



## Defining the Anthropocene

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Time is divided by geologists according to marked shifts in Earth's state. Recent global environmental changes suggest that Earth may have entered a new human-dominated geological epoch, the Anthropocene. Should the Anthropocene – the idea that human activity is a force acting upon the Earth system in ways that mean that Earth will be altered for millions of years – be defined as a geological time-unit at the level of an Epoch? Here we appraise the data to assess such claims, first in terms of changes to the Earth system, with particular focus on very long-lived impacts, as Epochs typically last millions of years. Can Earth really be said to be in transition from one state to another? Secondly, we then consider the formal criteria used to define geological time-units and move forward through time examining whether currently available evidence passes typical geological time-unit evidence thresholds. We suggest two time periods likely fit the criteria (1) the aftermath of the interlinking of the Old and New Worlds, which moved species across continents and ocean basins worldwide, a geologically unprecedented and permanent change, which is also the globally synchronous coolest part of the Little Ice Age (in Earth system terms), and the beginning of global trade and a new socio-economic “world system” (in historical terms), marked as a golden spike by a temporary drop in atmospheric CO<sub>2</sub>, centred on 1610 CE; and (2) the aftermath of the Second World War, when many global environmental changes accelerated and novel long-lived materials were increasingly manufactured, known as the Great Acceleration (in Earth system terms) and the beginning of the Cold War (in historical terms), marked as a golden spike by the peak in radionuclide fallout in 1964. We finish by noting that the Anthropocene debate is politically loaded, thus transparency in the presentation of evidence is essential if a formal definition of the Anthropocene is to avoid becoming a debate about bias. The Anthropocene is essentially the time when human history meshes with near-permanent changes to the Earth system and some of those changes are preserved as geological deposits. A satisfying theory and definition of the Anthropocene will ideally rest on intertwined evidence from disparate human history and natural science disciplines. Such a definition may not be possible, and different disciplines many utilise different definitions. However, any scientific definition of the Anthropocene Epoch should be transparently evidence-based.