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Distinct organic carbon dynamics in the Irrawaddy, Salween, and Mekong river basins

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The continental organic carbon cycle plays an important role in controlling atmospheric CO_2 and O_2 concentrations, and thus Earth's climate and habitability. The flux and composition of organic carbon (OC) carried by world's major rivers yields insights on the sources, storage, and cycling of OC over large, globally-relevant spatial scales.

Here, we present the measurements of particulate and dissolved OC from the Irrawaddy, Salween, and Mekong river basins in Southeast Asia. Based on ^{14}C measurements, the Irrawaddy and the Salween export a significantly aged pool of POC, with fraction modern (Fm) ranging from 0.15 to 0.89 and strongly hydrodynamically sorted with depth in the river channels. In contrast, DOC in the Irrawaddy was significantly younger (Fm = 0.70-0.99), while in the Salween it was older (Fm = 0.61-0.66), compared to POC. The Mekong dominantly exports fine sediments rich in recent biospheric POC (Fm = 0.87-0.97). The results indicate distinct OC sources and turnover dynamics in the three river basins, controlled by different geomorphic, lithologic, and anthropogenic characteristics. We estimate the combined biospheric POC flux of the three basins to be around 2.7 Pg C / y, similar to that of the Ganges-Brahmaputra system, and a petrogenic POC flux that is 10-20x lower than the biospheric flux.