



## Study of the Upper Mantle beneath the Carajás Mineral Province and Adjacent Regions using P-wave seismic tomography based on ray theory

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### Abstract

The Amazonian Craton, located in the northern portion of South America, is surrounded on the east, south and southwest by Neoproterozoic mobile belts. In its southeastern portion is the Carajás Mineral Province (CMP), bounded to the north by the Bacajá Domain (BJD). CMP is subdivided into two distinct tectonic domains: Carajás and Rio Maria. The boundary between these domains is characterized by a transitional belt extending approximately from east to west. This work contains a preliminary study of the Upper Mantle beneath the CMP and adjacent regions. We used the P wave teleseismic travel time tomography method based on ray theory (all the information is along the seismic ray), on data from 30 stations installed with resources from the "Geodynamics (4D) of the Carajás Mineral Province" project, supported by Vale S.A. The results are horizontal maps and vertical profiles of the upper mantle velocity distribution for these regions. Low-velocity anomalies were observed in the northern portion of the Araguaia Belt, observed in the tomographic images of 50, 75, 100 and 150 km and evidenced in the vertical profiles. This anomaly may be related to successive collisional episodes, occurred during the Brasiliano Orogeny (650-520 Ma). Another low-velocity anomaly, located in the central-west portion of the CMP (between the Rio Maria and Carajás domains), has been observed at depths from 50 km, with its highest intensity observed at 100 km. This anomaly may be related to the Uatumã magmatism, of volcanic and plutonic character, of Paleoproterozoic age (1.88-1.70 G.A), that occurred in the Iriri-Xingu Domain, in the Central Amazonian Province, which borders the Carajás Province. Alternatively, it could be related to intense Neoproterozoic crustal reworking (2.7 Ga) that occurred north of the Rio Maria Domain, giving rise to the plutonic rocks of the Plaquê Suite. This hypothesis is more unlikely, due to this tectonic event being considerably older. High-velocity anomalies are usually observed in tectonically stable cratonic zones, in which interaction with the hot mantle and likely upwelling is limited due to thick subcontinental keels. In the Rio Maria domain (3.05–2.86 Ga) to the south of the study area, high-velocity anomalies were observed between depths of 50 and 200 km. The zone of greatest intensity of the anomaly occurs mainly between 100 and 200 km of depth. Another high-velocity anomaly was observed in the BJD, where the most recent tectonic stabilization took place in the Paleoproterozoic (~1.9 G.a). This anomaly may be related to metamorphic rocks with Archean protoliths. In this case, it is likely that the metamorphism in this portion of the BJD was not sufficient to cause reactivations in the sublithospheric mantle.