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Seismic Analysis and Characterization of the Felixlândia Region Using Focal Mechanisms and Waveform Inversion

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Introduction

Felixlândia (MG) is located on the western edge of the São Francisco Basin and has recently experienced an increase in the number of low-magnitude seismic events. In an intraplate setting, where seismic activity remains poorly understood, identifying the nature of these events (natural or anthropogenic) and characterizing the regional stress field is essential for understanding local seismicity and assessing seismic risk—particularly considering the presence of anthropogenic structures such as dams (Assumpção & Barbosa, 1994; Ferreira et al., 1995). In this context, focal mechanism modeling combined with waveform inversion represents an effective approach to infer fault geometry, stress orientation, and seismic source parameters (Assumpção, 1983; Doser, 1987).

Methodology

Seismic events of interest for this study will be analyzed using data recorded by the Brazilian Seismographic Network (RSBR) and some local networks. The methodology consists of the following steps: analyzing seismic phase polarities to construct focal mechanism stereoplots; applying waveform inversion techniques to estimate the seismic moment tensor (Zahradník & Custódio, 2012); and comparing results with geological data and nearby anthropogenic structures. Parameters such as nodal planes, orientations of the compression and extension axes, seismic moment (M_0), and moment magnitude (M_w) will be determined to characterize the fault type associated with the events.

Expected Results

Based on the proposed methodology, the study aims to identify the dominant faulting mechanism, the depth of the seismic events, and the orientation of the prevailing stress field. Additionally, the potential role of structures such as dams in triggering these events will be assessed, in order to determine whether the seismicity has a natural or induced origin (Assumpção et al., 2014; Ferreira & Assumpção, 2012). The results will contribute to the mapping of hidden active faults and to the refinement of the intraplate tectonic model for the São Francisco Basin (Berrocal et al., 1984; Assumpção, 1998).