

‘Hidden Rifts’ in Central and Southern Africa – Implications for Regional Basin Framework and Petroleum Potential*

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Abstract

Several phases of rifting have affected the interior of Sub-Saharan Africa during the Phanerozoic. These took place in the Triassic (Late Karoo), the Cretaceous (Early-Mid and Late) and Tertiary-Quaternary (Mio-Pliocene-Recent of the East African Rift System or EARS). These rift episodes have different directions of extension meaning that rift trends often intersect. Conversely, rifting is strongly controlled by basement structure so that, if local conditions are right, there will be a propensity for the coincidence of rifts even if rifting is oblique to the prevailing direction of extension. These possibilities lead to the probability of ‘hidden’ rifts. In addition, in areas where there is a paucity of subsurface data there is the possibility of ‘hidden’ rifts through ignorance.

We review regional rift models. Karoo rifting has been related to ‘continental escape’ where cratonic blocks have moved differentially along transcontinental shear-zones. The multi-phase Cretaceous rifting is related to regional NE-SW extension. Models for the EARS invoke mantle-driven ‘active’ rifting. We use these models to predict ‘hidden’ rifts in Central and Southern Africa.

The petroleum prospectivity of these interfering rift systems is evaluated on the basis of potential source rock development in the Karoo and Cretaceous rift sections. Lower Karoo (Permian) deltaic/paludal shales have a dominantly gas-prone character and where appropriately buried represent a huge, untapped gas resource. Upper Jurassic / Lower Cretaceous, Stanleyville lacustrine shales, sampled in Northeast DRC, are organically very rich and oil-prone. These would represent a source of oil resources where buried by superimposed Cretaceous or EARS rifts.



‘HIDDEN RIFTS’ IN CENTRAL AND SOUTHERN AFRICA -

***implications for regional basin
framework and petroleum potential***

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OBJECTIVES

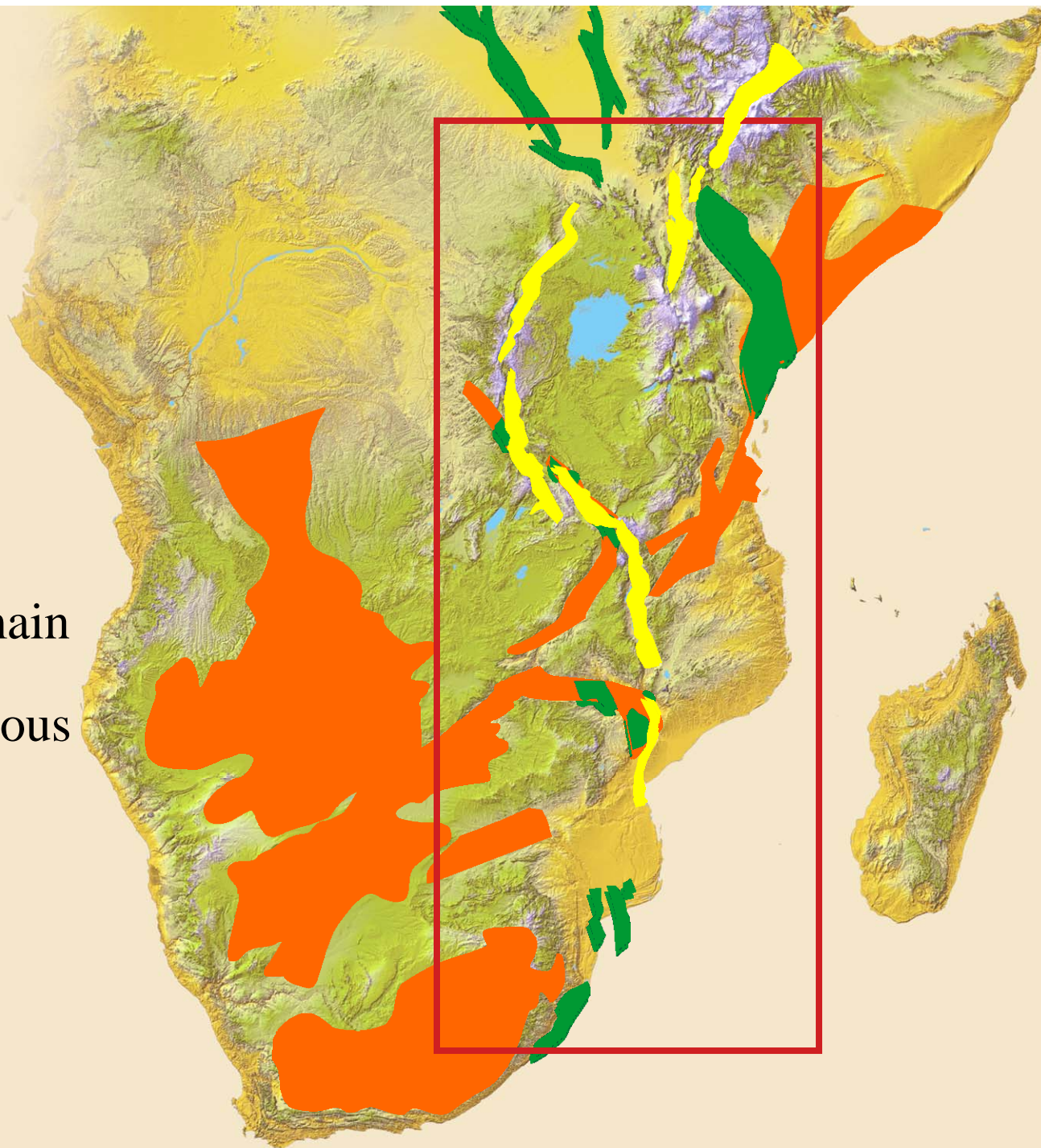
- **Identify rift sections 'Hidden' by younger rifts or cover**
- **Develop new play concepts and identify new exploration areas**

Multi-Phase Rifting

EARS

Eastern Break-up Domain

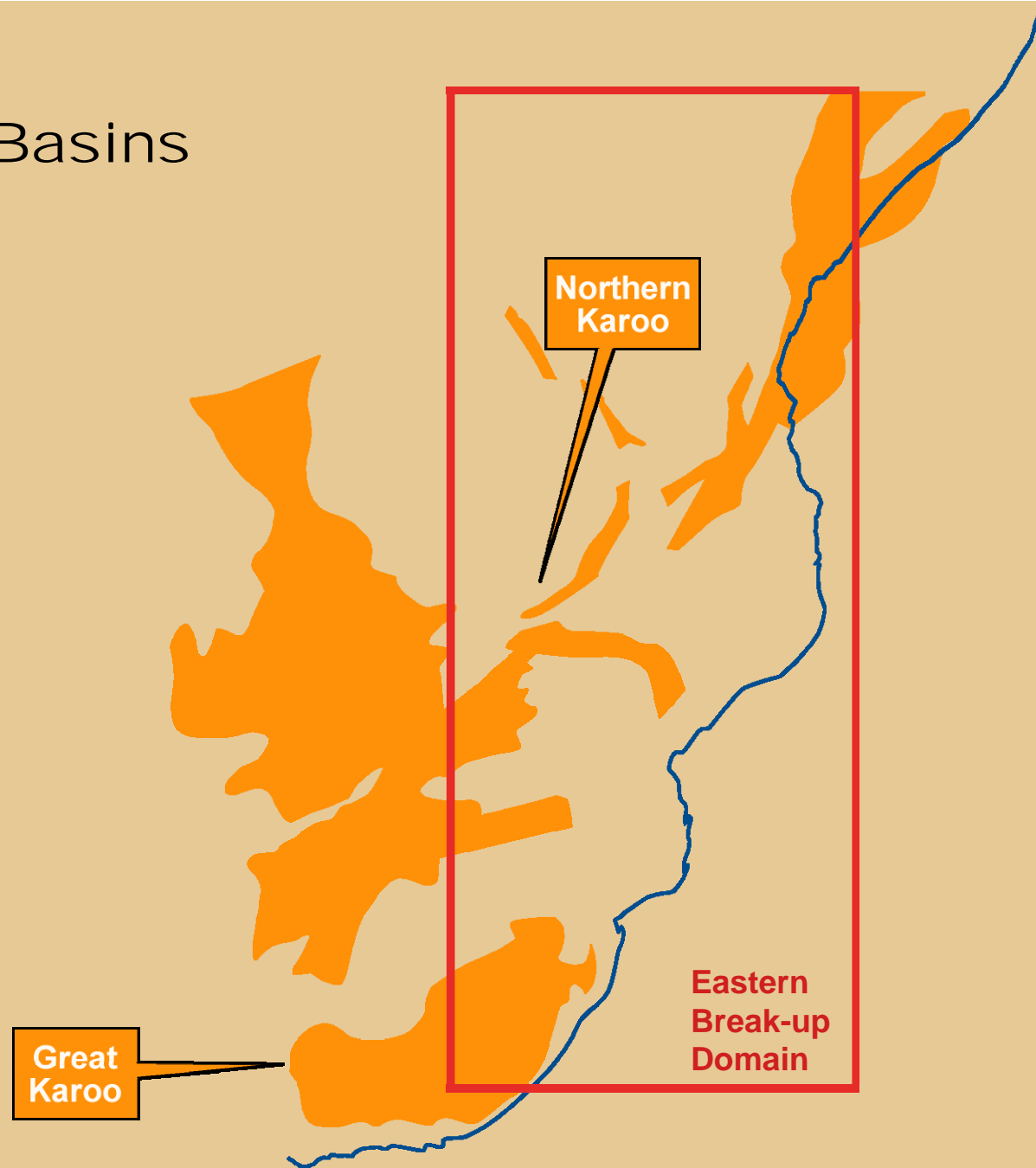
Late Jurassic - Cretaceous



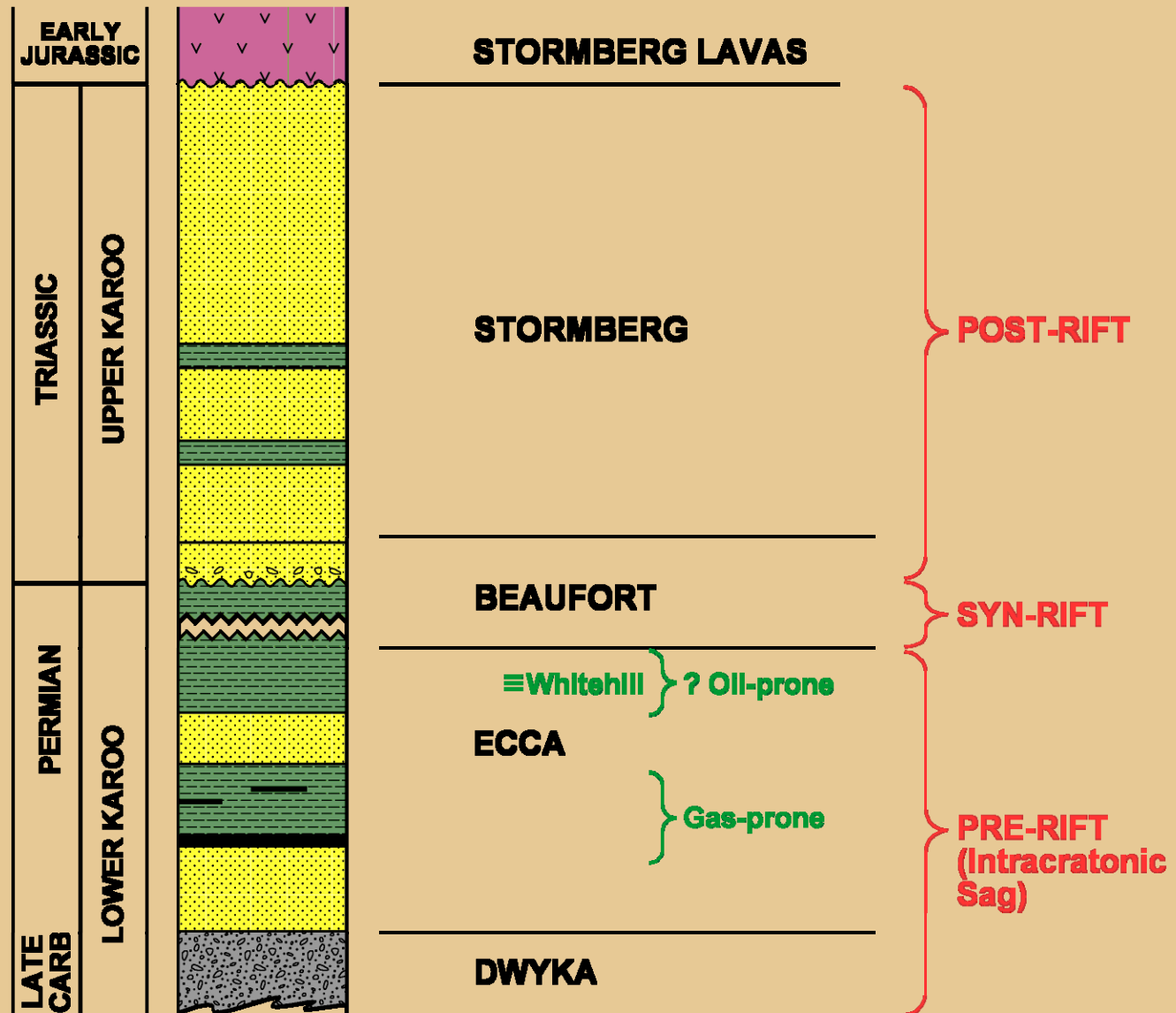
KAROO (PERMO-TRIASSIC)

- the beginnings of break-up

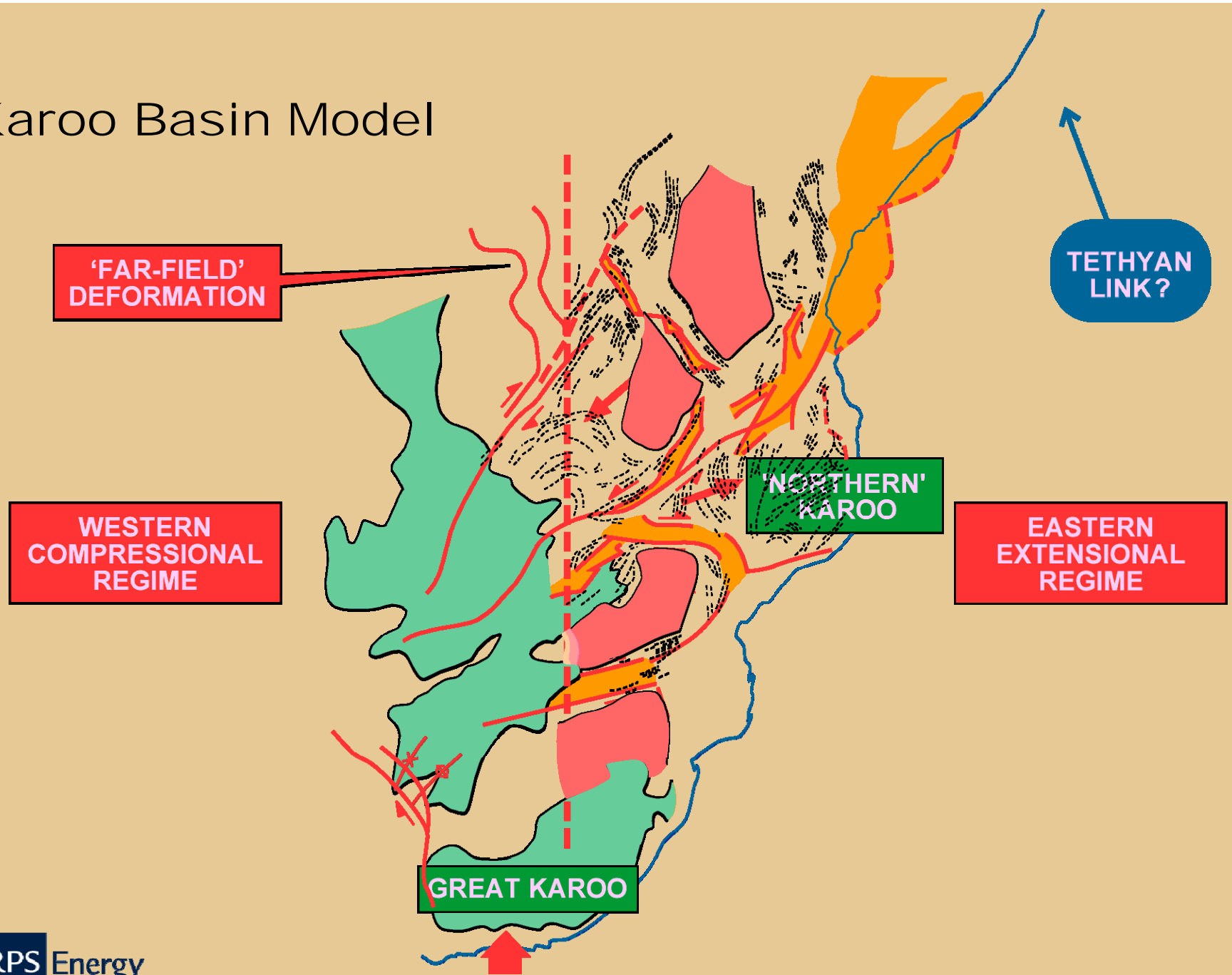
Karoo Basins



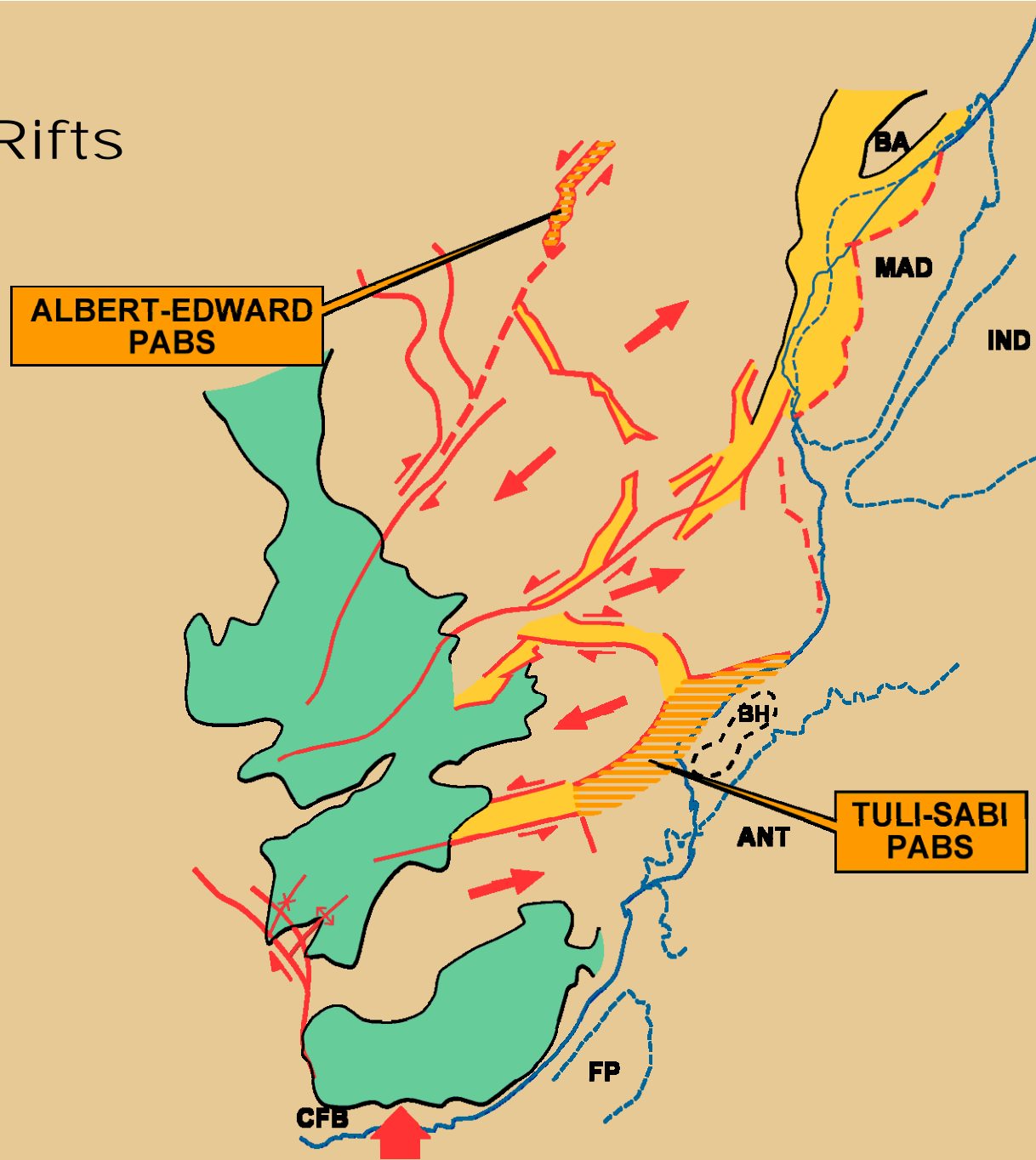
Northern Karoo Tectonostratigraphy



Karoo Basin Model



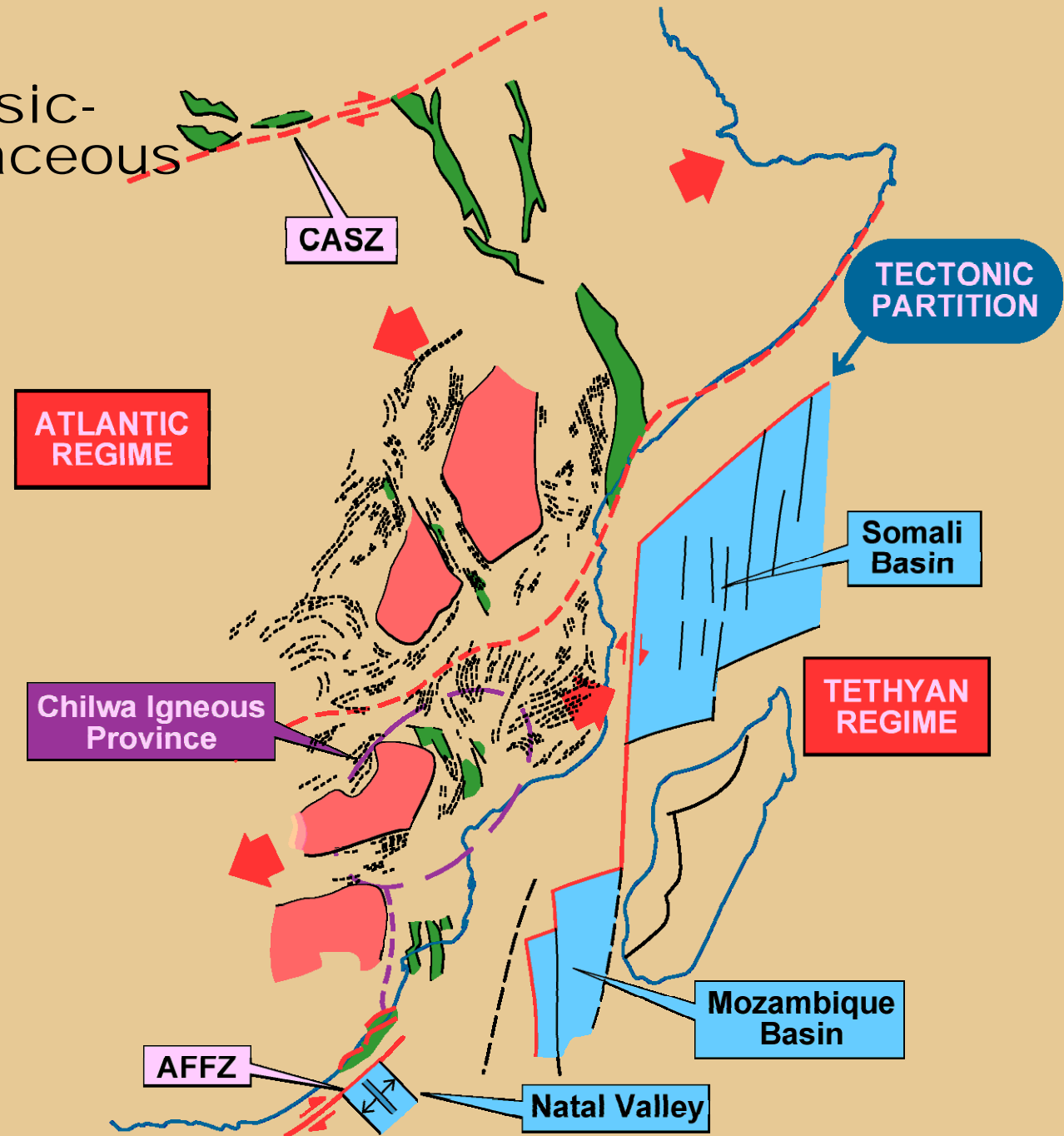
Hidden Rifts



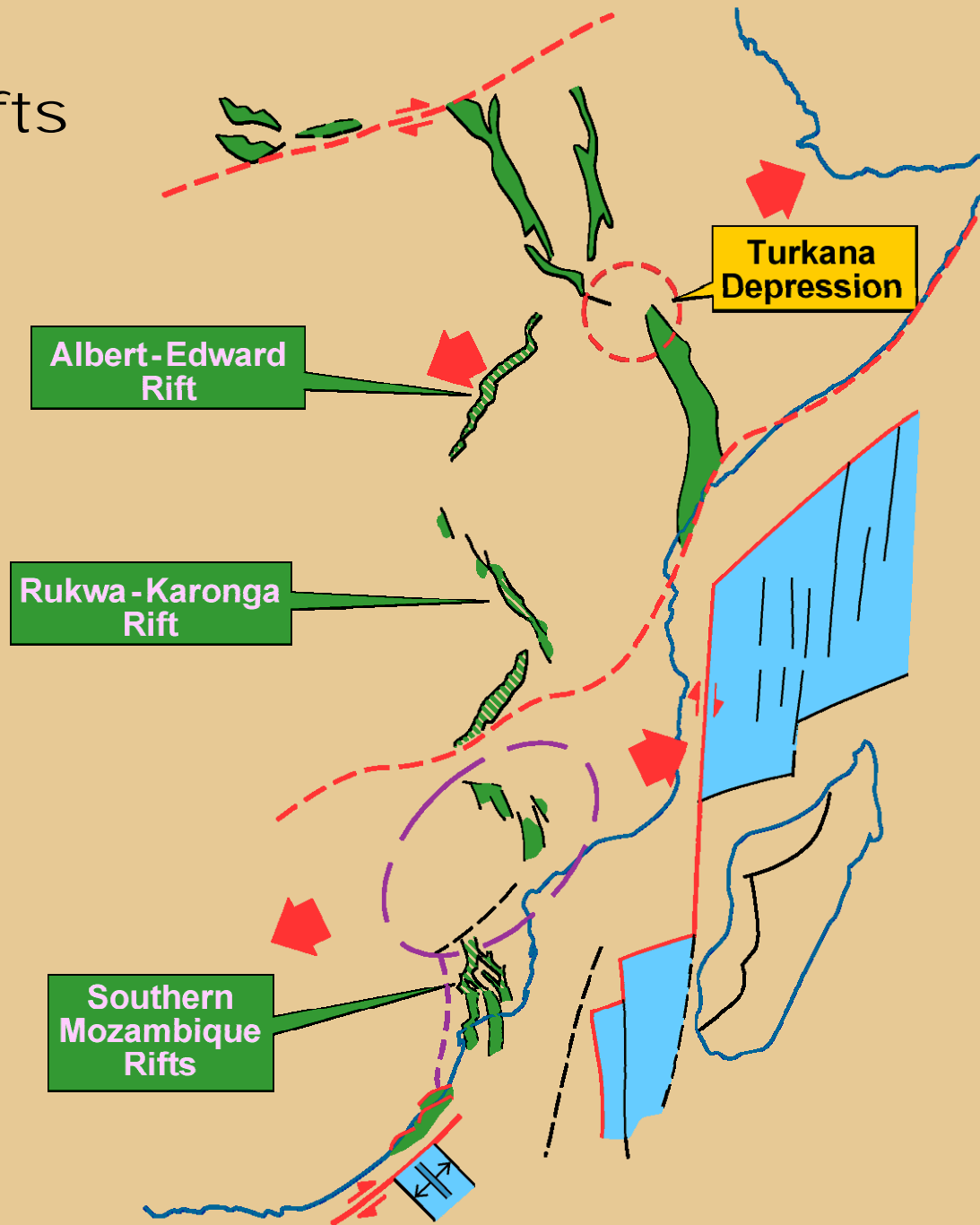
LATE JURASSIC - EARLY CRETACEOUS

- decoupled break-up

Late Jurassic- Early Cretaceous Basins

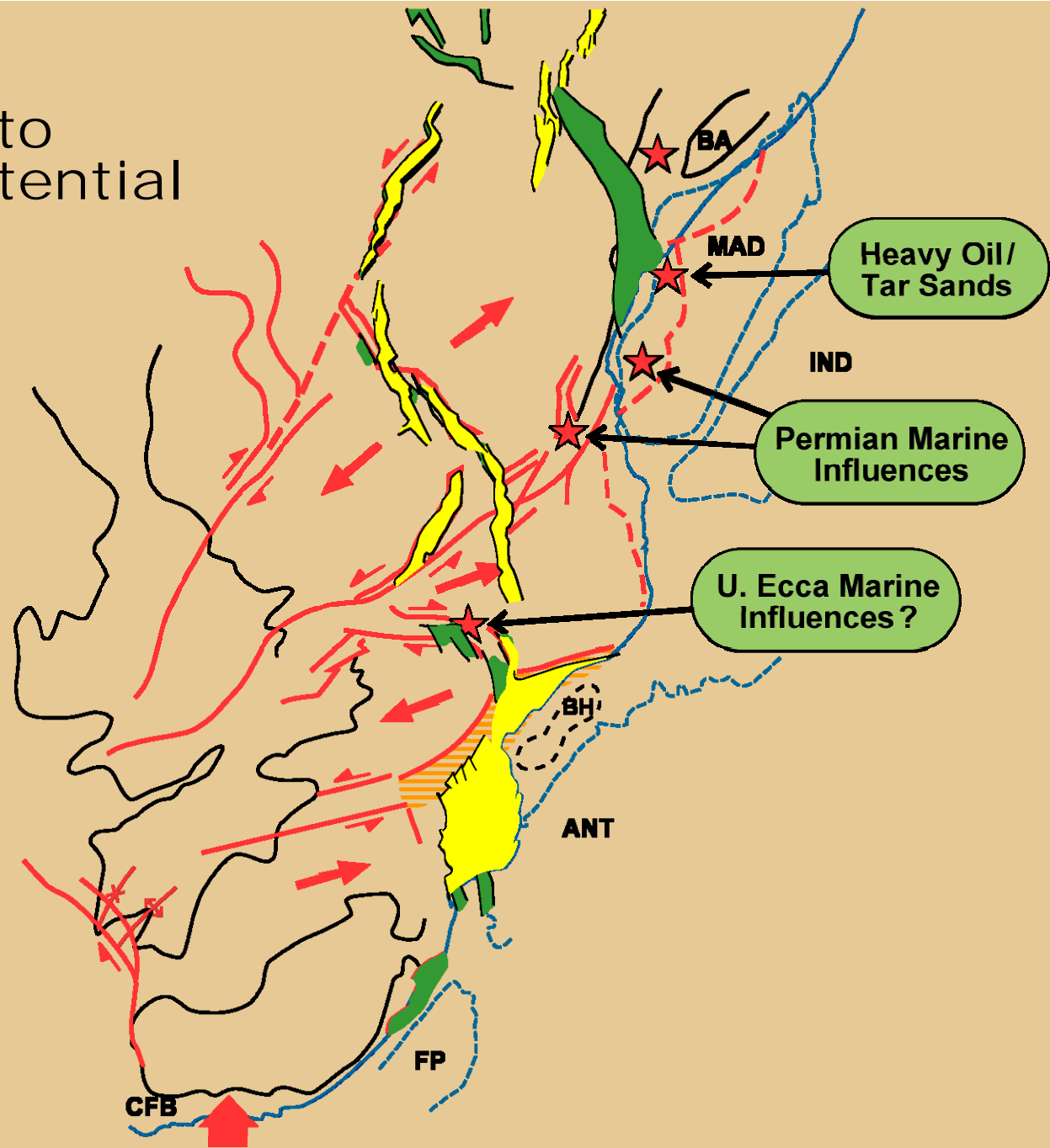


Hidden Rifts

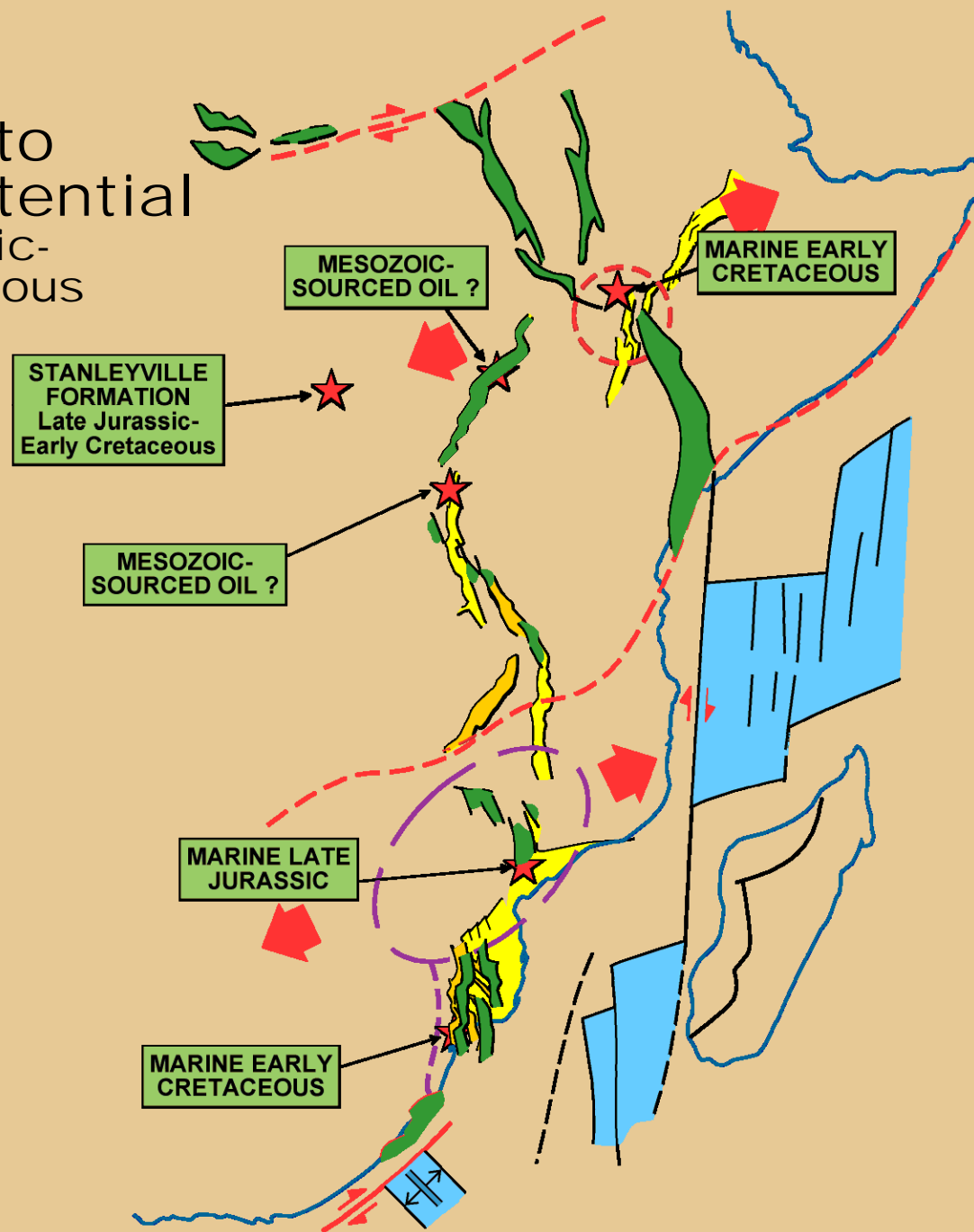


POINTERS TO PETROLEUM POTENTIAL

Pointers to Petroleum Potential Karoo



Pointers to Petroleum Potential Late Jurassic- Early Cretaceous



CONCLUSIONS

- Karoo gas resource in interior rifts / ?marine influence/oil potential in Tuli-Sabi PABS
- Late Jurassic-Cretaceous lacustrine / ?marine oil potential in interior rifts
- Not easy to explore for – ‘hidden’

Complex maturity history - superimposed rifting, inversion/uplift volcanicity