

# **GEOCHEMICAL AND PETROPHYSICAL ANALYSIS OF THE PERMIAN LOWER ECCA GROUP, KAROO BASIN, SOUTH AFRICA**

**Claire Geel<sup>1</sup>, Emese Bordy<sup>1</sup>, Hans-Martin Schulz<sup>2</sup>, and Bernhard Krooss<sup>3</sup>**

<sup>1</sup>University of Cape Town

<sup>2</sup>German Research Center for Geoscience

<sup>3</sup>RWTH Aachen University

## **ABSTRACT**

Heightened global interest in unconventional hydrocarbon resources has resulted in the main Karoo Basin becoming an attractive target area for shale gas exploration in the past few years. In the Karoo Basin, the Whitehill Formation (Permian Ecca Group) is the most likely unit to produce potentially exploitable gas, although the underlying Prince Albert and overlying Collingham Formations, respectively, remain candidates for exploration as well. In our collaborative efforts, we aim to investigate the petrophysical and geochemical characteristics of the lower Ecca Group. In gas shale systems, the shale acts as both the source rock and reservoir. Successful gas-bearing shale will have the following characteristics: 1) high organic content, 2) primary or secondary cracking of kerogen, 3) retention of oil for cracking to gas by adsorption, 4) porosity resulting from organic matter decomposition, and 5) brittle mineralogical composition. The Whitehill Formation has a high TOC content, up to 8.5%. Solid bitumen was observed in vitrinite reflectance measurements ( $BR_o=4\%$ ), which suggests thermal cracking from oil has taken place. Thermovaporization measurements and on-site gas desorption recorded small quantities of short chain hydrocarbons such as methane. Mercury intrusion porosimetry measured the meso- and macro-porosity at 0.83%, while the Helium pycnometry technique, which includes nano-porosity, measured 6.91%. The mineralogy of the shale suggests suitable brittleness due to high clay, quartz, calcite, dolomite and pyrite content. The samples evaluated in this study are highly affected by their location relative to the Cape Fold Belt and dolerite intrusions.