Relation between erosion and carbon transfers in 420 lake watersheds of the world during the last 300 years: a paleolimnological study

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Accelerated soil erosion has become a pervasive feature on landscapes around the world and is recognized to have substantial implications for biogeochemical cycles[1,2]. However, little is known about global trends in soil erosion and the interactions of erosion with C transfers over centennial time scales, limiting our ability to put recent increases in a long-term perspective and to estimate C transport in watersheds, which can ultimately feedback on the climate system[3]. Lake sediments provide a key archive for assessing soil erosion dynamics and C transport that occurs in lake catchments. Here, the analysis of large numbers of samples was performed on 420 lakes sediment records of the world to assess the effect of erosion on C transport in contrasted lake-watersheds during the last 300 years. Continuous sediment records were generated using core scanners (i.e. micro-XRF) and computed tomography to provide near-annual trends on terrigenous elements, here used as proxies of erosion (e.g. Al, Ti, K, Fe). Then, C and N (organic and mineral forms) on discrete samples were analyzed using a Variomax elemental analyzer to assess total C sequestration by lakes, C sources, and long-term changes in the contribution of erosion to C transfers in lake-watersheds. Our results suggest that the fraction of eroded C relative to exported sediments by erosion has changed over the last 300 years in many of our studied watersheds and has varied with changing human practices.

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