



SBGf Conference

18-20 NOV | Rio'25

Sustainable Geophysics at the Service of Society

In a world of energy diversification and social justice

Submission code: VPZ8W907PL

See this and other abstracts on our website: <https://home.sbgf.org.br/Pages/resumos.php>

Ground-based gamma-ray spectrometry signatures of a kimberlite and its adjacent rocks in Jauru kimberlite field, southwestern Parecis Basin, Mato Grosso, Brazil.

Adolfo Silva (Geological Survey of Brazil), Izaac Cabral Neto (Geological Survey of Brazil), Paloma Do Sacramento di Carli (Geological Survey of Brazil), Vidya Vieira de Almeida (Geological Survey of Brazil), Éderson Silva (Geological Survey of Brazil), Felipe Da Mota Alves (Geological Survey of Brazil)

Ground-based gamma-ray spectrometry signatures of a kimberlite and its adjacent rocks in Jauru kimberlite field, southwestern Parecis Basin, Mato Grosso, Brazil.

Please, do not insert author names in your submission PDF file

Copyright 2025, SBGf - Sociedade Brasileira de Geofísica/Society of Exploration Geophysicist.

This paper was prepared for presentation during the 19th International Congress of the Brazilian Geophysical Society held in Rio de Janeiro, Brazil, 18-20 November 2025. Contents of this paper were reviewed by the Technical Committee of the 19th International Congress of the Brazilian Geophysical Society and do not necessarily represent any position of the SBGf, its officers or members. Electronic reproduction or storage of any part of this paper for commercial purposes without the written consent of the Brazilian Geophysical Society is prohibited.

Abstract

Kimberlites are ultramafic rocks that commonly contain a set of crustal and/or mantle-derive xenoliths and xenocrystals, such as olivine, garnet, spinel, chromium-diopside, phlogopite, and diamond, which can be of interest for mining and/or academic purposes. In the Mato Grosso State, the most kimberlite bodies occur in large kimberlite fields like Juína (52 intrusive bodies) and Paranatinga (40) fields. On the other hand, the Jauru kimberlite field accounts for only nine intrusive bodies of which three of them (namely Jauru-1, Jauru-2, and Jauru-3) occur close to the SW Parecis Basin border. During a recent fieldwork, we have mapped a kimberlite body 1 km away from Jauru-2 intrusion. We collected ground-based gamma-ray spectrometry data with the aim of investigating not only the radioelement content of this mapped kimberlite, but also the radiometric signatures of the adjacent rocks. Although geophysical investigation of kimberlites is commonly performed by magnetic or electromagnetic methods, gamma-spectrometry data can be useful in investigating processes leading to modification of the mineral composition of the rock (e.g., hydrothermal alteration) or soil formation (e.g., chemical weathering). By using a handheld gamma-ray spectrometer (RS - 230 with BGO sensor, Radiation Solution Inc.), we collected a total of 34 measurements of different units such as sandstones, kimberlites and granitoids, as well as their derived soils. All measurements were taken each 180 seconds (or 3 min) with the gamma-ray spectrometer previously stabilized. Besides the original radiometric variables (K, eTh, and eU), we also compute the ratios eU/eTh, eU/K and eTh/K, as well as the F-parameter and the Laterite Index. Then, we use different data visualizations like scatter and ternary plots. For ternary plot, concentration and ratios of the radiometric variables were sum-normalized, similar to airborne gamma-ray spectrometry ternary maps. Our main findings include: i) All chart plots show that silicified host rocks are K-rich (> 3%). The origin of K enrichment is unclear, but since that it occurs less than 5 m away from the mapped kimberlite, the K source may be related to a metasomatic alteration during the kimberlite emplacement; ii) The K concentrations in the mapped kimberlite is relatively higher (~0.5%) than nearby sandstones (~0.3%). This probably arises from the phlogopite contained in kimberlite; iii) Granitoid measurements are characterized by high radiometric values of K (> 5%) eTh (~30 ppm) and eU (~4 ppm), but such values are reduced in residual soils (K < 4.5%, eTh < 10 ppm, eU < 3 ppm). A decrease in the radioelement content is expected as chemical weathering progresses. However, our measurements of K contents in granitoid saprolite show that at least some K (~6%) may remain in profile; iv) F-parameter and Laterite Index are inversely correlated, but in a non-linear way. We suspected this can be related to K mobility, since that F-parameter tends to enhance the K increment, whereas Laterite Index tends to increase with K depletion. These findings suggest that ground-based gamma-ray data can be a useful tool for understanding compositional changes related to kimberlites and their surrounding rocks. However, new information, such as petrological data or chemical analysis, is required to deepen this understanding.