suggests that the Anthropocene may be widely recognised and delineated as a sharply distinctive chronostratigraphic unit reflecting major Earth System change that will have geologically lasting consequences.
