Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10549

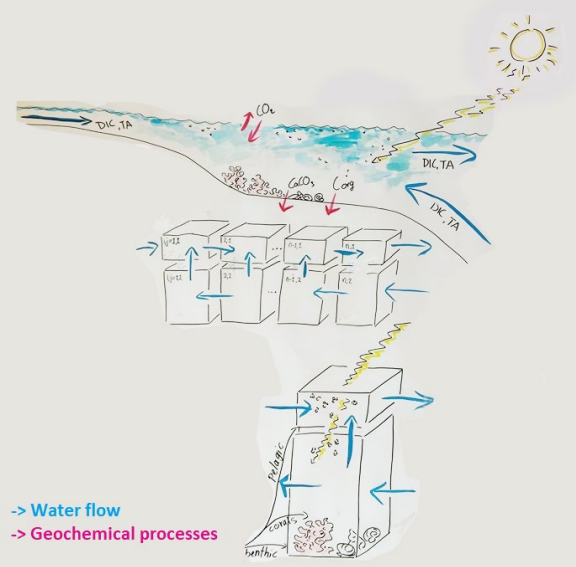
Effect of ocean margin calcification dynamics on global carbon transfer during the Cenozoic – a box model study

ANNE L. KRUIJT[1], KARLINE SOETAERT[2], APPY SLUIJS[1] AND JACK MIDDELBURG[1]

[1]Utrecht University

[2]Royal Netherlands Institute of Sea Research (NIOZ)

Presenting Author: a.l.kruijt@uu.nl



We present a new ocean margin model focusing on calcification in the shallow marine realm.

In the open ocean, calcium carbonate is mainly formed by calcifying plankton. In shallow marine environments, however, coral reefs and shell building benthos are the dominant calcifiers. These organisms play a crucial role in the ocean (margin) budget of particulate and dissolved inorganic carbon and alkalinity. Changes in ocean margin dimensions and water conditions will have a large impact on the amount of calcium carbonate that is deposited and consequently on ocean margin air-sea fluxes of CO_2, both at present and in the geological past.

However, in global carbon cycle models these ocean margin calcification processes are often not explicitly resolved, but instead being crudely represented or parameterized. Furthermore, current carbon budget estimates for the land-ocean-continuum are incomplete, with riverine PIC fluxes and ocean margin carbonate burial fluxes being poorly constrained, complicating accurate parameterization of ocean margin calcification.

Our ocean margin model (conceptual image added as figure), which contains simple hydrodynamics and biogeochemical processes, bridges the gap between existing global carbon cycle models and site-specific coastal ocean biogeochemistry models. Using global input fluxes of particulate and dissolved inorganic and organic carbon we will explore global ocean margin calcification, air-sea CO_2-fluxes, and their dependencies on environmental factors. We test the effect of changes in bathymetry, temperature and light attenuation on the way carbon is transferred through the coastal interface, and show the model's applicability to Cenozoic climate excursions. With our model, necessary first order insights can be gained into the effect of ocean margin calcification dynamics on the global carbon transfer during these past events.