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The Wilkes subglacial basin eastern margin electrical conductivity anomaly

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We have analyzed the deep conductivity structure at the transition between the Transantarctic Mountains (TAM) and the eastern margin of the WSB in NVL, by means of the GDS (Geomagnetic Deep Sounding) technique, in order to constrain the geodynamical interpretation of this antarctic sector.
The TAM form the uplifted flank of the Mesozoic and Cenozoic West Antarctic Rift System.
Structure of the TAM rift flank has been partially investigated with different geophysical approaches.The Wilkes Subglacial Basin is a broad depression over 400 km wide at the George V Coast and 1200 km long. Geology, lithospheric structure and tectonics of the Basin are only partially known because the Basin is buried beneath the East Antarctic Ice Sheet and is located in a remote region which makes geophysical exploration logistically challenging.
Different authors have proposed contrasting hypothesis regarding the origin of the WSB: it could represent a region of rifted continental crust, or it may have a flexural origin or might represent an "extended terrane". Recently aerogeophysical investigations have demonstrated a strong structural control on the margin.
Magnetovariational studies carried out at high geomagnetic latitudes are often hampered by source effects, mainly due to the closeness to the Polar Electrojet currents systems (PEJ). Its presence, in fact, makes the uniform magnetic field assumption, on which the magnetovariational methods are based on, often invalid, which outcome is a bias in the GDS transfer functions and to compromise the reliability of the inverted models.
Data from the aforementioned campaigns have been then processed under the ISEE project (Ice Sheet Electromagnetic Experiment), aimed at evaluate and mitigate the bias effect of the PEJ on geomagnetic an magnetotelluric transfer functions at high geomagnetic latitudes, by means of suitable processing algorithms, developed upon a statistical analysis study on PEJ effects (Rizzello et al. 2013).
Recent results allowed for a new processing of a wide dataset acquired during three different international Antarctic campaigns supported by the Italian Antarctic Project: the BACKTAM, WIBEM and WISE expeditions.
The qualitative analysis of the induction arrows, in the period range 20-170 s, reveals an approximately 2D regional electrical conductivity pattern with a clear differentiation between the three Terrains crossed by the GDS transect we have re-analized: the Robertson Bay, the Bowers and the Wilson Terrain. Bi-dimensional conductivity models, jointly with magnetic and gravimetric profiles, suggest a differentiation of the investigated area in three crustal sectors separated by the Daniels Range and the Bowers Mts., in close relation with main known structural lineaments; to the West, a deep conductivity anomaly is associated with the transition to the Wilkes Subglagial Basin. We deem that such anomaly, together with the magnetic and gravimetric signatures, is compatible with an extensional regime in the eastern margin of the WSB.

References

Rizzello, D., Armadillo, E., Manzella, A.“Statistical analysis of the polar electrojet influence on geomagnetic transfer functions estimates, over wide time and space scales”. EGU 2013 General Assembly, Wien – poster presentation.