ELECTRICAL CONDUCTIVITY IMAGING OF CRUSTAL STRUCTURES IN NORTHERN VICTORIA LAND, ANTARCTICA

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Magnetovariational (MV) and magnetotelluric (MT) surveys are useful tools to understand both the structure and evolution of the Antarctic lithosphere over regionally extensive areas. This is particularly the case over the interior of East Antarctica, the most poorly understood part of our planet and a major frontier for future exploration. However, the application of these techniques is still in its infancy in Antarctica compared to the other continents. This is in part due to the polar electrojet current system which can cause source fields that may violate the uniform plane wave assumption underlying standard MV and MT data processing.
Since year 2000, we initiated a phase of systematic deep electrical conductivity studies over Northern Victoria Land, in East Antarctica. Among the first results achieved, the most outstanding evidence, revealed by MV probing, is a wide electromagnetic anomaly under the Deep Freeze Range crustal block. Following this experience a larger number of MV stations were deployed over the Transantarctic Mountains and the enigmatic Wilkes Subglacial Basin. The BACKTAM array across the Cenozoic Rennick Graben and the Early Paleozoic terrane boundaries of northern Victoria Land provides an example of the potential of the MV technique in the detection of major glaciated fault zones.
Here we show a new set of 2D deep electrical conductivity images across the Rennick Graben and the eastern faulted margin of the Wilkes Subglacial Basin. Induction arrows analysis and a 2D inversion models provide a unique deep electrical resistivity window beneath these fault zones. The electrical resistivity break across the Lanterman Fault is apparently restricted to the upper crust, suggesting that this strike-slip fault may not represent a deep lithospheric suture. Further east, a westward-dipping conductor is traced to a depth of 40 km beneath the Robertson Bay Terrane. It may image a remnant of the paleo-Pacific oceanic plate, which subducted beneath the Bowers Terrane. Within the Wilson Terrane, the Rennick Graben is an upper-crust resistive block. The Rennick Graben lacks a deep crustal or upper mantle conductor, in contrast to several continental rifts. However, similar resistive lower crust underlies some other major strike-slip fault belts.

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