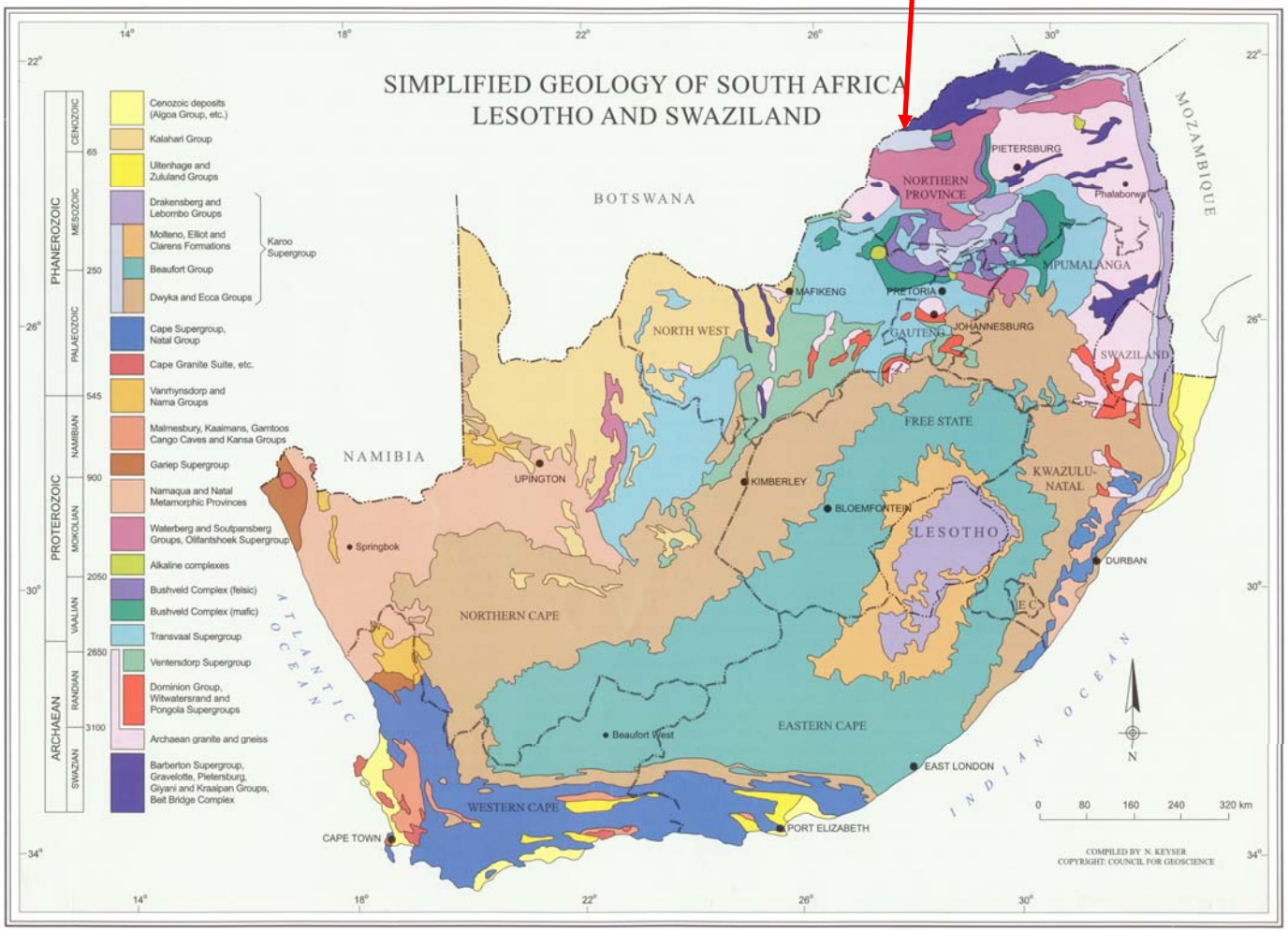
The structure of the Karoo-age Ellisras Basin in Limpopo Province, South Africa in the light of new airborne geophysical data

Dr. Stoffel Fourie, Dr. George Henry and Ms. Leonie Marè

Location

Waterberg Coalfield



Map courtesy Council for Geoscience

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Importance of Waterberg Coalfield

- Future of SA coal resources

- Exxaro –
- Grootegeluk Mine:
- Resources 5 559 Million tonnes (Mt)
- Reserves 3 308 Mt (included in resources)
- Other resources – 6 662 Mt

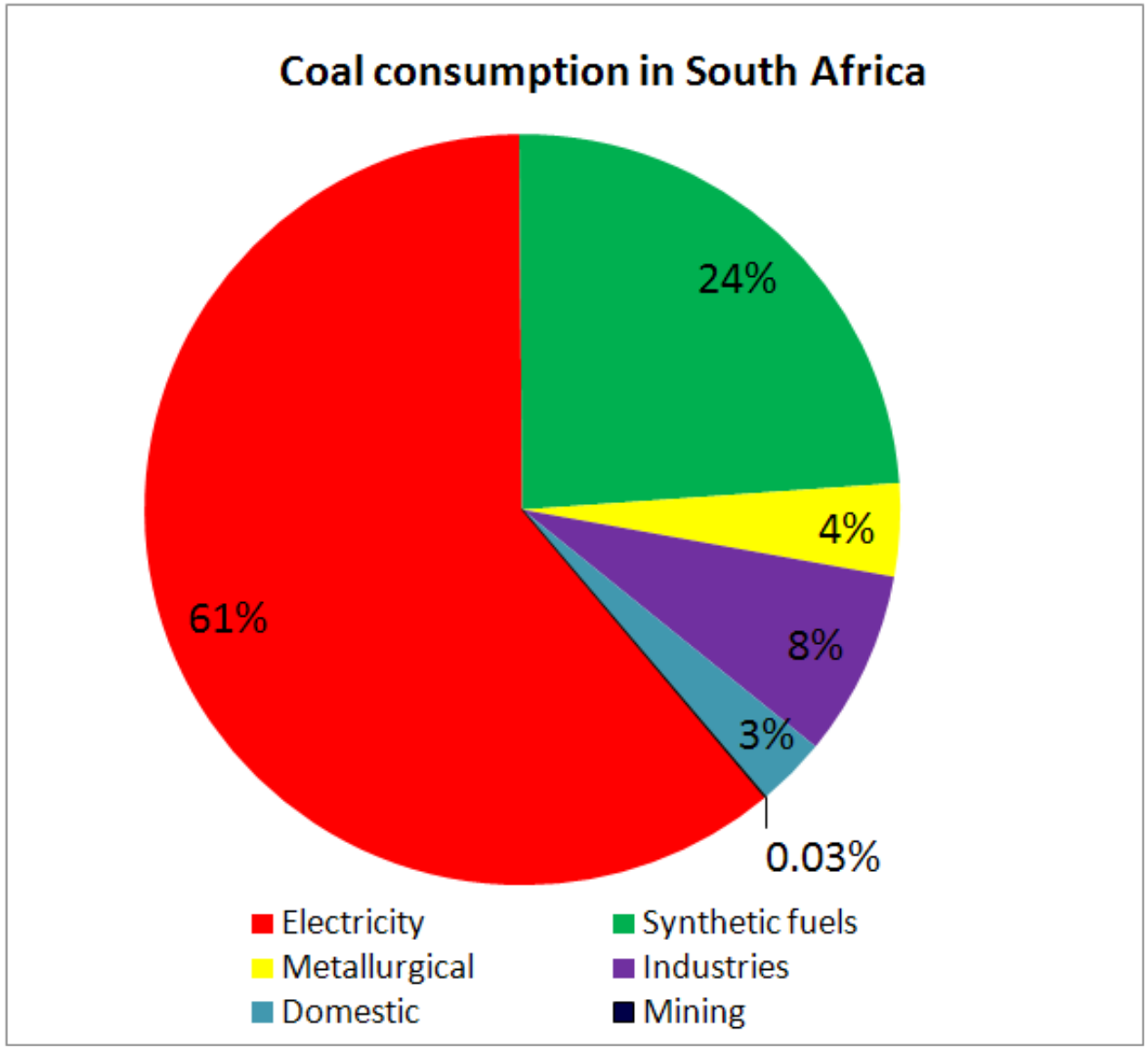
From: Exxaro Annual Report 2008

Witbank : 10 140 Mt reserve
Highveld : 10 000 Mt
Ermelo : 4 600 Mt

From : Jeffrey 2005, all figures for 2000

SA Production ~250 Mt (2007)

From: SAMI, 2008



From: ESI-Africa

Courtesy Exxaro

Grootegeluk Coal Mine

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Courtesy Exxaro

Grootegeluk Coal Mine – mining operations

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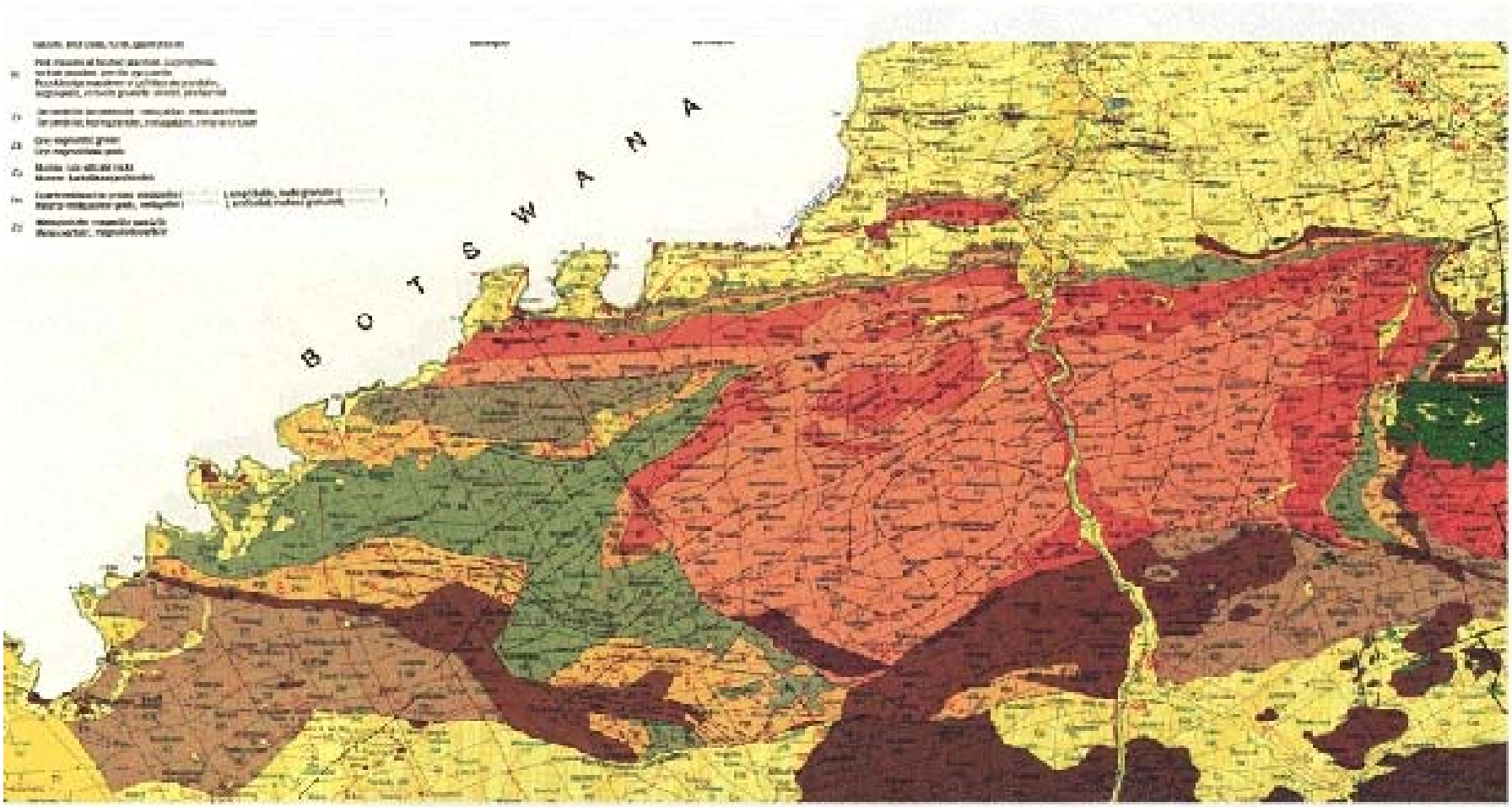
Courtesy Exxaro

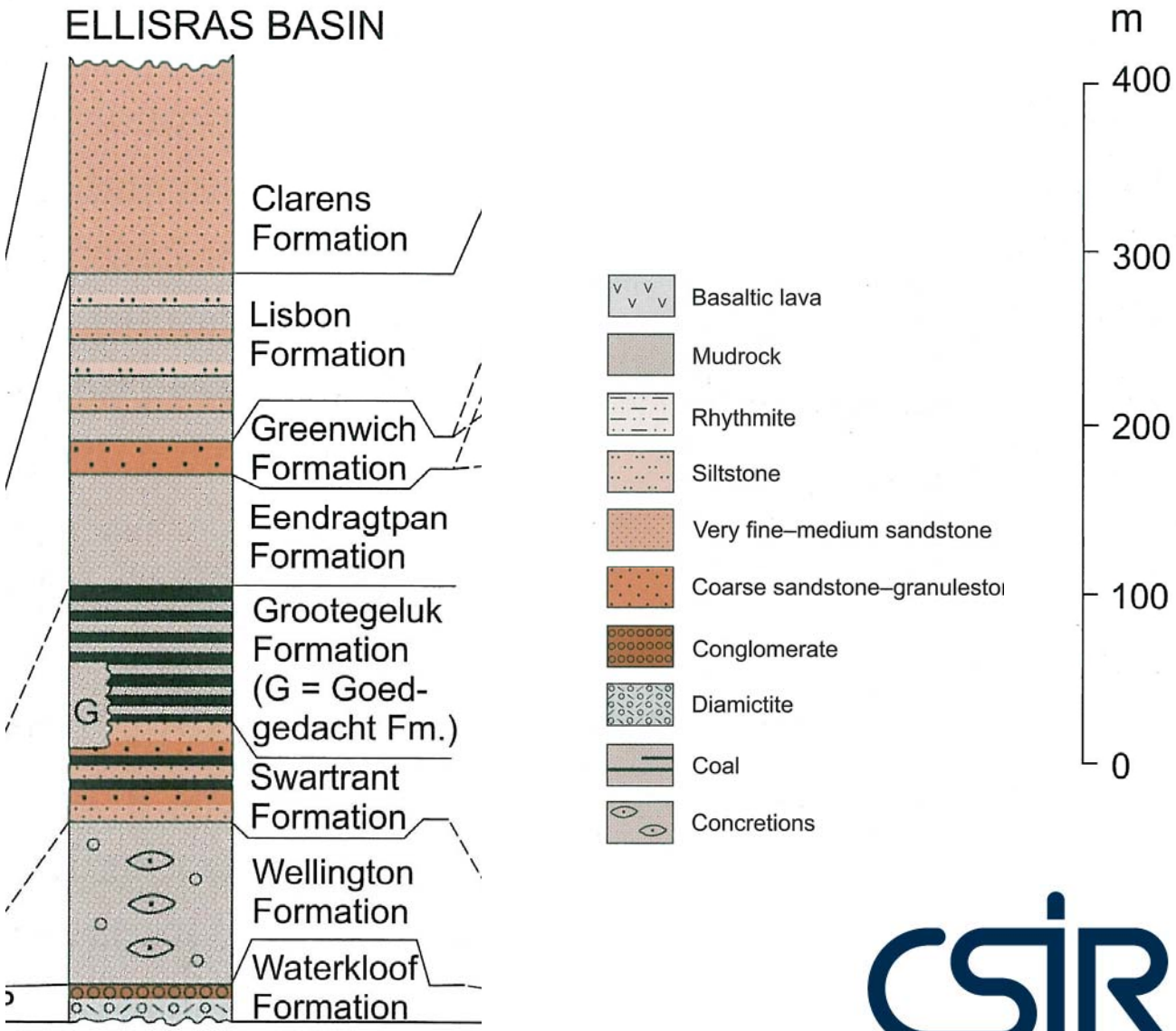
Grootegeluk Coal Mine – Processing Plant

Geological Setting



Courtesy: Council for Geoscience

Karoo Supergroup

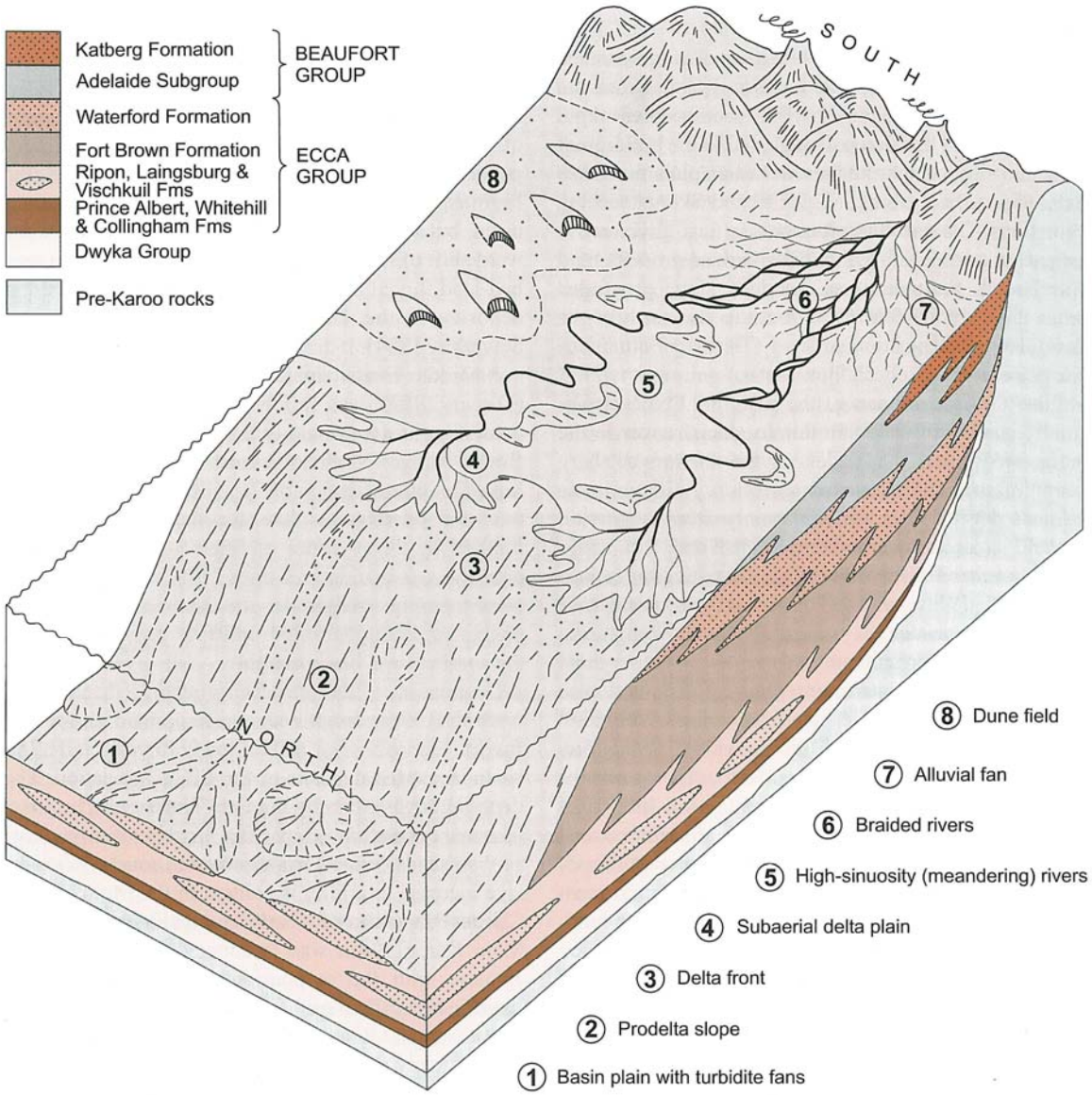


Johnson et al., 2006

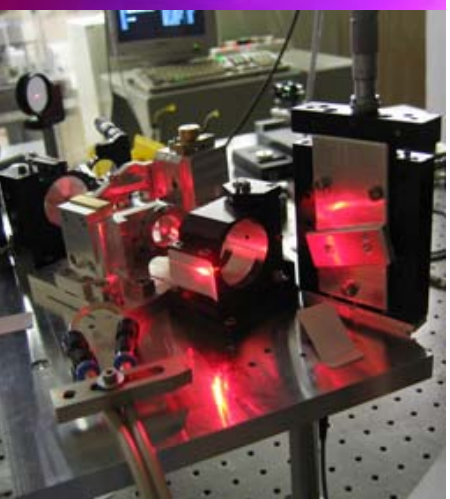
Courtesy Exxaro

Grootegeluk Coal Mine – coal seams

Deposional environments



Johnson et al., 2006



Airborne Geophysics

- Stoffel Fourie’s presentation
- Radiometrics
- Magnetics

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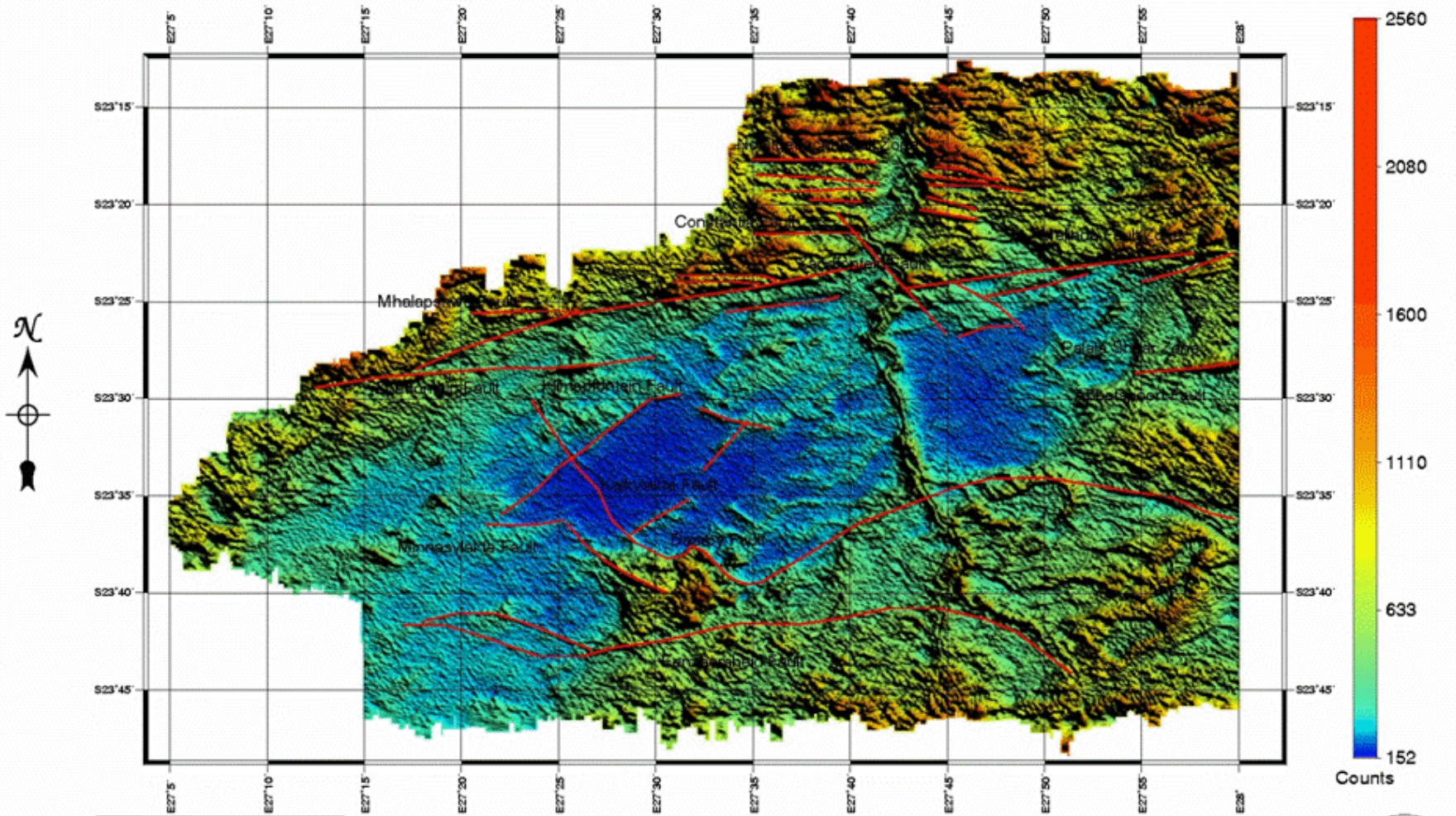
Waterberg Total Count Data



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Waterberg Coalfield
Airborne Geophysics
Total Count Data
Flightline Spacing 200m
Flight Direction N-S

DATE: 29/02/2000 | BY: G.J.S. Fourie | PLAN NO.
SCALE: 1:250 000 | REF.

Scale 1:250 000

8 0 8 16

Kilometers

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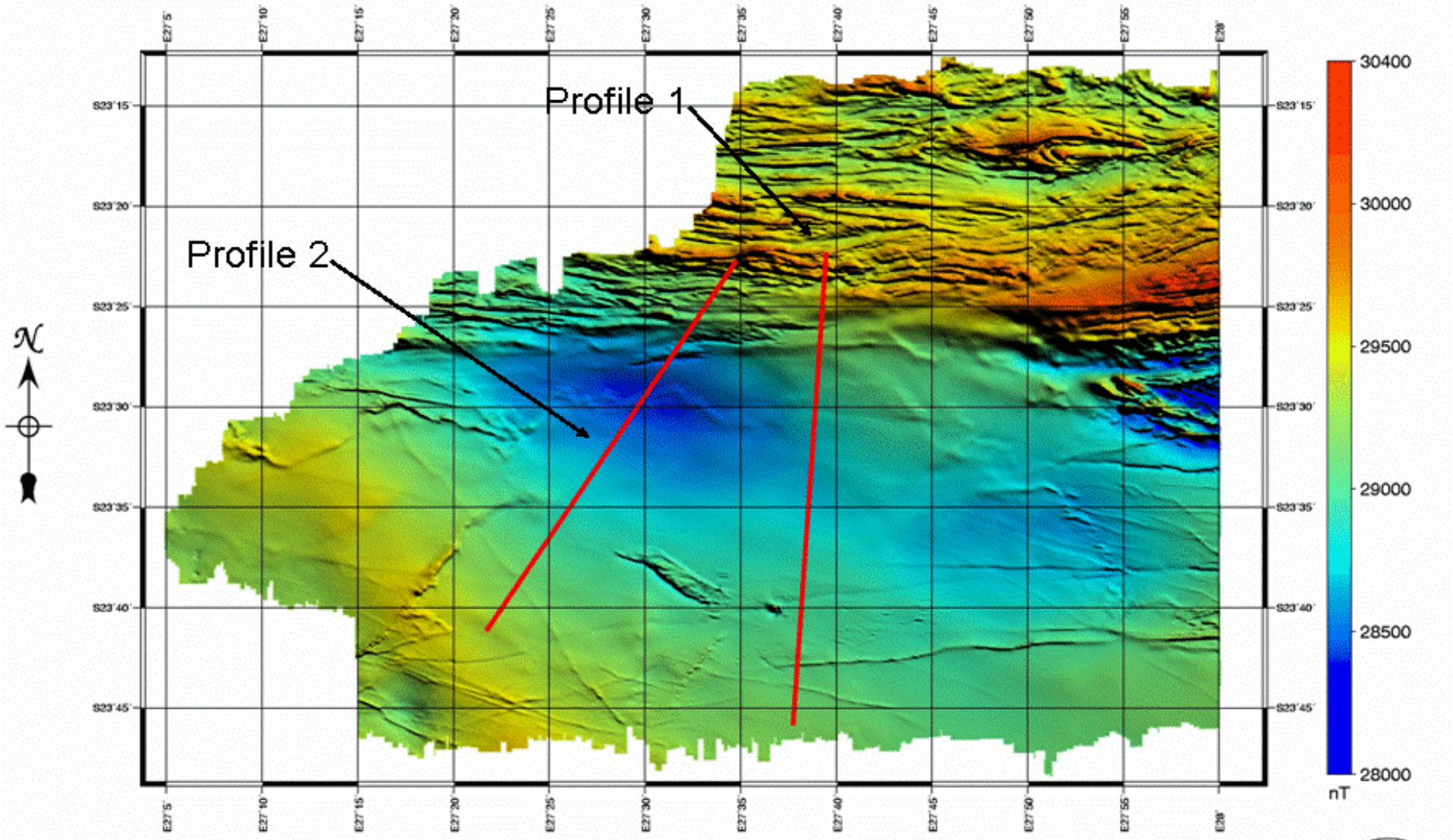
COALTECH

Waterberg Magnetic Data



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Waterberg Coalfield
Airborne Geophysics
Magnetic Data
Flightline Spacing 200m
Flight Direction N-S

DATE: 28/02/2008 | BY: C.J.S. Fourie | PLAN NO.
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Scale 1:250 000

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Kilometers

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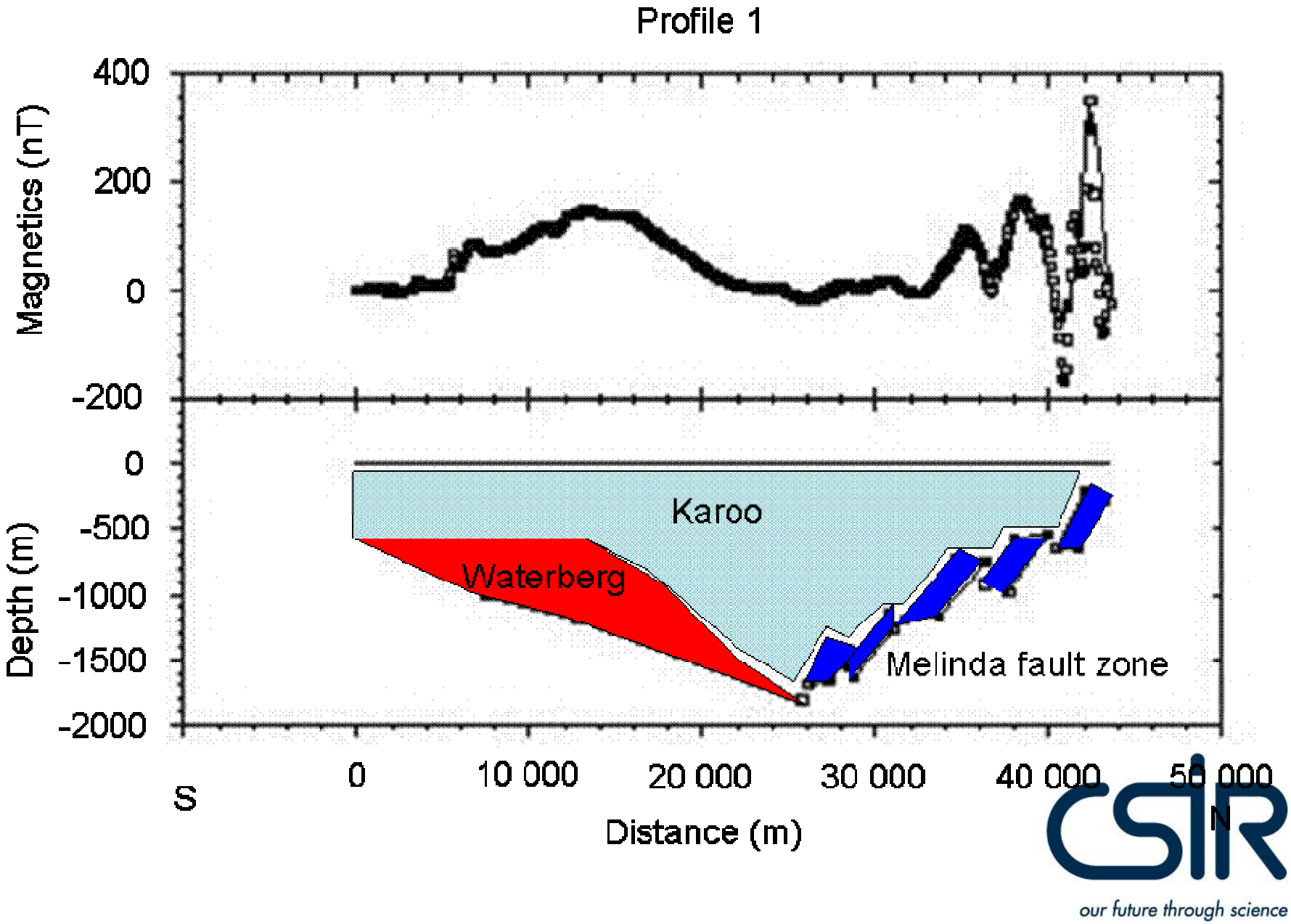
COALTECH



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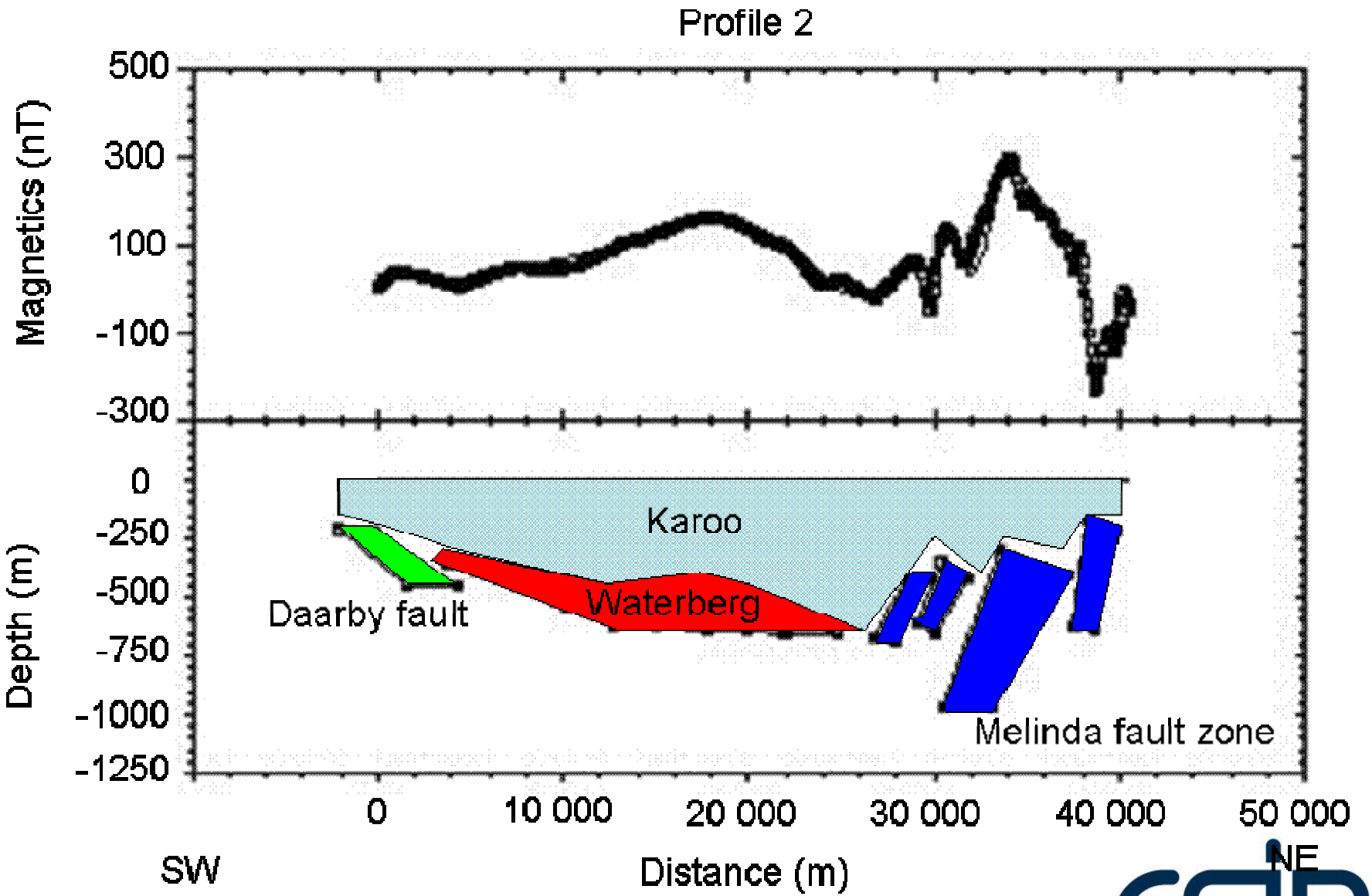

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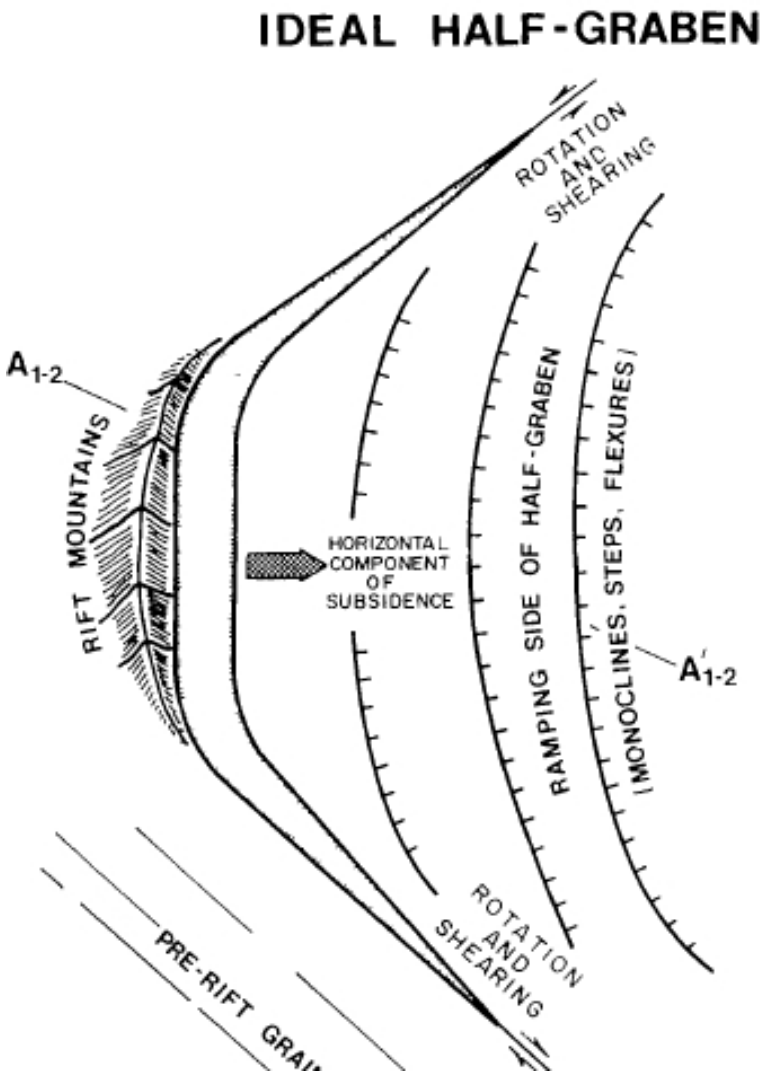
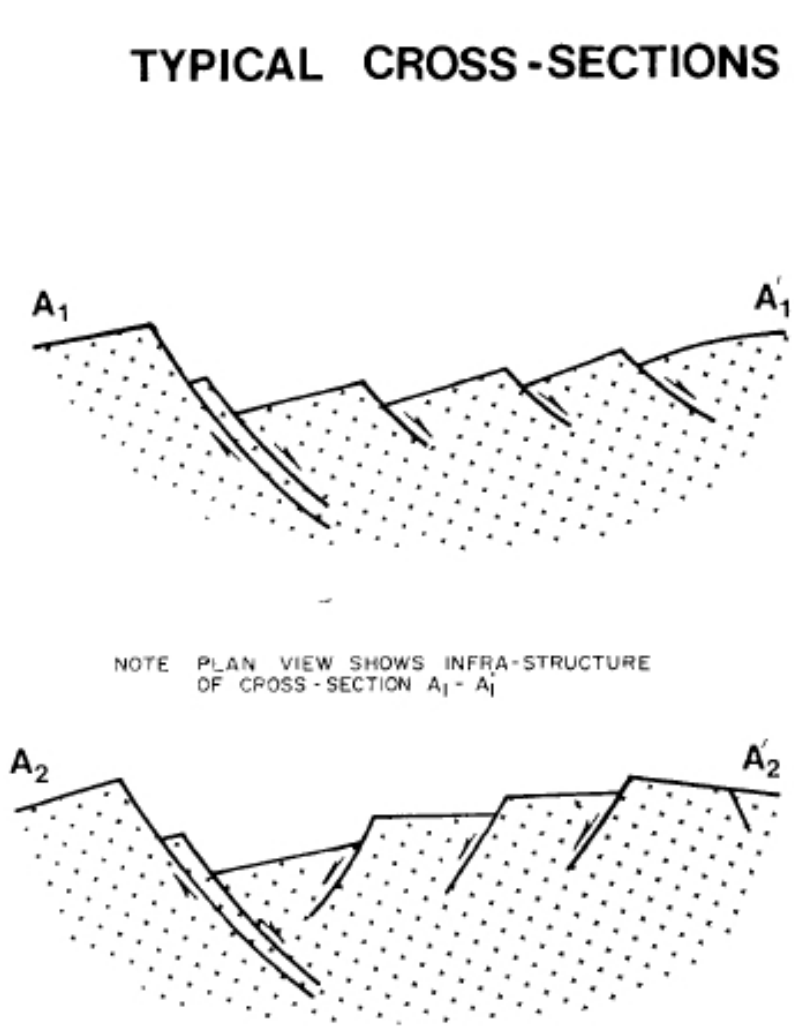
Analogue with East African Rift



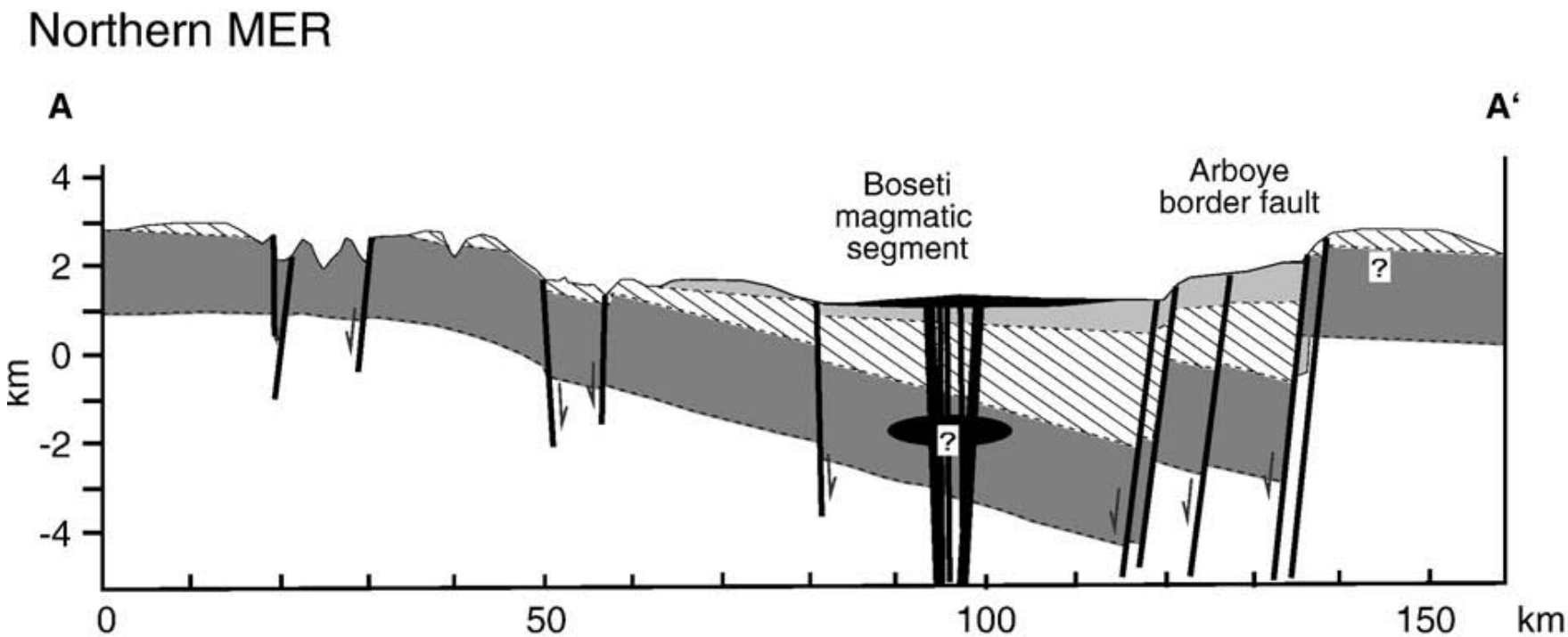
From: Rosendahl, 1987

Analogue with East African Rift



From: Rosendahl, 1987

Main Ethiopian Rift (MER)



From: Corti, 2009

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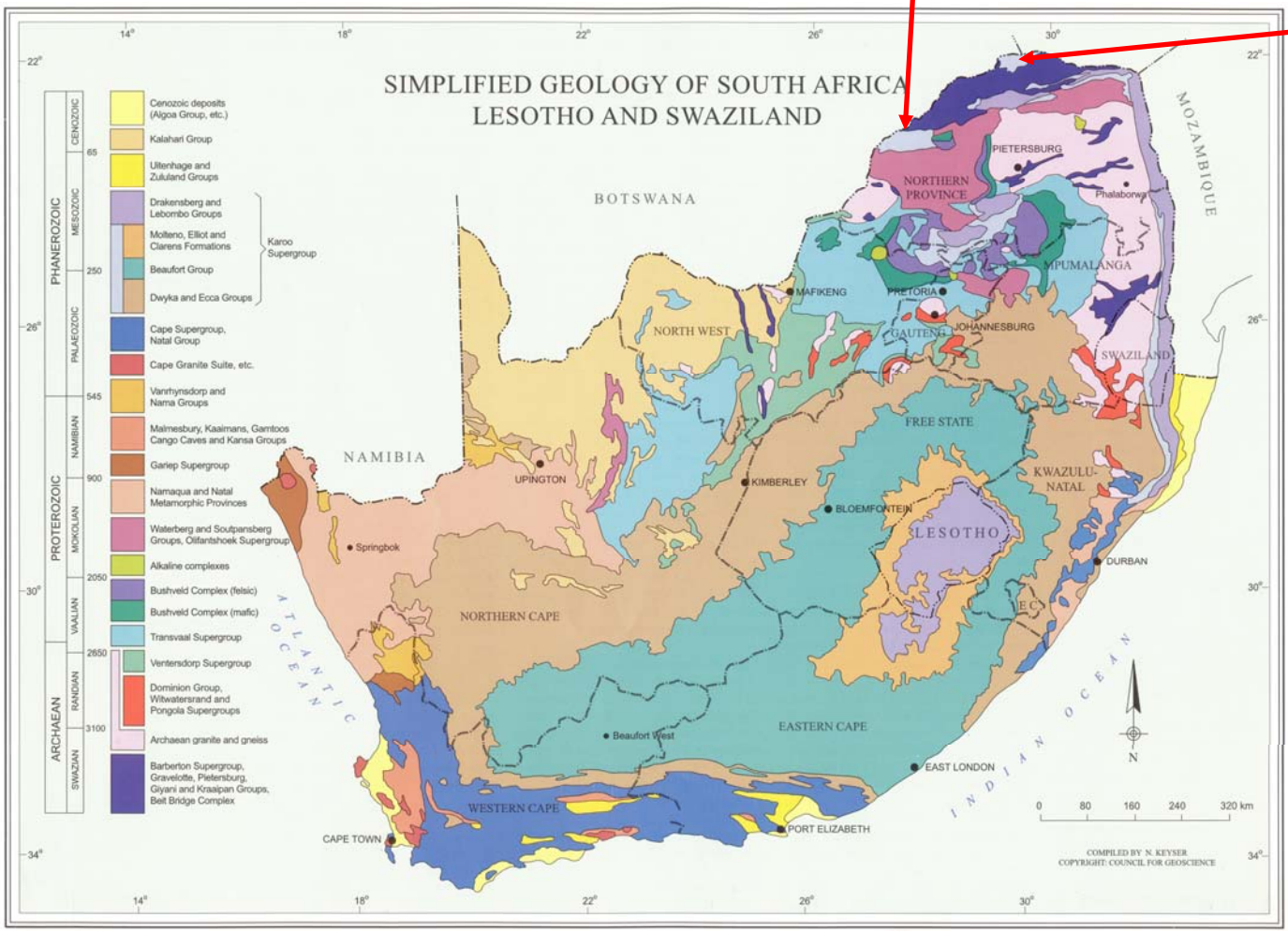
Waterberg Coalfield

Tuli Coalfield

Bordy and Catuneanu, 2001



Map courtesy Council for Geoscience

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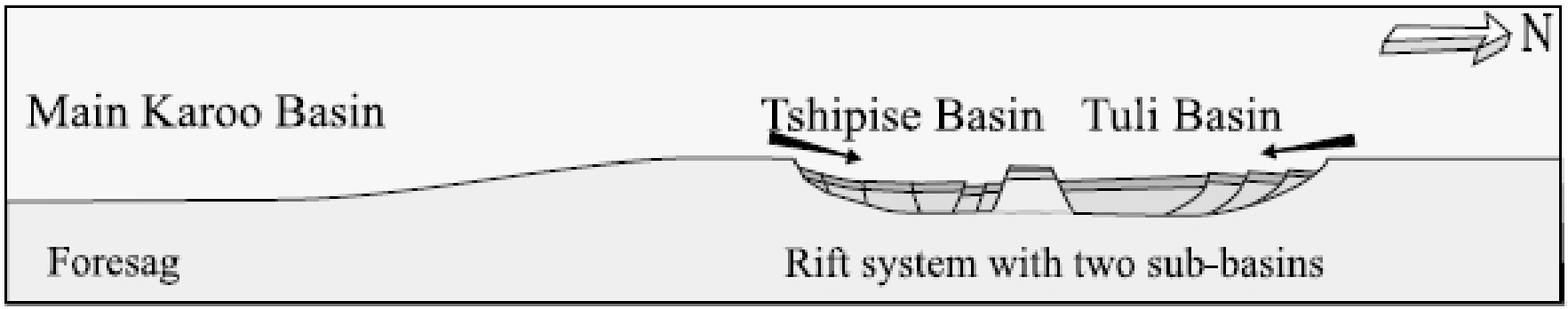
Cross-section Tuli

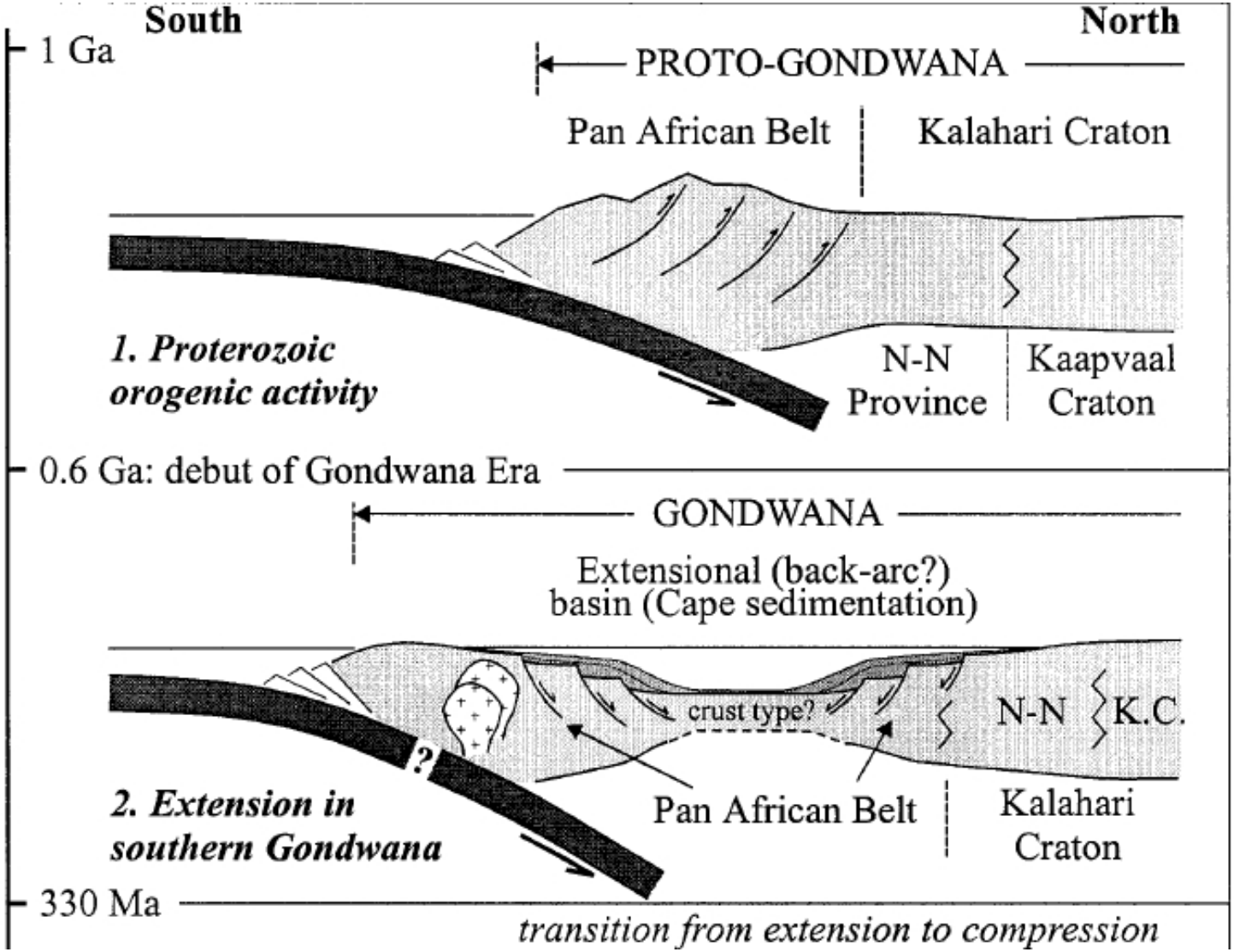


Asymmetric basins

Bordy and Catuneanu, 2001

Karoo tectonic setting

- Catuneanu et al. 1998 – retro-arc foreland basin
- Tankard et al. 2009 – lithospheric deflection due to subduction-driven mantle flow
- Both models – have rifting late in basin development
- Here we support early rifting in the smaller basins



Cape Supergroup

From :Catuneanu et al. 1998

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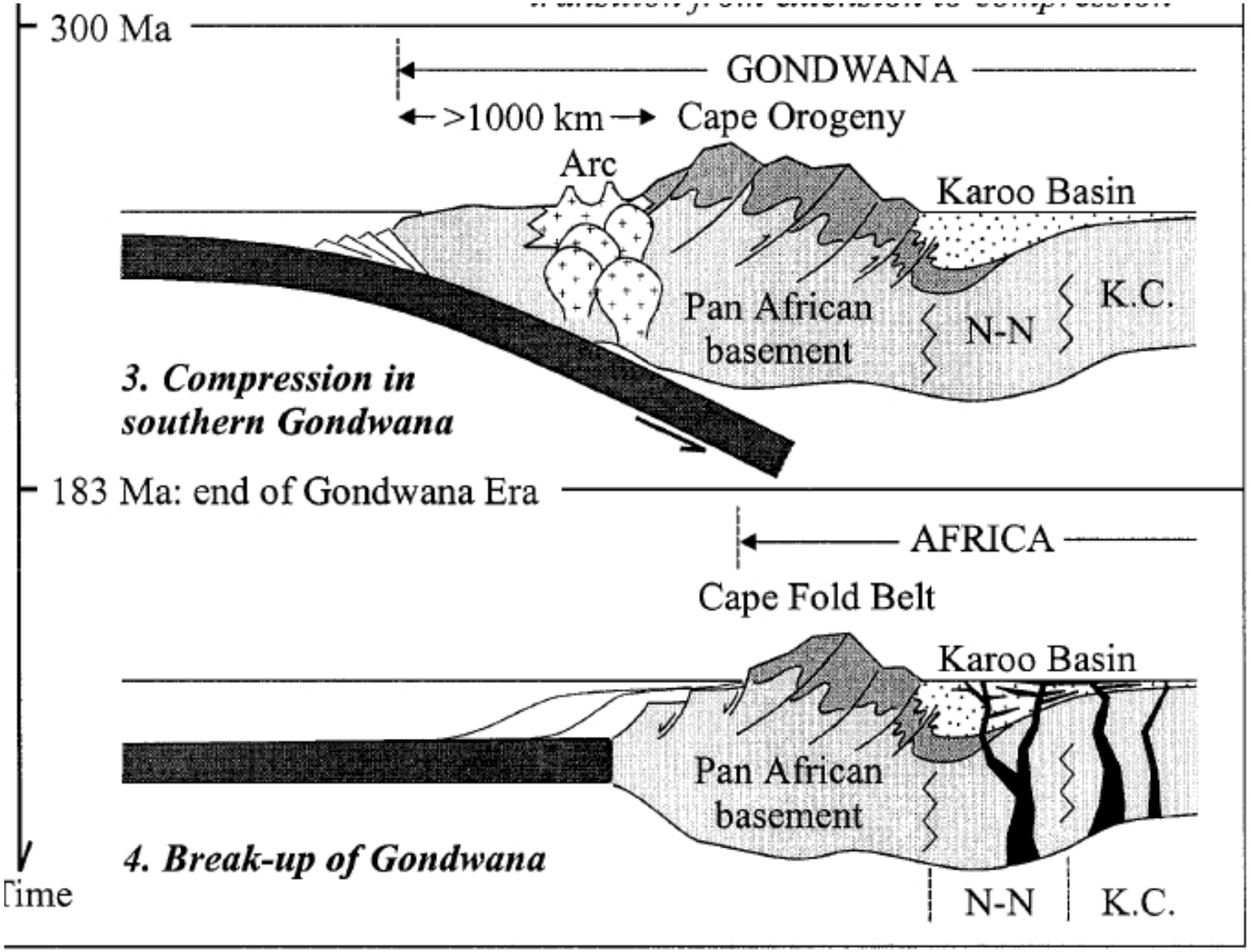

Karoo Supergroup

From: Catuneanu et al., 1998

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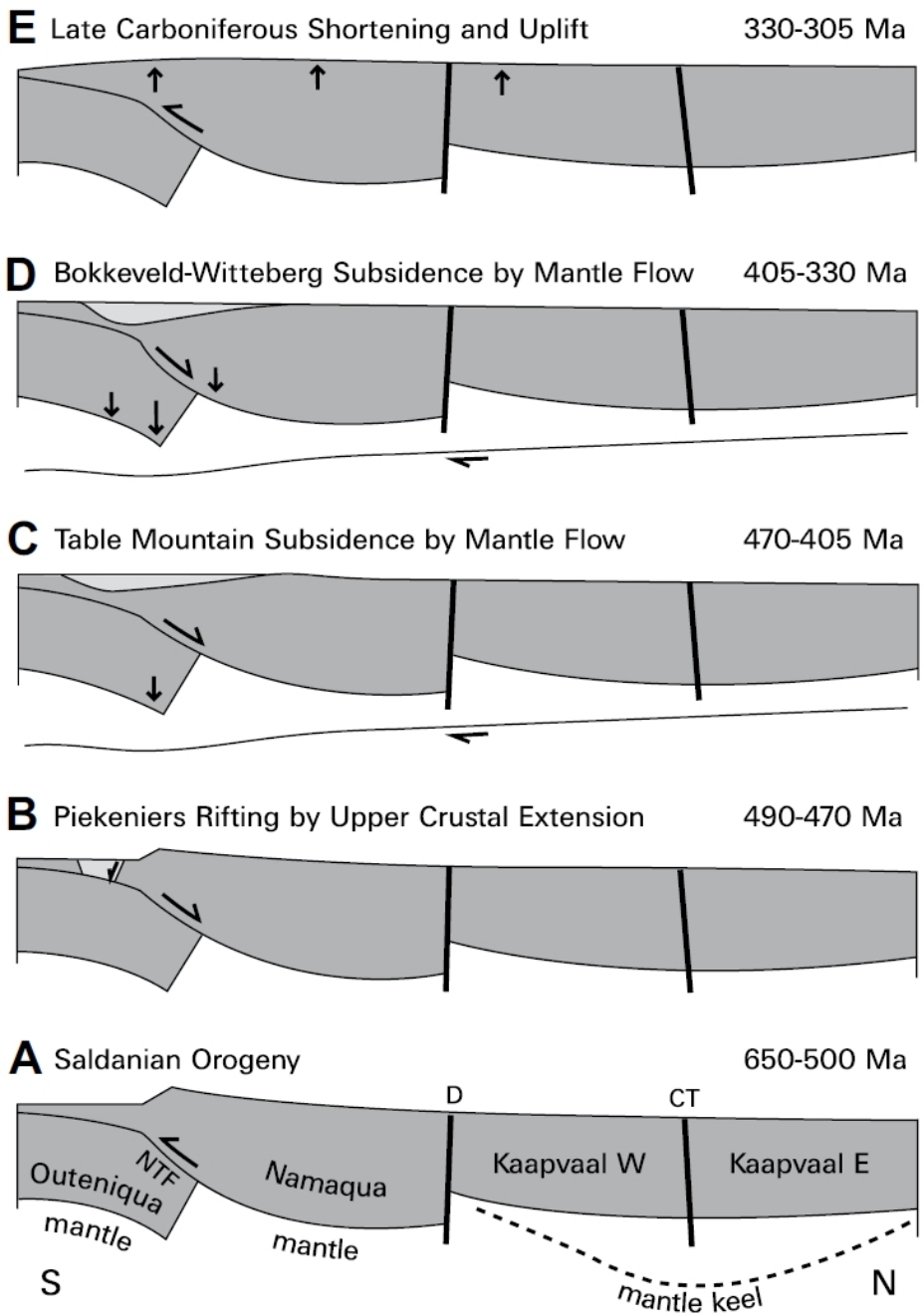

Youngest

Cape Supergroup

Oldest

Tankard et al., 2009

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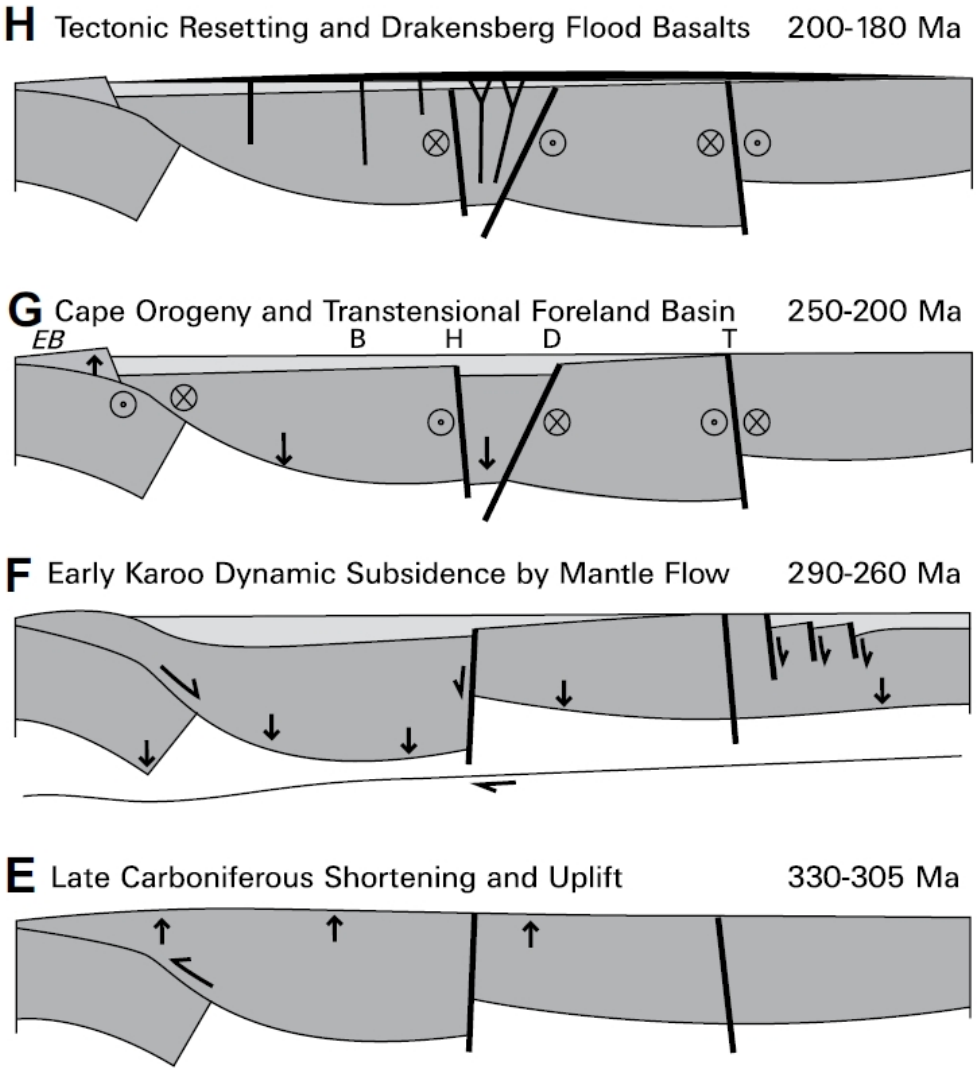
Karoo Supergroup



Youngest

Oldest

Tankard et al., 2009

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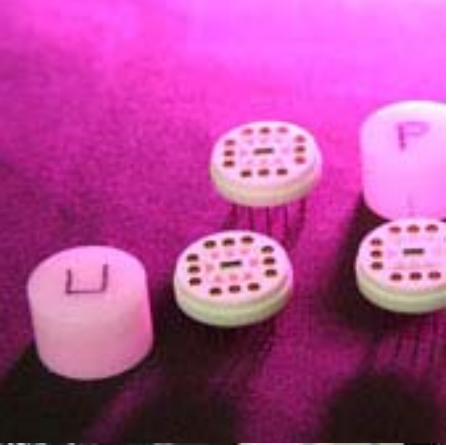

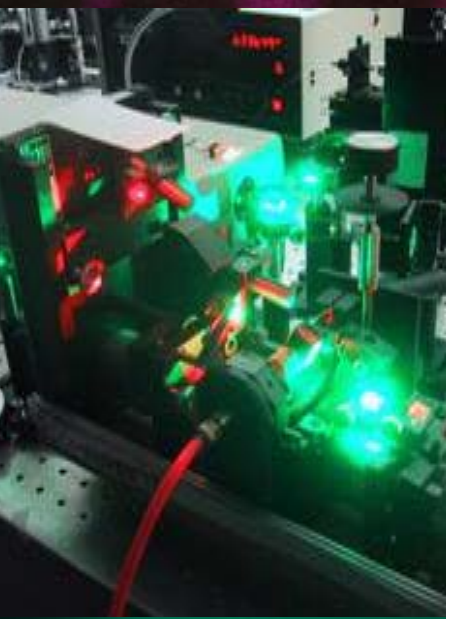

Future work

- Geophysical
- Gravity
- EM
- Seismics – problem with farmers !

- More sedimentology

Questions ?

Courtesy Exxaro

Thank you

Acknowledgments : Coaltech, CGS, CSIR

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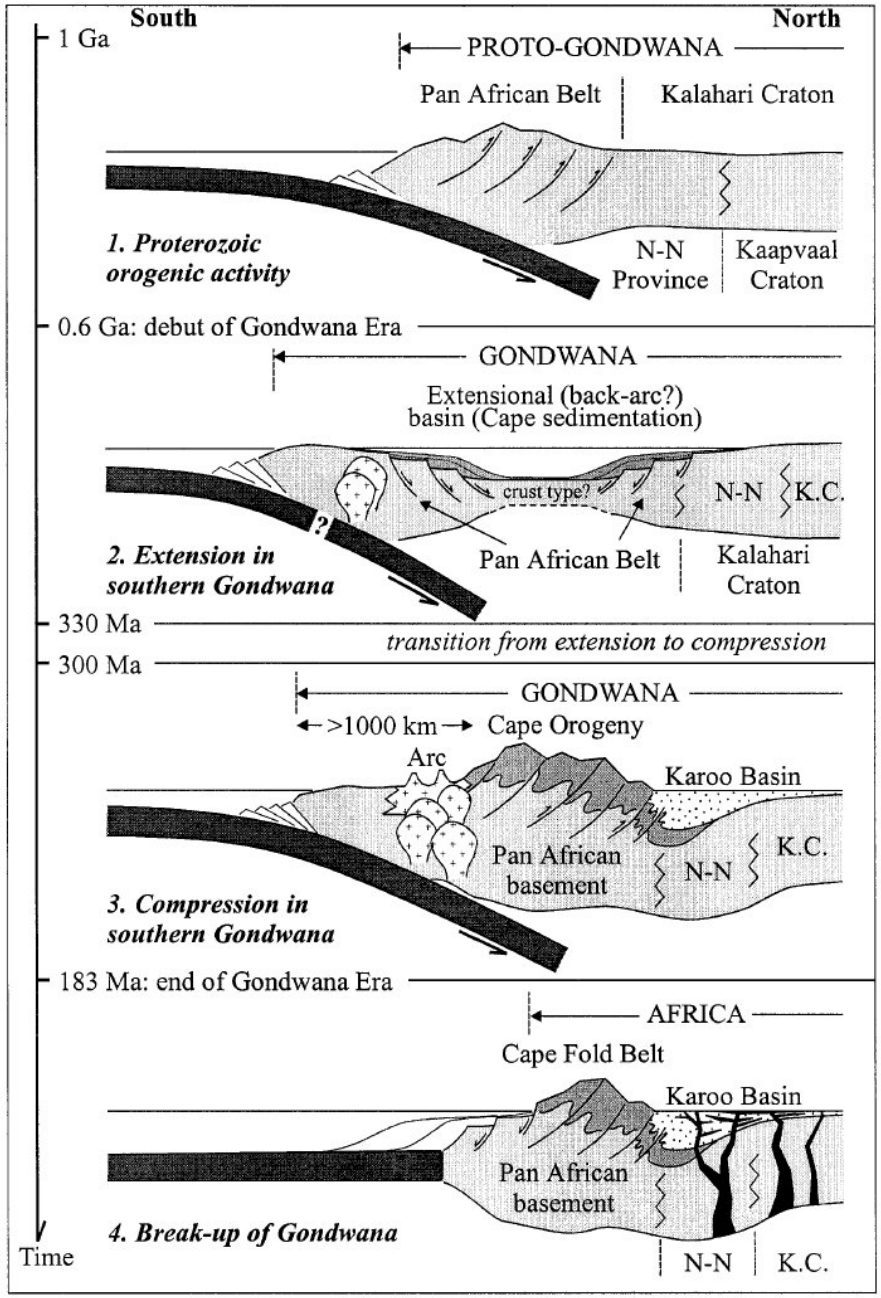
Catuneanu et al. 1998



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