



## **Future longterm changes in marine CO<sub>2</sub> uptake and oxygen - an ESM study**

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A complex earth system model including atmosphere, ocean, ice sheets, marine carbon cycle and terrestrial vegetation was used to study the longterm response (100-2000 yrs) of the marine carbon uptake and oxygen distribution to global warming. Two different classes of sensitivity experiments were conducted: CO<sub>2</sub> stabilization scenarios with prescribed atmospheric CO<sub>2</sub> concentration (1x, 2x, 3x, and 4x CO<sub>2</sub>) and CO<sub>2</sub> emission scenarios with prescribed CO<sub>2</sub> emissions into the atmosphere (SRES B1, SRES A1B and SRES A2). For the high emission SRES A2 scenario, the uptake of anthropogenic carbon by the ocean is predicted to be about equal to the uptake by the land biosphere for the next 100 years. Thereafter, the large carbon storage capacity of the ocean dominates with 60-70% the total land and ocean biosphere uptake of anthropogenic carbon. The total carbon uptake is significantly reduced by up to 19% for the SRES emission scenarios and by up to 28% for the stabilization scenarios if climate change is considered in the simulations. A global reduction in the export production and a reduced strength of the thermohaline circulation alter the oxygen distribution in the deep sea substantially. On the millennial scale, the export production and the oxygen distribution recover.