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**CONTROL ID:** 720661

**TITLE:** *In Situ*-produced vs. Meteoric $^{10}$Be in Hillslope Soils: One Isotope, Two Tracers, Different Stories

**PRESENTATION TYPE:** Assigned by Committee

**SECTION/FOCUS GROUP:** Earth and Planetary Surface Processes (EP)

**SESSION:** Sediment Supply, Storage, and Delivery as Controlled by Hillslope-Channel Coupling (EP02)

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**ABSTRACT BODY:** *In situ*-produced and meteoric $^{10}$Be are both powerful tools for tracing the production and transport of hillslope sediment. *In situ*-produced $^{10}$Be is used to infer sediment production rates as well as investigate sediment sources and transport. Meteoric $^{10}$Be may also be useful for inferring sediment production and transport rates in some landscapes, especially those that lack the target minerals for *in situ*-produced $^{10}$Be. Few studies have investigated the insights gained by a comparing *in situ*-produced and meteoric $^{10}$Be inventories. We present a series of paired $^{10}$Be inventories from different climatic and tectonic regimes to illustrate both the value and the potential pitfalls of coupling these geomorphic tracers.

The mean *in situ* and meteoric $^{10}$Be near surface (within a meter) inventories for our field areas are as follows: Great Smoky Mountains, NC, USA: 3.6 x $10^7$ atoms cm$^{-2}$ and 3.3 x $10^{10}$ atoms cm$^{-2}$; Laurely Fork, PA, USA: 2.6 x $10^6$ atoms cm$^{-2}$ and 3.0 x $10^9$ atoms cm$^{-2}$; Oregon Coast Range, OR, USA: no *in situ* data and 3.87 x $10^{10}$ atoms cm$^{-2}$; North Island, New Zealand: no *in situ* data and 1.8 x $10^9$ atoms cm$^{-2}$; and Amparafaravola, Madagascar: 1.86 x $10^7$ atoms cm$^{-2}$ and 8.0 x $10^9$ atoms cm$^{-2}$. The associated inferred soil residence times, respectively, are: Great Smoky Mountains, NC, USA: 40.9 ky and 25.6 ky; Laurely Fork, PA, USA: 2.9 ky and 2.3 ky; Oregon Coast Range, OR, USA: *n/a* and 30ky; North Island, New Zealand: *n/a* and 1.5 ky; and Amparafaravola, Madagascar: 21 ky and 6.2 ky. Soil residence times inferred from meteoric $^{10}$Be assume a global average delivery rate of 1.3 x $10^6$ atoms cm$^{-2}$ yr$^{-1}$. These soil residence times are minimum values that assume that all *in situ* and meteoric $^{10}$Be is accounted for. Discrepancies between inferred soil residence times most likely highlight some error in assumptions regarding meteoric $^{10}$Be retention in the soil mantles that we sampled. For example, if meteoric $^{10}$Be is not retained at the near surface where we collected our samples, then significant amounts of $^{10}$Be are not being accounted for in our inventory calculations.

If meteoric $^{10}$Be is fully retained by a given landscape, soil residence times inferred from each type of $^{10}$Be should agree. However depth profiles and downslope transects from each field area show differing degrees of meteoric $^{10}$Be mobility. We compare meteoric $^{10}$Be concentrations from each of our field sites to trends in CBD-extractable Al and Fe oxides, bulk soil pH, and mean grain size. Meteoric $^{10}$Be mobility correlates positively to trends in mobile Fe and Al oxides and negatively to soil pH. These data suggest that a meaningful comparison between a landscape's *in situ*-produced and meteoric $^{10}$Be inventories requires a thorough understanding of the geochemistry of the sampled soil mantle.

**INDEX TERMS:** [1826] HYDROLOGY / Geomorphology: hillslope, [1150] GEOCHRONOLOGY / Cosmogenic-nuclide exposure dating.

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