Geophysical Research Abstracts
Vol. 16, EGU2014-1515, 2014
EGU General Assembly 2014

The age of river-transported carbon: new data from African catchments and a global perspective.

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The role played by river networks in regional and global carbon (C) budgets is receiving increasing attention. Despite the potential of radiocarbon measurements (Δ14C) to elucidate sources and cycling of different riverine C pools, there remain large regions from which little or no data are available. Also, there have been no comprehensive attempts to synthesize the available information and examine global patterns in the 14C content of these organic and inorganic riverine C pools. Here, we present new 14C data on dissolved (n = 25) and particulate (n = 67) organic C from six river basins in tropical and subtropical Africa, and also compile over 1000 literature 14C data and ancillary parameters from rivers globally. Across the African basins, the new riverine data span a Δ14C range of -126 to 155 ‰ (average Δ14C of -60 $\pm$ 158 ‰) and -869 to 93 ‰ (average Δ14C of 68 $\pm$ 53 ‰) for DOC and POC fractions, respectively. These C radioisotope signatures represent radiocarbon ages of $\sim$1000 BP to modern (post-1950) for DOC and $\sim$16000 BP to modern for POC. Our data show that, excluding fresh-waters strongly perturbed by anthropogenic practices, the DOC fraction exported by African rivers is always dominated by modern carbon. Globally, a consistent pattern emerges of older C in systems carrying high loads of organically poor sediments. In contrast to oceanic environments, riverine DOC is typically (over 90% of paired samples) more recent in origin than POC. While our analysis does not allow to directly assess the (controversial) importance of ancient C supporting bacterial respiration in river systems, the distribution of Δ14C data for dissolved inorganic C (DIC) favors the hypothesis that, in most cases, more recent organic C is preferentially mineralized.