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Analysis of recent seismicity in the Frutal region, Minas Gerais, Brazil

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Introduction

Since April 2023, a significant increase in the recording of seismic events has been observed in the Frutal region (MG), Brazil. On June 18, 2024, the event with the highest magnitude (4.1 mR) was recorded, based on data from seismographic control stations at the Seismological Observatory (SIS-UnB), University of Brasília, and data from the Brazilian Seismographic Network (RSBR), on which SIS-UnB is also a member.

Following the event of greatest magnitude, two additional temporary seismographic stations were installed near the epicenter, one in Frutal (MG) and the other one in Colômbia (SP), with the aim of providing improved capability to analyze local seismic events in the region.

In view of the above, this study focuses on investigating local seismicity in the Frutal region (MG) by reanalyzing previously recorded events and incorporating data from the newly installed temporary stations.

Methodology

Using data from SIS-UnB control seismographic stations and the RSBR, and employing the SeisComP and Seisan software, P- and S-phase arrival times were picked. Next, a local velocity model was calibrated, epicentral and hypocentral locations were determined, and finally focal mechanism estimates were carried out and their correlations with known geological structures were evaluated.

Results

The results of this study consist of a velocity model refined using the data employed in the analysis, as well as more accurate hypocentral locations and magnitude determinations, primarily through the incorporation of data from the stations installed in the study area between June 23, 2024, and February 1, 2025. These results were then correlated with existing geological structures in the region, allowing us to infer the activation directions of the faults present in the area.