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2D and 3D Inversion Results from Magnetotelluric Survey in the Eastern Karoo Basin, South Africa

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With the current search for new energy resources, shale gas has become an increasingly important resource alternative. Thus, there is renewed interest in the hydrocarbon bearing potential of the Karoo Basin with special focus on the black organic shales of the Whitehill Formation. 2D and 3D subsurface magnetotelluric (MT) modelling of the Eastern Karoo Basin near Jansenville, South Africa will provide an initial assessment of the geometry and internal properties of the conductive Whitehill Formation at depth.

Expanding on the 2D survey of Weckmann et al. [1], a 50km x 30km MT field experiment was jointly conducted by AEON (Africa Earth Observatory Network) and the GFZ (German Centre for Geosciences) in November 2014. 111 five-component (3 magnetic, 2 electric) MT stations were deployed for three days each, measuring time variations of the Earth's natural electromagnetic fields in a range of 10kHz-1mHz. Stations were arranged into seven profiles (separation distance of 5km) with a dense 2-3km site spacing along the profile, thus enabling high resolution 2D and 3D MT inversions.

Standard single-site processing, remote referencing and notch and delay filtering have been conducted at the GFZ in Potsdam, Germany. Initial 2D and 3D MT inversions, using Mare2DEM [2] and ModEM [3, 4] respectively, are in progress. Model interpretation will focus on factors key to determining the potential for shale gas activity (e.g.: geometry of shale rock horizons and identification of water reservoirs). Potential incorporation of additional data sets collected in the study area, which include aeromagnetic, seismic, borehole logs and hydrocensus, will assist in the interpretation.

References:

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