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Effects of hydrologic connectivity on greenhouse gas evasion from small tropical rivers

Small freshwater coastal ecosystems link uplands and nearshore environments. Despite the disproportionately high rates of terrestrial primary productivity and greenhouse gas production thought to occur in the tropics, the biogeochemistry of small coastal creeks and rivers with intermittent connections to the ocean is poorly studied. We sampled a range of coastal systems over several years along a connectivity gradient in northeastern Puerto Rico. The connectivity gradient spanned from creeks with continuous freshwater delivery to the sea, to those with infrequent (annual or less) connectivity to marine environments. Our results show that concentrations of greenhouse gases (CO2, CH4, N2O), dissolved oxygen, and nutrients vary dramatically in concert with the extent to which these freshwater systems are hydrologically connected to marine environments. Systems with low connectivity are highly reduced, with the entire water column anoxic and containing extremely high levels of methane. These hot spots of greenhouse gas production represent a potentially important and under-estimated source of greenhouse gases that is driven by the high productivity of tropical mangroves and other wetland systems.