Session: T - 07.02 Detrital thermochronology: the sedimentary record of orogenesis
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Title:

LINKING 10-BE ESTIMATES OF EROSION RATES WITH LANDSCAPE VARIABLES: COMPILATION AND CONSIDERATION OF MULTIPLE DATA SETS FROM AROUND THE WORLD

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Measurement of cosmogenic 10-Be in quartz isolated from river sediment allows for the estimation of basin-averaged erosion rates on a time scale of 10^3-10^6 years. Application of this method during the past decade has produced a number of data sets from a variety of tectonic and climatic settings, thus providing an opportunity to investigate relationships between erosion rates and landscape variables. By characterizing drainage basins using GIS, we analyze interrelationships among tectonics, climate, topography, lithology, vegetation, and the 10-Be derived erosion rates. Initial analysis includes seven North American data sets, including the Coast Range (OR), the Rio Puerco (NM), Yuma Wash (AZ), the Llano Uplift (TX), the Great Smoky Mountains (NC & TN), the Susquehanna River (PA), and Idaho. Additional analyses will incorporate published and in-house data sets representing all continents except Antarctica. Preliminary results suggest that regional erosion rates correlate positively with probabilities for ground shaking from seismic hazards mapping, a proxy for tectonic activity. In addition, regions with samples from basins with mean basin slopes exceeding 15º show a positive correlation between mean basin slope and erosion within the region; however, the relationship differs between regions. Because existing data sets were collected using various sampling strategies, substantial variation exists regarding basin scale, the availability of lithologic data, and the quartz distribution within the basins (which is important for interpreting 10-Be results as erosion rates). However, a new suite of 72 samples from the Susquehanna River in the central

Appalachians will specifically address relationships between lithology and topography within a decaying orogenic belt. Samples are from sandstone, shale, and schist basins (dominantly 3-10 km_ in area) in the Appalachian Plateaus, Piedmont, and Valley & Ridge physiographic provinces. Mean basin slopes range from 2º-22º. Initial Susquehanna data for 15 samples from USGS gaging stations representing larger sub-basins (mean area = 7800 km_) show that erosion rates inferred from 10-Be are positively correlated with sediment yield ($R_ = 0.5$), at least for basins that are unglaciated and lacking intensive agriculture. However, landscape-scale parameters show little or no correlation with erosion rates for these basins, which have heterogeneous lithology and physiography.