

2006 Philadelphia Annual Meeting (22–25 October 2006)

Paper No. 112-1

Presentation Time: 1:30 PM-5:30 PM

BE MONITORING OF EROSION RATES IN THE APPALACHIAN MOUNTAINS, SHENANDOAH NATIONAL PARK, VIRGINIA

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We are using cosmogenic Be analysis of fluvial sediments and bedrock to elucidate erosion rates ($10^3 - 10^6$ year timescale) and infer post-orogenic geomorphic processes in Shenandoah National Park. Our sampling plan is designed to investigate relationships between erosion rate, lithology, slope, and basin area. Sixteen samples have been collected from a variety of basin sizes (1 – 30 km²) and average basin slopes (7 - 23°) in each of four different lithologies that crop out in the Park: quartzite, granite, siliciclastic rocks, and metabasalt. The steep slopes of the Blue Ridge Province where we sampled are heavily vegetated and rise 100's of meters above the Piedmont to the east and the Valley and Ridge to the west.

Data from 4 fluvial sand samples (with streams selected so that they drain only 1 of the 4 lithologies) have erosion rates of 5.6 m/My (quartzite, average basin slope = 14°), 13.8 m/My (granite, average basin slope = 17°), 11.9 m/My (siliciclastics, average basin slope = 17°), and 4.3 m/My (metabasalt, average basin slope = 17°). Each sample was divided into four grain-sizes (sand to gravel) for analysis. Only two of the samples (granite and basalt) show a monotonic decrease in ¹⁰Be concentration as grain size increases with the large grain size (>10 mm) having 65% and 79% of the ¹⁰Be that the sand fraction (0.25 to 0.85 mm) contains.

These initial data suggest: 1. Lithology affects basin-scale erosion rates in Shenandoah Park. 2. Grain size has little or no effect on ¹⁰Be concentration in this area. 3. Cosmogenically-determined erosion rates in Shenandoah Park are similar to or lower than those reported elsewhere in the Appalachians including those of Matmon et al. (2003), 25 to 30 m/My for meta-sandstone in the steep Great Smoky Mountains, and those of Reuter et al. (2004), 4 – 54 m/My in Susquehanna River basin for shale, sandstone, and schist. 4. Short term cosmogenic erosion rates (10⁴ yrs) in the Blue Ridge of Shenandoah Park are consistent with long term rates (>10⁷ yrs) estimated using U/Th/He near the Blue Ridge Escarpment by Spotila et al. (2004), 11 to 18 m/My, and using fission tracks in the southern Appalachians by Naeser et al. (2005), 20 m/My. This consistency suggests long-term rates of erosion of the region are steady and are reflected by the cosmogenic data.

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[General Information for this Meeting](#)

Session No. 112--Booth# 6

[Erosion: Processes, Rates, and New Measuring Techniques \(Posters\)](#)

Pennsylvania Convention Center: Exhibit Hall C

1:30 PM-5:30 PM, Monday, 23 October 2006

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