UPDATED MAP OF THE MAFIC DIKE SWARMS OF BRAZIL BASED ON AIRBORNE GEOPHYSICAL DATA

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ABSTRACT: The Precambrian shield of South America indicates a history of several cycles of breakups, dispersion, accretion, and continental collisions. These breakup events may be related to LIPs (Large Igneous Provinces), and their identification and classification can be done by mapping and identifying mafic dike swarms, especially those that cover more than 50,000 km². Research on mafic dike swarms and LIPs (Large Igneous Provinces) are of vital importance in geologic history because they provide information on geodynamics, mantle geochemistry, and paleomagnetism. These data provide key information for paleogeographic reconstructions with the aid of barcode matches and precise radiometric ages. Considering such issues, the Brazilian Precambrian shield can be used as a case for refining the cartography of the relevant intraplate activity (e.g., dikes, sills, flood basalts) in space and time. In Brazil, the only map of mafic dike swarms that covers the entire national territory was created in 1987 by Sial, Oliveira and Choudhuri. Technical limitations of that period, such as limited radar imagery and fieldwork, and lack of geochemical and isotopic analysis, did not allow the identification of the real extension of the mafic bodies and their precise ages. In order to fill this gap, this work presents an updated map of the mafic dike swarms of Brazil produced from airborne geophysical maps (Series 1000 – Geological Survey of Brazil). Linear and strong anomalies found on aeromagnetic maps (e.g. First Vertical Derivative of the Magnetic Field and Amplitude of the Analytic Signal) were mapped on a GIS platform. The obtained data were compared to ternary radiometric maps and geological maps to exclude bodies that do not correspond to mafic dikes. The remaining structures - those believed to represent mafic dikes - were classified (i.e. received attributes, such as name, age, magmatic event, etc.) based on data compiled from the literature. The updated map exhibits more than 5,000 elements, including dikes and magmatic suites, in which about 75% were geologically identified and divided into 60 dike swarms, with preferred NE-SW and NW-SE orientations, and 10 igneous suites and/or formations. The dikes were grouped into sixteen extensional episodes from the Archean to the Cenozoic, although some are related to extension/transtension domains within regional compressive zones akin to orogenic settings. The most frequent records refer to the Proterozoic, representing intraplate episodes, some of them consistent with LIPs. The dataset also includes a large record of the Mesozoic age, which corresponds to major LIP events related to the opening of the Atlantic Ocean and the fragmentation of Gondwana.

KEYWORDS: MAFIC DIKE SWARMS, LIPs, AIRBORNE GEOPHYSICAL MAPS.