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**Diagenetic, thermal and provenance histories of the Permian lower Ecca Group based on two newly drilled boreholes in the western and eastern main Karoo Basin, South Africa**

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The main Karoo Basin of South Africa contains up to 6 km of sedimentary rocks [1,2,3] recording a geological history from ~312 to ~183 Ma and with several stratigraphic units of economic importance (e.g., coal, uranium) [4,5,6,7,8]. In recent years, a global drive towards unconventional hydrocarbon reservoirs has heightened the interest in the Permian black shales of the lower Ecca Group (the Prince Albert, Whitehill and Collingham formations), which have high total organic carbon. Up to 14 wt% is recorded in the black shales of the Whitehill Formation, which makes it a potential host for shale gas. The total organic carbon content values and other geological characteristics of these lower Ecca units vary laterally within the basin, and depend on the abundance of Jurassic-age Karoo dolerite intrusions. Assuming that the thermal maturity of the carbonaceous rocks in the lower Ecca increased during burial and diagenesis, the development of shale gas is possible within the basin. Greater understanding of the sedimentology, geochemistry and depositional environments of the lower Ecca Group is required to more accurately determine the full history under which shale gas may have formed. Two deep boreholes by the Karoo Research Initiative KARIN in the eastern and western main Karoo Basin intersect in full the lower Karoo strata. The first borehole, located in the Tanqua Karoo Basin, was completed at 671 m depth, whereas the second borehole, located at Willowvale (Eastern Cape), was completed at 2352 m. These freshly drilled cores will provide unaltered rock samples for the petrographical, geochemical and petrophysical analyses to be carried out in our study in order to assess the burial, diagenetic, thermal and provenance histories as well as to determine the hydrocarbon potential of lower Ecca Group in the main Karoo Basin.

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