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Coastal spreading of olivine to reduce atmospheric CO₂ concentrations: a preliminary evaluation

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Abstract

In the Dutch media, it has recently been proposed (by Prof. R.D. Schuiling) to reduce atmospheric CO₂ concentrations by spreading ground, sand-grade olivine along large portions of the Earth's coastlines. This paper provides a preliminary evaluation of this proposal, and has been carried out as part of CATO, the national Dutch CCS program. The feasibility of beach weathering of olivine depends on factors such as the rate of olivine dissolution, the sequestration capacity of the dominant reaction, and process efficiency including olivine mining, crushing, grinding, and transportation. Offsetting 25% of the current worldwide CO₂ emission of 28 Gt/yr by beach spreading of olivine requires the distribution of 5.6 Gt of olivine per year on the world's beaches. For seawater temperatures of 15 to 25°C, olivine sand of 300 µm takes approximately 700 to 2100 years, to reach a steady state sequestration rate and is of little practical value for sequestration. To obtain useful, steady state CO₂ uptake rates by 2020 requires grain sizes of < 10 µm. The transportation and deposition of such quantities poses major infrastructural transport, environmental, and public health questions. The practicality of CO₂ sequestration by coastal spreading of olivine is therefore questionable. Some modest contribution may be feasible in special situations, but more research is needed to evaluate this. Much more promising is the possibility of land weathering of olivine in tropical regions.
