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Estimating the effects of land use and climate change on Amazonian river carbon dynamics

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The Amazon River discharges nearly 20% of the earth's fresh water. The river catchment covers approximately six million square kilometres. One major driving factor in Amazonia is annual flooding during which terrestrial and riverine components are closely connected and an intense exchange of organic material occurs. The large carbon fluxes in this system are expected to change due to climate and land use change. To estimate the amount of these carbon fluxes under various scenarios we use the Dynamic Global Vegetation and Hydrology Model LPJmL. We adapted LPJmL to realistically reproduce observed discharge and calculate inundation area. We additionally developed a riverine carbon module that calculates conversion of terrestrial organic mater during the river passage. The aim of our study is to understand the complex interplay occurring in a floodplain and the effect of land use and climate change on these interactions on the scale of the Amazon basin. Our results indicate that by the end of the 21st century, significant changes in inundation patterns are likely to occur. Inundated area will increase, high/low water peak months will shift by up to 3 months and inundation length will increase by 1 to 3 months. These changes also influence the regional organic carbon balance. Because Amazonia plays a vital role for global water and carbon cycles, changes in these fluxes will therefore also have global impacts.