Timescales of leaf wax biomarker transport and preservation in alluvial river systems: Rio Bermejo, Argentina

M. Repasch[1], D. Sachse[1], N. Hovius[1], J.S. Scheingross[1], T.I. Eglinton[3], M. Lupker[3]

[1]GFZ German Research Centre for Geosciences, Section 5.1 Geomorphology, Potsdam, Germany

[2] National University of the Littoral and National Council of Scientific and Technical Research, Santa Fe, Argentina

[3] ETH Zürich, Department of Earth Sciences, Zürich, Switzerland

Rivers are the primary conduits for organic carbon (OC) transfer from vegetation-rich uplands to long-term sinks, and thus are responsible for significant fluxes among different reservoirs of the carbon cycle. Sedimentary leaf-wax biomarkers can be used to elucidate the mechanisms of transport, preservation, and/or transformation of OC during its passage from source to sink.

In this study we evaluate the timescales of terrestrial leaf wax n-alkane transport from source to sink. Our natural laboratory is the Rio Bermejo in northern Argentina, which transports material from the central Andes over 700 km across the foreland and out onto the craton without input of foreign material from tributaries. Rapid channel migration rates are responsible for remobilization of floodplain sediment and terrestrial OC, which is delivered to a large continent-scale river downstream.

By sampling suspended sediment, river bank sediment, and soil from several locations along the length of the Rio Bermejo, and analyzing the biomarker isotopic composition, we evaluate the geomorphic processes that control the timescale of fluvial POC transport. Compound-specific ^{13}C measurements show enrichment of terrestrial alkanes (C25-C33) with increasing distance downstream, suggesting significant input of ^{13}C-enriched floodplain material. We propose that microbial degradation is responsible for preferential preservation of ^{13}C in floodplain sediment over the timescale of 10^2-10^3 years. We expect compound-specific ^{14}C measurements to show increasing age with distance downstream. Analysis of modern and aged river bank sediment samples will determine where and over what timescales leaf wax alkanes are oxidized by microorganisms. With these data, we will be able to quantify the loss of OC during fluvial transit, enabling carbon cycle models to account for these losses.