

Paper No. 4-13

Presentation Time: 11:00 AM-11:15 AM

BASIN SCALE EROSION RATES FROM THE POTOMAC RIVER BASIN USING IN SITU AND METEORIC ^{10}Be

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We measured in situ and meteoric ^{10}Be in sand collected from 70 sites in the Potomac River Basin, including 3 sites on the main-stem Potomac River, and 1 site on the Shenandoah River (basin areas of 29796, 24851, 2254 and 4136 km²). 10 Potomac River samples, including the 4 above, came from USGS gauging station sites, where suspended sediment data are available (23 to 29796 km²). 60 samples came from Potomac River tributaries (5 km² to 64 km²).

In situ, basin-scale, ^{10}Be erosion rates range from 3 to 39 m/my with a mean and median of 12 m/my. Basins in the Coastal Plain (n=8) have the lowest erosion rates, 4 to 39 m/my with a mean of 10 m/my and a median of 6 m/my. The highest erosion rates are in Appalachian Plateau and Blue Ridge basins (n=6, n=8), each with a range from 9 to 18 m/my and a mean and median of 13 m/my. 21 samples from the Piedmont have erosion rates that range from 3 to 21 m/my, a mean of 12 m/my and a median of 13 m/my. 17 samples from the Valley and Ridge have a range from 4 to 30 m/my, a mean of 11 m/my and median of 9 m/my. These erosion rates are similar to basin-scale erosion rates measured in and near the Appalachian Mountains (4-54 m/my).

We interpret measured meteoric ^{10}Be concentrations as erosion rates assuming steady state and a ^{10}Be delivery rate of 1.75×10^6 atoms/ (cm²*yr). Calculated erosion rates range from 4 m/my to 186 m/my with a mean of 36 m/my (3x mean in situ rate) and a median of 21 m/my (less than 2x the median of the in situ rate). The higher erosion rates calculated from meteoric ^{10}Be measurements most likely reflect violation of the steady state assumption caused by soil stripping from colonial and post colonial agriculture and subsequent landuse changes. The difference between in situ and meteoric-based erosion rate estimates could also reflect more rapid erosion of non-quartz bearing rocks than quartz bearing rocks.

USGS sediment load data (n=10) suggest that rates of sediment export are similar, but slightly higher, than rates of sediment generation (12 m/my) in the Potomac basin. The up stream sediment loads, when converted to lowering rates, range from 5 to 26 m/my with a mean of 17 m/my and a median of 16 m/my (n=9). A site at the mouth of the Potomac has a sediment load equivalent to 24 m/my lowering, similar to rates of sediment generation estimated by meteoric ^{10}Be (25 m/my) and in situ ^{10}Be (19 m/my) for sand samples collected at the site.

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8:00 AM-12:00 PM, Sunday, 31 October 2010

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