

# APPLICATION OF AIRBORNE MAGNETIC DATA FOR GOLD MINES-NAMUNO-MOZAMBIQUE

Authors: Macuacua C. Carlos, Toru Mogi, Kazuya Ishizuka (Hokkaido University) and Mitsuru Utsugi (Kyoto University)

Carlos Castigo Macuacua<sup>1</sup>, \*Toru Mogi<sup>1</sup>, Kazuya Ishitsuka<sup>2</sup>, Mitsuru Utsugi<sup>3</sup>

1. Hokkaido University, 2. Hokkaido Univ, 3. Kyoto Univ

The Namuno area is located in Mozambique belt terrains, the extensive belt is defined as the southern Part of the East African Orogeny and essentially consists of medium-to high-grade gneisses and voluminous granitoids. The deposit of gold is expected to exist in the area.

In this research, in order to delineate the subsurface structure of the area, we analyzed high-resolution aeromagnetic data by 3D inversion, spectral pattern, filtering operation and Euler deconvolution.

The 3D inversion is based on L1 and L2 norm regularization that is equivalent to the naive elastic net equation and linearly combines the L1 and L2 penalties of the Lasso and Ridge method (Utsugi, 2016). The main objective of application of the above-mentioned technique for solving inversion problem was to construct an acceptable model using appropriate tradeoff parameter  $\beta$  that highlight geological subsurface linear features which may have acted as conduits for gold mineralized fluids in over Namuno area.

The obtained optimal model from the Coordinate Descent Algorithm for L1-L2 norm regularized problem reveals the low magnetic signature elongated features with predominately SW-NE orientation, that is located in depths inferiors to 1km. This trend may correspond the quartz veinlets (carrying gold mineralization over this area) and are spread out in all over the target area as well as significant high anomalies values which overlap on Xixano complex intrusive orthogneisses gabbroic rocks, in the southeast of the study area. In order to discuss these results, the horizontal first order derivatives filters were applied and also revealed the existence of linear geological structures predominantly oriented to NE, not exposed in geological map(1:250000) and where confirmed by shaded relief with azimuth of light 315°, amplitude of light 45° and factor  $z=5$ .

Furthermore, the 2-D spectral analysis revealed several population depth source models, where the deeper magnetic source bodies with an average depth of 752m, while the depth to the shallower magnetic source bodies ranges from 63 to 203 m and an average depth, is 130 m. The shallower magnetic anomalies are believed to be as the result of discontinuities like faults, intrusive rocks (gabbroic rocks) fractures and lineations the deeper population may be assigned to magnetic basement rocks (amphibolite gneisses). The Euler deconvolution with structural index equal to 1.0, was performed and this technique helped to delineate structural features located predominately at depths 300 -500 m. Thus, some linear structural features inferred by several techniques aforementioned lay on top of some areas with very strong small-scale gold mining in Namuno area.

Keywords: Aeromagnetic, Inversion, Namuno