Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.34663

Quantification of Sediment and Organic-Carbon Fluxes in a Boreal Sub-Arctic River (Dezadeash River, Southern Yukon, Canada)

ANGELINA VIKTORIA NIKOLAEVA AND ALESSANDRO IELPI

The University of British Columbia - Okanagan Campus

Rivers act as global agents in transporting sediment, including organic carbon (OC), and connect upland environments undergoing erosion to oceans. As climate change transforms northern environments, Arctic river systems are subject to substantial change in their geomorphic and biogeochemical processes. However, owing to the remote nature of (sub-)Arctic watershed, limited studies have attempted to directly quantify river sediment fluxes in relation to their morphodynamics. It is therefore necessary to develop novel methodologies to estimate sediment and carbon budgets using site-specific measurements that can be upscaled to predict watershed-wide dynamics. This study aims to estimate sediment and organic carbon fluxes in the meandering Dezadeash River, which is found in the sub-Arctic region of southern Yukon, Canada. Two methodological approaches are presented herein: one based on timelapse photogrammetry and soil OC geochemistry, and one on hydrology and aqueous geochemistry. The photogrammetric analysis revealed that over the observed timespan (1948–2023), the migration rate of the Dezadeash River increased, possibly in response to changes in permafrost and vegetation coverages along its floodplain. This analysis also revealed that the Dezadeash River floodplain exports (Equation 1) kT OC yr^{-1}. In contrast, the hydrologic methodology determined an export of (Equation 2) kT OC yr^{-1}, as well as yearly fluxes for total suspended sediment and total dissolved sediment of, respectively, (Equation 3) kT yr^{-1} and (Equation 4) kT yr^{-1}. The difference in OC export between the two approaches reveals different contributions from floodplain and upland catchments, as well as possible sensitivity to the timescales over which these environmental signals are integrated. Overall, this research establishes a novel methodological approach to estimate biogeochemical fluxes along remote watersheds, which may serve to inform broader-scale carbon budgets under contexts of ongoing and future climatic change.

Equation 1: $0.44^{+1.76}_{-0.35}$

Equation 2: $4.68^{+4.45}_{-1.42}$

Equation 3: $28.13^{+80.66}_{-20.66}$

Equation 4: $112.38^{+66.85}_{-42.65}$