

What We Talk about When We Talk about Earth's Oxygenation

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Abstract

Few topics in Earth sciences and geobiology have been as extensively debated as the role of Earth's oxygenation in controlling when and why animals emerged and diversified. All currently described animals require oxygen for at least a portion of their life cycle. Therefore, the transition to an oxygenated planet was a prerequisite for the emergence of animals. Yet, our understanding of Earth's oxygenation and the environmental requirements of animal habitability and ecological success is currently limited; estimates for the timing of the appearance of environments sufficiently oxygenated to support ecologically stable populations of animals span a wide range, from billions of years to only a few million years before animals appear in the fossil record. In this light, the extent to which oxygen played an important role in controlling when animals appeared remains a topic of debate. When animals originated and when they diversified separate questions, meaning either one or both of these phenomena could have been decoupled from oxygenation. I will present views from across this interpretive spectrum about the links between animals and surface oxygen levels. However, I will focus on reconstructing atmospheric oxygen levels and trying to piece together why oxygen levels have changed through Earth's history.