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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 ^9Be ACROSS THREE WATERSHEDS

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

We leached ^9Be 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 ^9Be in mineral grains. This is significant because ^9Be in grain coatings is subject to the same post-depositional influences as $^{10}\text{Be}_{\text{met}}$, while ^9Be incorporated into mineral matrixes is uninfluenced by post-depositional conditions, similar to $^{10}\text{Be}_{\text{is}}$. The leachate was analyzed by ICP-OES.

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

Geological Society of America *Abstracts with Programs*. Vol. 47, No. 7, p.514

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