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First 3D modelling of the sub-surface of east-central Namibia using combining geophysics with distal geological data

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ABSTRACT

The Geophysics Division has embarked on its country-wide interpretation of world-class airborne magnetic and radiometric geophysical data in 2012. This integrated interpretation of geophysical data sets started with the successful Karas Interpretation project, the experience and interpretation techniques gained during the Karas Interpretation identified that additional specialized software and computer-based 3D modelling and rendering should be applied. To this end, it was decided to invest in 3D modelling using the GeoModeller software package exclusively developed by Intrepid Geophysics. The Geophysics Division and Intrepid Geophysics embarked on an ambitious project to develop the first ever 3D model of the sub-surface of eastern Namibia using the full suite of geophysical and vector based geological data available at the GSN.

The project area corresponds to the zone between longitude 17°E to 21°E and latitude 20°S to 22°S. Geological maps, the digital terrain model, and processed geophysical data from this zone were used to constrain an implicit 3D model of formation boundaries and structural geology for the Inland Damara Belt area and overlying Tertiary cover. GeoModeller software was used because it has the advantage of an integrated workspace for all available data, and creates geolocated models. The Projection System of the model and its constraining data is WGS84/SUTM33S. The stratigraphic pile for the project was created by combining knowledge from two geological maps and simplifying in order to create a realistic but simplified geological pile. Formations which are well revealed by the geophysics data were also given priority. The draped vertical derivative from the RTP was created to domain the magnetic signal and facilitates compartmentalization of the large-scale geological features. This enabled contouring of the structural features of the Damara Belt below the Tertiary cover. By using variable transparency in each layered data set, the RTP could be juxtaposed on the geological maps in workspace. This allowed extrapolation of the trend of the Damara thrust belt and incorporated sequences from the south-west to the north-east. In this manner, continuity of the Damara Belt under the Tertiary Cover was clearly evident.

A preliminary 3D geology model of the Damara Belt Inland Branch has been successfully created using geological knowledge gained from airborne magnetic data and therefore new results that build on this model of the Damara Belt Inland Branch will be presented, as depth converted EM sections (vertical CDI images) were incorporated into the model, and used to better constrain the cover thicknesses. Borehole data drilled for water exploration in the area are included into the model in order to constrain the 3D geology model even further.

REFERENCES

- [1] Gray, D.R., Foster, D.A., Meert, J.G., Goscombe, B.D., Armstrong, R., Trouw, R.A.J., and Passchier, C.W., A Damara Orogen perspective on the assembly of southwestern Gondwana. 10.1144/SP294.14, *Geology & Geophysics publications*, 2008. ¹

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