Amazon relic landscapes: evidence from cosmogenic ^{3}He in paleoriver hematite pebbles

MONTEIRO, H.S.[1],VASCONCELOS, P.M.[2], AND FARLEY, K.A.[3]

[1]Unesp, Rio Claro, São Paulo, Brazil, hevelynbr@gmail.com
[2]UQ, Brisbane, Qld, Australia, paulo@earth.uq.edu.au
[3]Caltech, Pasadena, California, USA, farley@gps.caltech.edu

The Carajás Mountains, located in the southeastern part of the Amazon craton, Brazil, host some of the deepest and most ancient continuously exposed weathering profiles on earth. Palaeodrainage systems, now inactive, filled with rounded hematite cobbles and pebbles are preserved on the Carajás Surface. These now fossilized rivers carved the landscape at a time when the Carajás Surface may have been a more continuous land surface, as opposed to its present state as isolated plateaus. To verify the old nature of the now extinct high-elevation (900 – 600 a.s.l.) palaeodrainage systems and to understand how river sediments survived changes in erosion and climate regimes, we use cosmogenic nuclides to calculate the time of surface exposure of hematite pebbles filling paleochannels.

Cosmogenic 3He concentrations on 41 distinct hematite cobbles and pebbles collected from two localities in the Serra Leste plateau, Carajás, Brazil, yield results ranging from 102 to 6 pcc/g. Assuming present-day elevations of 773 m (site 1) and 746 m (site 2) and latitude of S 05°58'26.16", exposure ages vary between 24.71 ± 0.09 and 2.76 ± 0.04 Ma for site 1 and 38.51 ± 0.15 and 6.33 ± 0.62 Ma for site 2. These cosmogenic 3He concentrations reveal a protracted history of exposure for the Carajás plateau. The range in ages obtained for the various pebbles probably reflect the exposure histories of the hematite ores before erosion, during transport, and after deposition at different depths within the channels. Unfortunately, the paleochannels sampled in this study have been disturbed by recent mining activities, and the original relative depth of each pebble within the channel could not be established. The results reveal that the paleosurface that once hosted the pebble-rich palaeodrainage system was being actively incised prior to ~ 40 Ma. Weathering geochronology and in situ cosmogenic isotope measurements imply that the Carajás Surface has seen very little erosion over the past ~ 20 Ma [1] [2]. The cosmogenic isotope concentrations on the river pebbles suggest that around 40 Ma a dramatic change in weathering and erosion-transportation regimes occurred, which favored the preservation of the pebble infill in the landscape.

[1] Shuster et al (2012) *EPSL*, **41-5**0; [2] Monteiro et al (2018) *GCA*, **162-183**.