



Beyond the Neutral Pipe Hypothesis: Rivers and the Global Carbon Cycle (Ralph Alger Bagnold Medal Lecture)

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The neutral pipe hypothesis treats rivers as passive conduits for dissolved and particulate organic carbon moving from terrestrial environments to the ocean. Most models of global and regional carbon dynamics make this simplifying assumption. During the first decade of the 21st century, ecologists convincingly demonstrated that rivers are active pipes that release carbon dioxide to the atmosphere in a manner dependent on the specific characteristics of the river. However, carbon-cycle research has not yet integrated the ability of river corridors (active channels and floodplains) to store substantial amounts of organic carbon at timescales of 10²-10³ years. I review the characteristics of rivers that facilitate organic carbon storage, as well as the human alterations that reduce riverine carbon storage, present available data on organic carbon storage in diverse river corridors, and discuss the implications of river dynamics for the global carbon cycle.