



## Carbon dioxide in European coastal waters

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We compiled from literature annually integrated air-water fluxes of carbon dioxide (CO<sub>2</sub>) computed from field measurements, in 19 coastal European environments that were gathered into 3 main ecosystems: inner estuaries, upwelling continental shelves and non-upwelling continental shelves. Air-water CO<sub>2</sub> fluxes were scaled at European regional level and compared to fluxes of atmospheric CO<sub>2</sub> in other aquatic and terrestrial compartments. Continental shelves are significant sinks for atmospheric CO<sub>2</sub> at an average rate of -1.9 molC/m<sup>2</sup>/yr that scaled at European level corresponds to an absorption of atmospheric CO<sub>2</sub> of -68.1 TgC/yr. This sink is equivalent to the one reported for the terrestrial biosphere of -66.1 TgC/yr, based on carbon-stock change models. Estuaries are significant sources of CO<sub>2</sub> to the atmosphere at an average rate of 49.9 molC/m<sup>2</sup>/yr that is higher than the CO<sub>2</sub> emission to the atmosphere from rivers and streams (26.9 molC/m<sup>2</sup>/yr) and lakes (7.6 molC/m<sup>2</sup>/yr). The scaled emission of CO<sub>2</sub> to the atmosphere from inner estuaries of about 67.0 TgC/yr would almost fully balance the sink of atmospheric CO<sub>2</sub> computed for continental shelves, and is higher than the emission of CO<sub>2</sub> to the atmosphere from continental aquatic systems of 36.5 TgC/yr. However, the scaled emission of CO<sub>2</sub> from estuaries to the atmosphere is inconsistent with the potential emission of CO<sub>2</sub> based on the fate of river organic carbon during estuarine transit. This discrepancy is most probably due to the poorly constrained surface area estimate of inner estuaries.