Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33833

Devonian mafic dyke swarms in the Guiana Shield and the Emsian hiatus in Brazilian basins: evidence for an aborted mantle plume?

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The erstwhile supposed tectonic stability of Precambrian cratons is progressively challenged by the discovery of an increasing number of mafic dyke swarms in them, representing Large Igneous Provinces and rising mantle plumes. In the Guiana Shield at least four LIPs were discovered: Yanomami (1.98 Ga) Avanavero (1.78 Ga) Käyser (1.53 Ga) and CAMP (0.2 Ga), each of them assumed to reflect the ascent of a mantle plume.

During drilling for gold in the IAMGOLD Rosebel Gold Mines in northern Suriname, a new 2 m wide NE trending mafic dyke suite was discovered, the Roma Dolerite, which gave a surprising U-Pb 399.49±0.65 Ma age on 20 small zircon grains. U-Pb analysis for single zircon crystals was by isotope CA-ID-TIMS at the University of Toronto. The Roma dolerites are medium-grained ophitic pigeonite dolerites, with locally additional olivine. Geochemically they are low-Ti tholeiitic basalts.

Earlier, a NE trending Devonian dyke was reported along the Oyapock River, at the border between French Guiana and Brazil, with an Ar-Ar age on biotite, amphibole and plagioclase of 380 Ma. We interpret the dykes as evidence for an aborted Devonian mantle plume. The 70° NE Roma trend and the 35° NE Oyapock trend intersect each other in the present Atlantic Ocean around 7°N and 49°W, the possible centre of the mantle plume. Its paleogeographic context remains uncertain.

In the stratigraphy of the Amazon-Solimões basin and most other Brazilian basins a hiatus of ~7-16 Ma has been reported within the Emsian, that corresponds exactly with the age of the Roma and Oyapock dolerite suites. No conspicuous sea-level lowstand is known to have occurred at this time, and the only explanation has been given so far for this hiatus is a far-field effect of the Caledonian Orogeny. However, we speculate that uplift and erosion around an uprising Devonian mantle plume affords a better explanation.