Preliminary weathering and carbon budgets for the Irrawaddy and the Salween rivers

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Approximately 30% of the total global sediment and solute flux to the ocean is estimated to be delivered by just 10 of the world's large rivers [1]. However, these estimates are highly uncertain due to difficulty in constraining the average sediment load and composition of such large rivers. To accurately quantify the global weathering and carbon budget, we require better constraints on the flux, the sources, and the fate of matter transported by world's major rivers.

Here were present sediment flux and chemistry data from the Irrawaddy (Ayeyarwady) and Salween (Thanlwin) rivers in Myanmar. To do this, we used a Rouse-based hydrodynamic modeling approach, which combines depth sampling with ADCP discharge measurements to robustly integrate sediment composition with depth and across the river channel. We show that Irrawaddy sediment flux varied from ~0.05 to 4-7 Mt/d and the Salween sediment flux varied from ~0.02 to 2-4 Mt/d in February 2018 and in August 2018/19, respectively. We estimate the depth-integrated particulate organic carbon (POC) flux during the monsoon as 1.2-3.5 × 10^{10} g/d for the Irrawaddy and 0.8-2.4 × 10^{10} g/d for the Salween. Extrapolated annually, this flux is about 50% lower than estimated previously [2]. Depending on sampling depth and season, the fraction of petrogenic (^{14}C-depleted) carbon ranges between 10 and 70%, with a depth-integrated average of 35% an 20% for the Irrawaddy and the Salween, respectively.

Finally, to partition the sediment and solute flux between different lithological components and source areas, we used a Monte Carlo mixing model, solved using major element chemistry and isotope ratios of H_2O, SO_4, POC, and radiogenic Sr and Nd in sediments. Preliminary results indicate that the Irrawaddy is dominated by CO_2-driven silicate weathering, whereas the Salween includes a significant pyrite and carbonate weathering component.

[1] Milliman, J. D., & Farnsworth, K. L. (2011). *River Discharge to the Coastal Ocean* (pp. 13–69).

[2] Bird et al. (2008*), Quaternary International*, 186 (1), 113–122.