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The erosion of particulate organic carbon from a small mountain river: The role of large floods

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The erosion of particulate organic carbon (POC) from active mountain belts and its transfer to sediments may play an important role in the global carbon cycle. The POC is comprised of both fossil organic carbon (derived from sedimentary rocks) and non-fossil, modern, biogenic carbon (from living biomass or recent, partially degraded material). Transfer of modern biogenic POC to sedimentary basins will contribute to the drawdown of atmospheric CO_2. Recent studies have shown that small rivers draining active mountain belts discharge large proportions of their total sediment load at very high sediment concentrations, during short periods of time. Rapid transfer of sediment may promote burial of the eroded POC. In addition, rivers draining emergent mountain belts deliver sediment to the oceans at hyperpycnal concentrations (where the density of the river plume is greater than that of ambient seawater) and POC may be transported to deep marine depo-centers. Here, we present geochemical constraints on the source and magnitude of POC transferred at high sediment concentrations from a small mountain river ($435 km^2$) in the Taiwan orogen.

Seventy-seven suspended sediment samples were collected from the Liwu River gauging station, Eastern Central Mountain range Taiwan, during 2004 and 2005. Water discharge (Q) was recorded hourly over this period by the Water Resources Agency, Taiwan. Sampling frequency was increased during large floods, including super-typhoon Mindulle 07/2004 (peak SSC $>$60g/L which is hyperpycnal). Bedrock, soil and vegetation were sampled along an altitudinal transect to characterize POC sources in the catchment. All samples were analyzed for organic carbon (C_{org}) and nitrogen (N) concentrations, $*^{13}C_{org}$ and $*^{15}N$. Suspended sediment shows co-variance of C_{org}, C/N, $*^{13}C_{org}$ and $*^{15}N$ during rising and falling Q and SSC, revealing complex variations

in POC source. The data suggest that during typhoon Mindulle at peak Q and SSC (>hyperpycnal) 25% of the riverine POC is derived from non-fossil sources (c.f. annual average of <20% non-fossil POC). Measurement of an additional organic carbon source proxy, $\Delta^{14}C$, will test these results.