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## **The Geological Framework and Economic Potential of the Coal-Bearing Karoo Strata in the Central Kalahari Basin, Botswana\***

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Search and Discovery Article #50184 (2009)

Posted May 20, 2009

\*Adapted from oral presentation at AAPG International Conference and Exhibition, Cape Town, South Africa, October 26-29, 2008.

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### **Abstract**

The Permian Karoo rocks in Botswana are little known with regards to their regional and local tectonic, climatic and depositional controlling mechanisms, and hence our understanding of the distribution, thickness and lateral continuity of the contained, economically important mineral resources (e.g., coal, coalbed methane, water) is hampered.

This MSc study of the coal-bearing Karoo strata in the Central Kalahari Sub-basin attempts to work out the dynamics of coal depositional environments, in particular the forces responsible for changes in the accommodation space (e.g., subsidence vs. sedimentation rates). This is hoped to be achieved by a detailed review of the temporal and spatial stratigraphic variation of the coal-bearing successions, including the analysis of facies changes based on over 800, widely distributed borehole records (e.g., core descriptions, gamma and spontaneous potential logs), field observations and palaeocurrent measurements. Utilizing RockWorks®, the subsurface data will be processed and results expressed in form of multi-log plots, cross-sections for correlation purposes (e.g., fence diagrams) and various maps (e.g., clastic to coal ratio contours, coal seam and sandstone isopach maps).

It is hoped that the results will lead to the development of regional tectonic and depositional models for the Permian Botswana Karoo sequences which will likely further enhance the exploration, exploitation and management of economic resources, especially that of coal, in the study area. Furthermore, it is anticipated that our results will be applicable as guidelines for future coal and stratigraphic correlation studies of the Permian Karoo strata in southern Africa.

Selected Figures

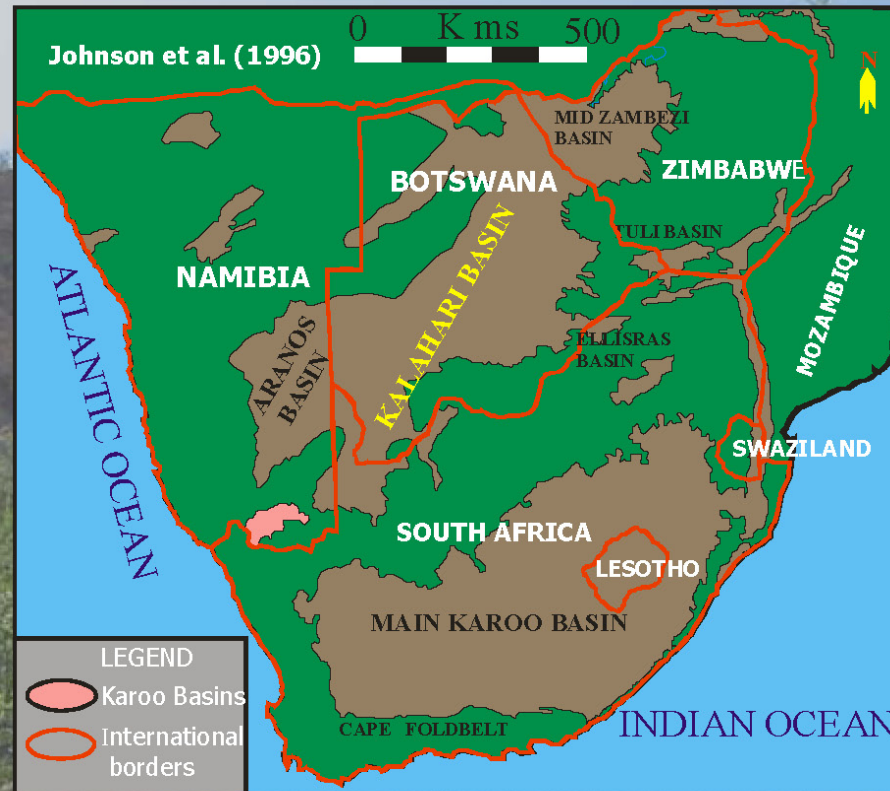
# Karoo Supergroup in southern Africa

Several distinctive Karoo basins:

Main Karoo Basin

Great Kalahari Basin

- ✓ Aranos Basin (Namibia)
- ✓ Kalahari Karoo Basin (Botswana)
- ✓ Mid-Zambezi Basin (Zimbabwe)

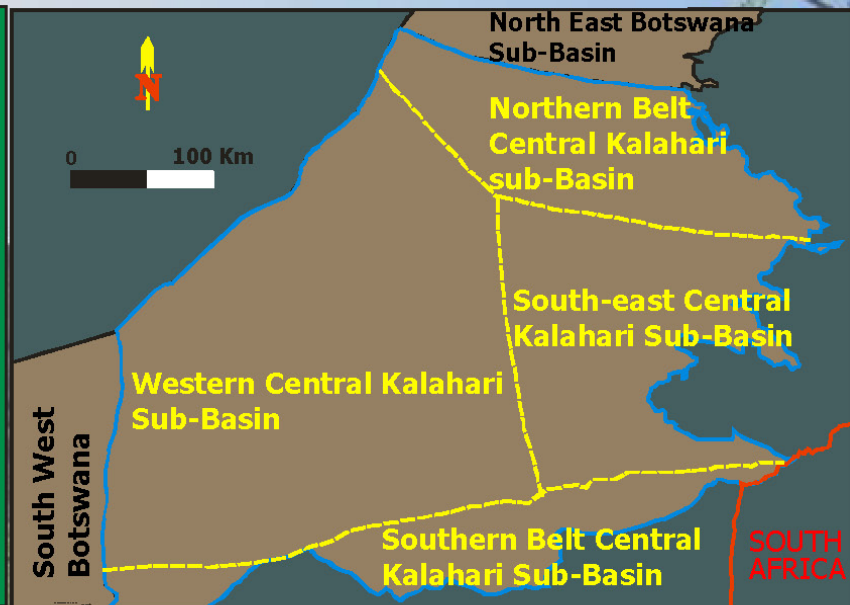


Slide 3. Location of the Karoo Supergroup in Southern Africa.

# Kalahari Karoo Basin (KKB)



Divisions of Kalahari Karoo Basin



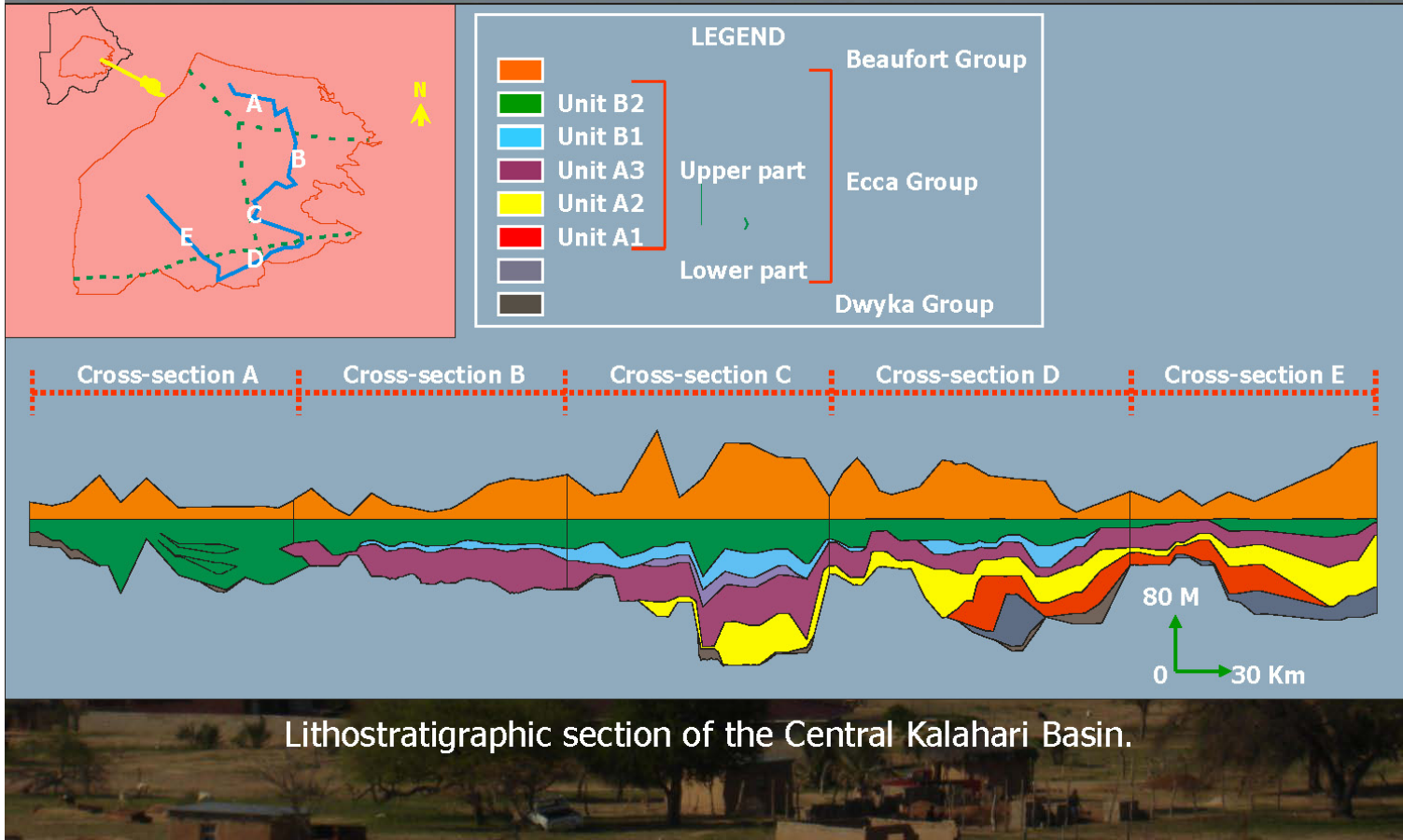
Subdivisions (Belts) of the Central Kalahari Basin – Study Area

Stormberg Lava Group
<b>Lebung Group</b>
Beaufort Group
Ecca Group
Dwyka Group

Karoo Stratigraphy in the Kalahari Karoo Basin

Slide 4. Subdivisions of the central Kalahari Karoo Basin (study area).

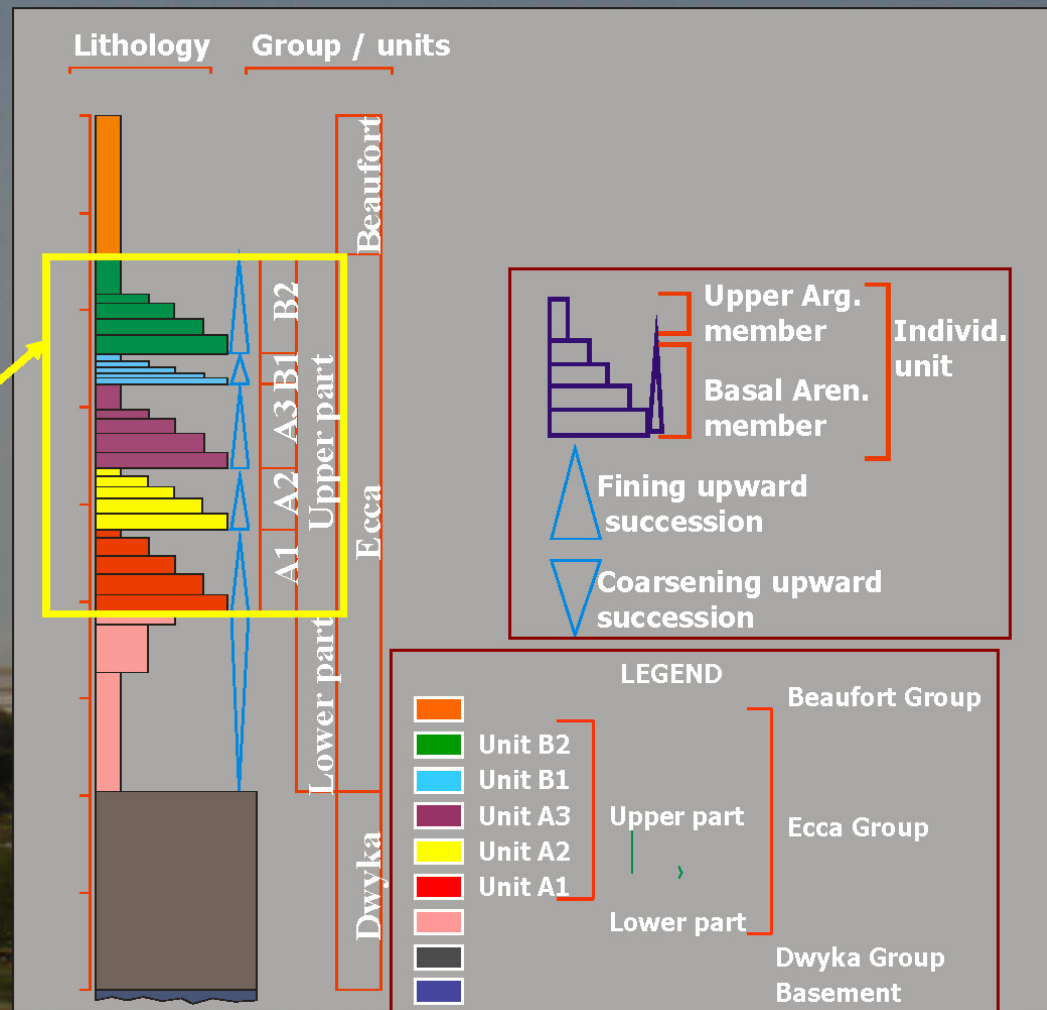
# Distribution of the Units in the Study area



Slide 17. Distribution of the stratigraphic units in the study area.

- The delta plain is characterised by five sedimentary cycles

- Unit B2
- Unit B1
- Unit A3
- Unit A2
- Unit A1



Slide 23. Delta plain deposits are characterised by five sedimentary cycles.

### **Selected References**

Catuneau, O., P.J. Hancox, B. Cairncross, and B.S. Rubidge, 2002, Foredeep submarine fans and forebulge deltas; orogenic off-loading in the underfilled Karoo Basin: *Journal of African Earth Sciences and the Middle East*, v. 35/4, p. 489-502.

Johnson, M.R., C.J. Van Vuuren, W.F. Hegenberger, R. Key, and U. Show, 1996, Stratigraphy of the Karoo Supergroup in southern Africa; an overview: *Journal of African Earth Sciences*, v. 23/1, p. 3-15.

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