

First atomic bomb test may mark the beginning of the Anthropocene

January 30 2015, by Jan A. Zalasiewicz And Mark Williams



16 milliseconds after the beginning of the Anthropocene: The Trinity nuclear test. Credit: Los Alamos National Laboratory

Human beings don't merely inhabit the world. They alter it, on an increasingly epic scale. It is said that we now live in a new epoch, the Anthropocene, in which geology and climate are controlled as much by human activity as anything else. How should we mark the beginning of this new stage in the life of our Earth?

A new study suggests that the Trinity test, the first demonstration of a nuclear weapon, should mark the death of the previous epoch, the Holocene, and beginning of the new one, the Anthropocene.

Human beings as geological force

Geology used to be strictly a business of rocks, minerals and fossils. This can be useful – for finding oil and coal, and those diamonds and gold nuggets too. But these things were also unimaginably old. So this happy science mostly kept its distance from the messier domains where human complexity ruled.

That is no longer true. The last few decades have seen an ever-greater realisation of how closely tied humans are to the Earth. Those 60-plus metals and minerals in your mobile phone must come from somewhere (and they're increasingly hard to find). But there's the other side of the coin. As we build our lives from the Earth, so we change the Earth, too.

The changes here, once we add them up, can be staggering. The extraction of a few hundred million years worth of buried carbon, funnelled into the atmosphere as carbon dioxide, is a phenomenon of extraordinary scale and speed in Earth's history. We already have an atmosphere like that of Pliocene times, 3m years ago – and the warmer climate and higher sea levels of that epoch look set to follow.

We have doubled the amount of reactive nitrogen at the Earth's surface – and one might have to go back billions of years to find a similar perturbation. The biosphere is now increasingly influenced by the alien species that we have carried from continent to continent and from ocean to ocean. Such a global reshuffling has never, ever happened before in Earth's history. We might be creating extraordinary new rock strata, in the form of our megacities.

Nukes mark the spot

This makeover of our planet was termed the Anthropocene some 15 years ago by the Nobel Prize-winning atmospheric chemist, [Paul Crutzen](#). Since then, geologists have been scrambling to see whether the idea has geological reality and how it might be defined as a new geological epoch.

In a paper published in the journal [Quaternary International](#), members of the Anthropocene Working Group, including us, have suggested that the key turning point happened in the mid-20th century. From this point onward, humans did not merely leave traces of their actions, but began to alter the whole Earth system.

While it is difficult to be completely precise about the boundary between epochs (which are typically defined in the millions of years) 26 of the 38 members on the panel agreed that July 16, 1945, the date of the world's first nuclear test, is a "practical and effective" choice.

The Trinity test was conducted at 5.30 AM in the New Mexico desert. In the wake of the test, J. Robert Oppenheimer – director of the Los Alamos laboratory which produced the bomb – is quoted as saying,

We knew the world would not be the same. A few people laughed, a few people cried, most people were silent. I remembered the line from the Hindu scripture, the Bhagavad-Gita; Vishnu is trying to persuade the Prince that he should do his duty and, to impress him, takes on his multi-armed form and says, 'Now I am become Death, the destroyer of worlds.'

While the panel members emphasise that the proposed boundary is not absolute, this marker is very distinct and easy to measure: since the first test, further bombs were detonated in the desert at an average rate of one every 9.6 days until 1988, leading to worldwide fall-out. This has left a characteristic radioactive marker in rocks, a signal which future

generations should be able to measure for millenia.

Like any geological boundary, it is not a perfect marker – levels of global radiation really rose in the early 1950s, as salvos of bomb tests took place. But it may be the optimal way to resolve the multiple lines of evidence on human-driven planetary change.

Great acceleration

The Anthropocene has struck a chord in the wider world that none of the other geological time units have done – not even the dinosaur-haunted Jurassic. There are several reasons for this.

First, the rapidly evolving world of the Anthropocene is quite unlike the world in which human civilisation arose, over many generations, when nature could be regarded as a more or less stable backcloth that humans could generally rely upon – and seek to tame.

Now the accelerating changes to the world's physical composition, chemistry and biology are taking us somewhere else – and how we cope with that new state will be a matter of life or death for many human generations to come. Nature is no longer a backcloth. Human-created technology is now creating a new kind of emergent system on Earth.

Second, our own species is currently the main driver in altering present and future geology. This gives problems to the geologist. Previous drivers of great changes to the Earth included great volcanic outbursts, meteorites and tectonic rearrangements of continents and oceans. These are quite complex enough as problems, but at least they are familiar ground to Earth scientists.

In the Anthropocene we are dealing with complex human attributes: economic, political and military forces are altering global geology. This

is not at all familiar ground for the average geologist – but it is a fruitful and important interface to be explored with historians, economists, lawyers and others in human-focused disciplines, in trying to understand what is happening to the Earth.

Finally, the changes taking place now are not simply yet another in the long succession of episodes of [climate change](#) and of mass extinction events that have affected the Earth. There really does appear to be [something new under the sun here](#), to borrow the historian John McNeill's phrase.

For a single species to be effectively top predator on both land and in the sea has no precedent, neither is there anything in Earth history that resembles, say, a human megacity. The Anthropocene is going somewhere fast, too, but goodness knows where. The emerging new world will need new ways to study it, and that might be good for all of us.

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