# How particulate material gave the Earth's atmosphere its oxygen

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There is a large body of compelling evidence that the dramatically enhanced delivery of partiulate material to the oceans following large-scale glacial events led to the oxgenation of our planet. The input of limiting nutrients to the oceans, at the present day, is dominated by the transport of particulate material from the continents. Experimental and field studies demonstate that these fine grained particles readily dissolve in seawater once they arrive in the oceans making these nutrients available. Field studies of catchments of similar lithology, age, and topography in north-east Iceland demonstrate that particulate delivery to the oceans are increased by orders of magnitude by melting glaciers. The increased arrival of pariculate material enhances both primary productivity and organic carbon burial. Notably laboratory experiments have shown that the presence of riverine particulate material in seawater increases substantally cyanobateria growth rates. The colonisation of the particulate material by microbes is observed both in these laboratory experiments and in the field. A strong correlation between the surface area of particulates arriving to the oceans and organic carbon burial has been reported in numerous studies. The link between organic carbon burial and the end of glacial epochs has been evidenced by carbon isotope excursions, which themselves have been linked to enahanced continental weathering though stable isotope analysis of sediments. Taken together, these observatons support the likelihood that the oxgenation of the Earth's atmosphere proceeded though the acceleration of the organic carbon cycle by the dramatically enhanced delivery of continental particulate material to the oceans following major glaical events. This particualte material both promoted primary productivity though the addition of limiting nutrients and oxgenation of the atmosphere though dramatically enhanced photosynethesis coupled to organic carbon burial.