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Analyzing early exo-Earths with a coupled atmosphere biogeochemical model

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Investigating Earth-like extrasolar planets with atmospheric models is a central focus in planetary science. Taking the development of Earth as a reference for Earth-like planets we investigate interactions between the atmosphere, planetary surface and organisms. The Great Oxidation Event (GOE) is related to feedbacks between these three. Its origin and controlling mechanisms are not well defined - requiring interdisciplinary, coupled models. We present results from our newly-developed Coupled Atmosphere Biogeochemistry (CAB) model which is unique in the literature. Applying a unique tool (Pathway Analysis Program), ours is the first quantitative analysis of catalytic cycles governing O_2 in early Earth's atmosphere near the GOE. Complicated oxidation pathways play a key role in destroying O_2 whereas in the upper atmosphere, most O_2 is formed abiotically via CO_2 photolysis.