Timescales of plant wax storage and transport in river systems

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Adequate paleo-environmental interpretation of the composition of terrestrial biomarkers deposited in river-dominated ocean margins relies on a mechanistic understanding of how environmental signatures acquired on land are transferred to marine sediments. The timescales of plant wax storage and transfer in river systems is of particular importance as it defines the practical temporal resolution at which plant wax can be used to reconstruct paleo-environments. Furthermore, constraining the residence time of terrestrial organic matter in river basins has broad implications for our understanding of the global carbon cycle as variations in the rate of carbon exchange between different continental reservoirs and the marine reservoir affects the atmospheric CO_2 budget over relatively short timescales. Over the past decade, we have been measuring the radiocarbon age of plant waxes in transit in modern rivers and preserved in marine sediments deposited since the last glacial maximum. In these contrasted settings, the apparent radiocarbon age of plant waxes vary from tens to thousands of years, yet paleo-environment records based on plant wax stable isotope composition often match very well independently dated records - such as speleothems. This raises the key question of the actual meaning of the radiocarbon age of organic molecules. This question will be adressed by focusing on the mechanistic aspects of plant wax storage and transfer in river systems as revealed by river-dominated marine sediment archives.