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Towards quantification of the global riverine carbon balance with a global coupled hydrology-biogeochemistry river model

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The aquatic continuum is a crucial component in the global carbon cycling. However, large uncertainties regarding export, retention, transformations and emissions remain. A more robust quantification of the global carbon budget of the aquatic continuum implies merging ecological, hydrological and chemical concepts. For a better understanding of the factors governing the global carbon budget in rivers, lakes, reservoirs, wetlands and floodplains, a deterministic coupled hydrology-biogeochemistry transport model is set up to simulate the ecological and chemical behaviour of aquatic continua worldwide. Here we estimate the effects of hydrology, nutrient loading, land use and climate on the sources, sinks and the mechanics of carbon from low order streams to the ocean. Hydrology is provided by PCR-GLOBWB, nutrient river loading is provided by IMAGE-GNM. We demonstrate that our global, spatially explicit model provides a first-order understanding of historical variability of POC, DOC and DIC in rivers.