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Constraining the carbon reservoir in deep-sea sediments since the Cretaceous

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Deep-sea sediments are the Earth's largest carbon sink. Oceanic phytoplankton produces 50% of the world's oxygen and consumes > 100 x 10^6 tons of carbon in the form of CO_2 on a daily basis. Important groups of planktonic organisms such as coccolithophorids and foraminifers build calcareous skeletal structures that accumulate in deep-sea sediments as "marine snow". Burial of this carbonate (in addition to organic carbon) represents the main mechanism by which CO_2 is removed from the atmosphere and the ocean, and sequestered in the stratigraphic record of the deep sea. We have very good estimates of the proportion of different biogenic sediments covering the modern seafloor and the distribution of carbonate within these sediments but our estimates within the global ocean on an evolving seafloor are unknown and remain to be quantified in a deep-time plate reconstruction framework.

The aim of this project is to compute the area of seafloor draped in deep-sea carbonate sediments at 1 Ma intervals since ~ 120 Ma using plate-tectonic reconstructions, palaeo-bathymetry grids, and published carbonate compensation depth curves. Volumes of preserved and subducted carbonate sediments will be estimated using sediment thicknesses calculated from known sedimentation rates from deep-sea drill sites. The output grids will be tested using established stratigraphy from key deep-sea sites. The workflow will use a simple Python script. The project will be undertaken as part of an SREI project on understanding the deep carbon cycle from icehouse to greenhouse climates, and will lead to further research opportunities.