Module 1 Origins and Earth Systems

Evidence worksheet\_03 “The Anthropocene”

**Learning objectives:**

* Evaluate human impacts on the ecology and biogeochemistry of Earth systems.

**General Questions:**

Waters CN, Zalasiewicz J, Summerhayes C, Barnosky AD, Poirier C. Głuszka, Cearreta A, Edgeworth M, Ellis EC, Ellis M, Jeandel C, Leinfelder R, McNeill JR, Richter DD, Steffen W, Syvitski J, Vidas D, Wagreich M, Williams M, An Z, Grinevald J, Odada E, Oreskes N, Wolfe AP. 2016. The Anthropocene is functionally and stratigraphically distinct from the Holocene. Science. 351(6269):aad2622-1-2622-10.

• *What were the main questions being asked?*

1. What are the signals that represent different times during the Holocene?
2. How does the rapid increase in anthropogenic materials act as a signature for a certain time periods?
3. What geochemical signatures have humans created in sediments and ice?
4. How have the testing and deployment of nuclear weapons created a traceable signature in sediments and ice?
5. How has atmospheric CO2 levels changed according to the ice cores and sea levels?

• *What were the primary methodological approaches used?*

This paper is a review that explained various geochemical signatures and trends during the Holocene with other literature, and the Anthropocene. It appears from the original paper that there were several different measures that were analyzed. Some measures include taking lake sediment cores to measure for constituents from anthropogenic materials of that sediment, glacier ice cores to measure atmospheric CO2, measuring sea level increases. There are also other key anthropogenic change markers such as temperature anomaly, methane as well as human made materials like concrete, plastic and black carbon from fossil fuel emissions.

• *Summarize the main results or findings.*

As technological advances occur through time, human population growth increases, leading to a corresponding increase in resource usage (fossil fuels, metals, fertilizers, land use change), leading to an ecological change. As show in the original paper, there is a considerable increase in ice core nitrate levels, atmospheric CO2, methane, temperature, cement, plastic, black carbon, which can all be attributed to humans.

Human wastes and byproducts of production has caused the formation of persistent materials in the world, which can act as a geochemical signature. Plastics produced by humans have started accumulating in both shallow and deep water sediments which can form biological and/or chemical interactions.

Radioactive materials have also started appearing due to the testing and deployment of nuclear arms by the USA and Russia. This created an increase on 239Pu (Plutonium) from the fall out and can accumulate in the sediments, creating another signature of the Anthropocene given its long half life.

There has been a relatively large proportion of animals going extinct, due to intensive human land and resource usage.

• *Do new questions arise from the results?*

• *Were there any specific challenges or advantages in understanding the paper (e.g. did the authors provide sufficient background information to understand experimental logic, were methods explained adequately, were any specific assumptions made, were conclusions justified based on the evidence, were the figures or tables useful and easy to understand)?*

Overall, reading the paper wasn’t too much of a challenge and since it is partially on a topic that is well known (global warming and human activities), it made it easier to understand the trends in the figures. The author explained the trends in the figures and what it relates to in terms of human activities. However, since it is a review, the methods were explained, but not in as much detail as the primary paper. Also, the ratios (such as 18O/16O), were not well explained so I was unable to see how it would relate to what it meant in the context of the Anthropocene. The authors do provide a good foundation with questions that would drive further research into defining the Anthropocene.