Geophysical Research Abstracts
Vol. 21, EGU2019-7646, 2019
EGU General Assembly 2019

Volumetric estimates of subducted carbon for pre-Pangea times

Suzanne Atkins (1,2), Andrew Merdith (2), and Michael Tetley (2)

(1) Department of Earth Sciences, ENS, Paris, France , (2) Laboratoire de Géologie de Lyon, Université Claude Bernard Lyon 1, Lyon, France

The subduction of carbon acts as a primary driver of the Earth's deep carbon cycle, providing a key transportation mechanism between surface systems and the deeper Earth on million to billion-year timescales. Carbon is stored in altered mantle peridotites and volcanic suites of oceanic crust, as well as within sediments overlaying oceanic crust. In this study, we explore time-dependent, volumetric estimates of subducted carbon stored within oceanic lithosphere . Flux estimates are calculated using full-fit plate reconstructions, which explicitly model the time-dependent, kinematic evolution of plate boundaries, and geochemical models for the serpentinisation of mantle peridotites. To address the inherent geometric, geological and temporal uncertainties present within deep-time plate reconstructions, we characterise a set of present-day tectono-climatic system parameters potentially affecting carbon subduction volume. These parameters include global ridge and subduction length, average spreading and convergence rates, variable estimates of lithospheric thickness, subducted seafloor age and trench migration behaviour. Parameters are jointly analysed to isolate their respective contributions to the volumetric estimates of altered-peridotite hosted carbon. A representative model of the volume of subducted carbon is determined for the Cenozoic, the period of time with the highest plate reconstruction certainty. Using this as a 'goldilocks zone' for expected flux, we investigate the deep-time flux estimates to identify excursions in flux behaviour. In particular, we focus on highlighting potentially contemporaneous global events including equatorial glaciation, true polar wander, supercontinent cycles, and possible implications for the Ediacaran-Cambrian transition towards the evolution of complex life.