



## **Chronology of Terra Firme formation in western Amazonia and implications for the diversification of Amazonian biota**

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The shift from a large wetland dominated by avulsive channels and flooded forests to the incised transcontinental Amazon River valley (Várzea) bounded by non-flooded forests (Terra Firme) is suggested as one of the main drivers of diversification of the mega diverse Amazonian Biota. Nonetheless, there is no consensus about the timing of this landscape shift, with the current literature suggesting a period that ranges from the Miocene (11 Ma) and the Late Pleistocene (100 ka). This uncertainty may be due to a lack of absolute ages for the sediments forming Terra Firme forest substrates in western Amazonian lowlands. In Brazil, the Içá Formation represents the uppermost fluvial deposits of Terra Firme forests substrates in western Amazonia. Therefore, a reliable chronology for the last depositional stage of the Içá Formation is key for an improved understanding of the formation of the current Terra Firme-Várzea system. Four sediment profiles were sampled along the margins of the Solimões and Içá rivers for Optically Stimulated Luminescence (OSL) dating, geomagnetic excursions, and palynological analysis. OSL dating was performed in twelve samples using a Single Aliquot Regeneration (SAR) protocol in quartz sand grains. The equivalent doses ranged from 47 to 130 Gy (Central Age Model) and the dose rate values ranged from 0.4 to 2.0 Gy/ka. The resulting sediment burial ages range from 48 to 112 ka. Paleomagnetic data were obtained from samples collected at same profiles sampled for OSL dating and results suggest the presence of Post-Blake geomagnetic excursion (~100 ka). The age of 100 ka for Post-Blake excursion are adopted for the Geomagnetic Instability Time Scale. Pollen assemblage data show a similarity to a more modern flora and the presence of *Alnus* clearly points towards Pleistocene deposition as it is unknown before in South America. The combined OSL, paleomagnetism and pollen data is a robust geochronological dataset that indicates Late Pleistocene ages for the last stage of built up of the Terra Firme in a broad region of the western Brazilian Amazonian lowlands. Therefore, the present-day unconformity between Terra Firme and Várzea deposits were formed by fluvial incision during the late Pleistocene and Holocene, which seems to be related with precipitation changes in the South American monsoon system. Our geochronological dataset point to important landscape changes during the late Pleistocene, with expansion of non-flooded Terra Firme and retraction of Várzea floodplain forests. This transition probably had important implications for the development of modern phylogeographical and biogeographical patterns in western Amazonia during the Quaternary. Future efforts will focus on dating drill-core sediment records using cosmogenic nuclides to extend the age range. Financial support: FAPESP 2009/53988-8, 2012/50260-6, 2014/23334-4, 2014/09800-2, 2016/09293-9; 2016/02656-9; CNPq 3009223/2014-8, 307647/2015-3; NSF DEB 1241066 and NASA.