

Magnetic Susceptibility Signatures and VLF-derived Extension Perspectives for the Ni-Cu-PGE Mirabela Intrusion, São Francisco Craton, Brazil.

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Nickel (Ni), copper (Cu), and platinum group elements (PGE) are strategic metals whose demand is expected to increase with the advancement of the clean energy transition. The paleoproterozoic Itabuna-Salvador-Curaçá orogen (ISCO), in the northern São Francisco Craton, hosts several mafic and ultramafic bodies that are mineralized or prospective for these metals. On the southern side of ISCO lies a stratiform mafic-ultramafic intrusion known as Mirabela, which hosts two magmatic Ni-Cu-PGE deposits, Santa Rita and Peri-Peri, and the Serra Azul Ni lateritic deposit. The Mirabela intrusion crystallized at ~1.99 Ga in a syntectonic transtensional setting. In the Santa Rita deposit, the Ni–Cu sulfide mineralization is hosted by harzburgites, orthopyroxenites, and olivine-orthopyroxenites in the intermediate portion of the cumulate sequence, and with the highest concentration on the harzburgite. The deposit is dominated by pentlandite (Ni), pyrrhotite (Fe), and chalcopyrite (Cu), occurring mainly as disseminated and intercumulus sulfides. According to Appian Capital, the total resources of the Mirabela intrusion are 52.9 Mt, with grades of 0.33% NiS, 0.12% Cu and 0.01% Co, and total reserves are 50,6Mt, with 0,31%NiS, 0,11% Cu and 0,01% Co. The mineralized horizon lies between basal dunites and overlying mafic units. Geophysical data and drillhole information indicate a ~4 × 2.5 km boat-shaped layered body, ~3 km thick, with well-developed cumulate stratigraphy and a continuous stratiform sulfide layer formed by accumulation of immiscible sulfide melts. The Santa Rita mine comprises two open pits aligned on a N-S trend, separated superficially by a gneiss, but the possibility of a depth connection is unknown. The study performed three VLF surveys, with profile lengths ranging from 1.2 to 1.8 km, to investigate the depth extension of the Mirabela body and its mineralization in new areas. Magnetic susceptibility was measured along ~450 m of drill core to correlate these values with ore concentrations and alterations.