GSA 2014
19-22 October | Vancouver, BC, Canada
THE GEOLOGICAL SOCIETY OF AMERICA®

2014 GSA Annual Meeting in Vancouver, British Columbia (19–22 October 2014)

Paper No. 332-10
Presentation Time: 3:45 PM

DETERMINING SEDIMENT SOURCES AND SINKS IN A SMALL HEADWATER WATERSHED IN YUNNAN, CHINA USING SHORT-LIVED RADIONUCLIDES

GARCIA GRECO, Gabriela[1], FIALLO, Dominic[1], NEILSON, Thomas B.[2], MARTIN, Joseph[1], SCHMIDT, Amanda H.[1], BIERMAN, Paul[3], SOSA-GONZALES, Veronica[3], WEI, Renjuan[4], ZHANG, Chunmin[4] and LIANG, Chuan[4], (1)Geology, Oberlin College, Geology Department, Rm. 416, 52 W. Lorain St, Oberlin, OH 44074, (2)Department of Geology, University of Vermont, 180 Colchester Ave, Department of Geology, UVM, Burlington, VT 05401, (3)Geology Department, University of Vermont, Delehanty Hall, 180 Colchester Avenue, Burlington, VT 05405, (4)School of Hydrology and Hydrologic Engineering, Sichuan University, Chengdu, Sichuan, 610064, China, gagarcia@oberlin.edu

^{137}Cs and $^{210}Pb_{ex}$ analysis of fluvial sediments in a ~2000 km^2drainage basin in Yunnan Province, China, show at least 30 cm of erosion since 1963. While human land use in southwest China has been associated with rapid erosion since the 1950's, hydrologic records show no correlation between sediment yield and environmental stresses such as land use, deforestation, and population changes.

We use radioisotope fingerprinting to better understand the relationship between fluvial sediment transport and upstream land use. Local agricultural techniques are typified by monoculture farming, often done on steep hillslopes; mean slope is 21.48°. Long-term, Chinese government hydrologic data makes Yunnan an ideal study site. Field observations, qualitative interpretation of Google Earth images, and Landsat 8 image analysis were used to understand land use trends.

A basin-wide absence of ^{137}Cs in samples with $^{210}Pb_{ex}$ indicates extensive surface erosion since the 1960's that subsequently slowed down. The basin is divided into four regions: center upstream, western and eastern tributaries, and a main stem. The center upstream has the greatest percentage of farmed land (18.14%), including tobacco farming, which tends to increase erosion rates; and also has significantly lower $^{210}Pb_{ex}$ activity than the rest of the watershed ($p<0.002$). The center upstream tributaries have an average $^{210}Pb_{ex}$ activity of 0.0015 Bq/g (σ 0.0015 Bq/g), while the other areas have a mean activity of 0.0058 Bq/g (σ 0.0019 Bq/g). If contemporary erosion levels were higher, $^{210}Pb_{ex}$ and ^{137}Cs would not likely be found in the fluvial sediment of corresponding tributaries. However, relatively high $^{210}Pb_{ex}$activity (0.0065 Bq/g) in the main stem suggests that the signature of intensive erosion is not present downstream, indicating that sediment from the central tributaries is being stored upstream.

These results suggest that the effects of land use on sediment supply to rivers could be quite localized in steep, agricultural landscapes, and may not translate into significant effects downstream in larger watersheds. This could partially explain why local and regional hydrologic records show no correlation between sediment yield and upstream land use: sediment yield may not accurately show the effects of land use changes on erosion.

Session No. 332

T45. Tracking Sediment Movement across Earth's Surface
Wednesday, 22 October 2014: 1:00 PM-5:00 PM

208/209 (Vancouver Convention Centre-West)
Geological Society of America *Abstracts with Programs.* Vol. 46, No. 6, p.800

Back to: T45. Tracking Sediment Movement across Earth's Surface

<< Previous Abstract | Next Abstract >>