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The role of continental erosion and river transports in the global carbon cycle

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The chemical and physical erosion of land materials released into the rivers organic (dissolved (DOC) and particulate (POC)), and inorganic (dissolved (DIC) and particulate (PIC)) carbon which is subsequently discharged into the oceans: about 1 GtC.y⁻¹ (DIC, PIC, DOC and POC represent respectively 38%, 17%, 25% and 20%). Most of the carbon transported by the rivers originates from the atmospheric CO₂, except PIC and half of the DIC which are supplied respectively by the physical and chemical erosion of carbonates.

The chemical erosion of inorganic materials which consists in dissolving or hydrolyzing primary minerals of rocks and soils requires CO₂ and releases DIC. The flux of CO₂ consumed by weathering processes is mainly produced by soil organic matter oxidation. Nevertheless, on a geological time scale, it is only the fluxes of CO₂ consumed by silicate rock weathering which represent a non-negligible sink of CO₂. Runoff and lithology are the major factors controlling rock weathering and atmospheric/soil CO₂ consumption. Among all silicate rocks, shales and basalts appear to have a significant influence on the amount of CO₂ uptake by chemical weathering. Moreover, soil cover plays an important role: the CO₂ flux is lower for lateritic river basins than for non-lateritic ones.

DOC and POC riverine fluxes are respectively dependent on the soil organic carbon contents and on the river sediment transports.

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