2015 GSA Annual Meeting in Baltimore, Maryland, USA (1-4 November 2015)

Paper No. 204-9
Presentation Time: 9:00 AM-6:30 PM

COMPARING METEORIC ^{10}BE, IN SITU ^{10}BE AND NATIVE ^{9}BE ACROSS THREE WATERSHEDS

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By measuring ^{10}Be produced in rock and soil (in situ ^{10}Be - $^{10}Be_{is}$), one can obtain average denudation rates over millennia. However, $^{10}Be_{is}$ analysis is methodologically limited to locations where quartz-bearing rocks crop out and to systems where one can isolate sand-size quartz grains. In other systems, meteoric ^{10}Be ($^{10}Be_{met}$) could provide a similar tool, but pedogenic processes, soil chemistry, and grain size control concentrations. Because ^{9}Be weathered from crustal rocks has the same reactivity as $^{10}Be_{met}$, others have hypothesized that $^{10}Be_{met}/^{9}$Be ratios of grain coatings normalize the $^{10}Be_{met}$ inventory to remobilization and grain size dependency. To test this hypothesis, we determined the relationship between $^{10}Be_{met}$, $^{10}Be_{is}$ and ^{9}Be by extracting ^{9}Be from three sets of fluvial sand samples previously measured for $^{10}Be_{met}$ and $^{10}Be_{is}$.

We leached ^{9}Be from 206 samples by reacting powdered sands in 6M HCl for 24 hours while reacting in a heated ultrasonic bath – a method that did not leach ^{9}Be in mineral grains. This is significant because ^{9}Be in grain coatings is subject to the same post-depositional influences as $^{10}Be_{met}$, while ^{9}Be incorporated into mineral matrixes is uninfluenced by post-depositional conditions, similar to $^{10}Be_{is}$. The leachate was analyzed by ICP-OES.

Samples show different $^{10}Be_{met}/^{9}$Be correlations with $^{10}Be_{is}$ across sampling locations. Samples from the Mekong River watershed in China have a positive correlation between $^{10}Be_{is}$ and $^{10}Be_{met}$ (R^2=0.46, n=119) and a stronger positive correlation between $^{10}Be_{is}$ and $^{10}Be_{met}/^{9}$Be (R^2=0.69). Samples from the Barron River Watershed in Queensland Australia have no correlation between $^{10}Be_{is}$ and $^{10}Be_{met}$ (R^2=0.05, n=16) but a positive correlation between $^{10}Be_{is}$ and $^{10}Be_{met}/^{9}$Be (R^2=0.56). Samples from the Potomac River Watershed in east-central North America show no correlation between $^{10}Be_{is}$ and $^{10}Be_{met}$ (R^2=0.06, n=71) or $^{10}Be_{is}$ and $^{10}Be_{met}/^{9}$Be (R^2=0.00). Considering all data, correlations between $^{10}Be_{met}/^{9}$Be ratios and $^{10}Be_{is}$ (R^2=0.70, n=206) are only slightly stronger than correlations between $^{10}Be_{is}$ and $^{10}Be_{met}$ (R^2=0.66). These results suggest that while measuring ^{9}Be can improve correlations between $^{10}Be_{met}$ and $^{10}Be_{is}$, further study is needed to understand the variables that influence Be dynamics across a diversity of watersheds.

Session No. 204--Booth# 9

T9. Developing Proxies for Human Impact on Soil and Sediment Mass Transfer throughout the Holocene (Posters)
Tuesday, 3 November 2015: 9:00 AM-6:30 PM

Exhibit Hall (Baltimore Convention Center)

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