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COSMOGENIC 10-BE ANALYSIS OF DEBRIS FLOW BOULDERS AND SEDIMENT FROM BRAZIL INDICATES LONG RETURN TIMES

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Debris flows, both the erosion they cause and the sediment they deposit, are significant natural hazards in the high-relief, passive margin of eastern Brazil. To determine the source of debris flow sediment and the return interval of flows significant enough to transport large boulders, we sampled and measured two sets of boulders deposited by pre-historic debris flows and one set of boulders deposited in 2011.

To determine the likelihood of inheritance of nuclides from prior exposure on basin slopes, we sampled 5 boulders (1.2 to 2.2 m) in the channel above Posse, at Campo Grande close to Teresópolis city. These boulders were moved in 2011 debris flows and 4 of 5 have relatively low concentrations of Be-10 (20,000; 26,000; 32,000 and 66,000 atoms/g), the equivalent of 3 to 10 ky of surface exposure. One boulder contains 320,000 atoms/g, the equivalent of 48 ky of exposure. These data suggest that most boulders carried by debris flows contain modest concentrations of Be-10 (few 10s of thousands of atoms/g) generated from prior exposure on slopes before transport and deposition in the lowlands.

We sampled 5 pre-historic debris-flow boulders from several meters above the active channel in Posse, about 6 km NW of Teresopolis, an area devastated by 2011 debris flows. These boulders have a wide range Be-10 concentrations (32,000; 120,000; 300,000; 411,000 and 440,000 atoms/g) and exposure ages (5, 19, 48, 66, and 72 ky). Considered along with the data from active-channel boulders, it appears likely that debris flows repeatedly deposited boulders in this area during the later Pleistocene.

Three large pre-historic debris flow boulders (5 to 6 m) sampled 5 km west of Bom Sucesso contain high concentrations of Be-10 (800,000 to 900,000 atoms/g) and thus have very long exposure ages, 117-132 ky. These boulders are many meters above the adjacent channel and several meters above the adjacent farmland.

Sandy sediment deposited by 2011 debris flows and sampled at three different locations contains 340,000 to 490,000 atoms/g of Be-10, more than most debris flow boulders. Because the sandy sediment contains high concentrations of Be-10, it must be sourced from more stable parts of the landscape than the boulders, perhaps stable channel margin deposits eroded and reworked by the debris flows or from the rocky outcrops, so common in the area?

Session No. 332

T45. Tracking Sediment Movement across Earth's Surface
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