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Understanding methane emissions at terrestrial-aquatic interfaces: A case study from East River, Colorado

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Rates and reactions of biogeochemical (BGC) processes vary in space and time to produce hot spots and hot moments of elemental cycling. These dynamics are particularly enhanced at terrestrial-aquatic interfaces (TAIs), such as floodplains which exhibit strong redox fluctuations. TAIs generate and export anaerobic BGC products, such as methane (CH_4), and the net CH_4 flux is tightly coupled with the metal redox chemistry and the microbial activity at these TAIs. While methanogenesis is well-studied in wetlands, a knowledge gap persists in understanding how these trace gases behave at redox-active TAIs. Therefore, the main objectives of this study are: (i) to compare macroscale observations on the field scale for methane emissions as a function of spatial and moisture gradient; and (ii) to link the methane flux data to redox speciation (Fe, Mn) and methane cycling microbial community abundance and composition. Preliminary data indicates a positive correlation of *in-situ* CH_4 flux with average soil moisture content and metal redox chemistry from riverine floodplains of East River, CO. Ongoing microbial analyses indicate the relative distribution of the methane cycling microbial communities. By combining molecular-scale techniques with field and bulk measurements to capture spatio-temporal dynamics, results from this study will provide much needed quantification of coupled metal redox chemistry and microbial activity in relation to trace greenhouse gas emissions at TAIs.