

Belly of the Beast: detailed mapping in the deformation core of a quartz-plastic transitional zone fault, implications for deep fault seismicity on major strike-slip faults

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Research Questions

- Where do earthquakes occur in transitional zone strike slip faults?
- What is the relationship between total strain, strain rate and shear zone geometry?
- What was the temperature during deformation in the Pofadder Shear Zone?

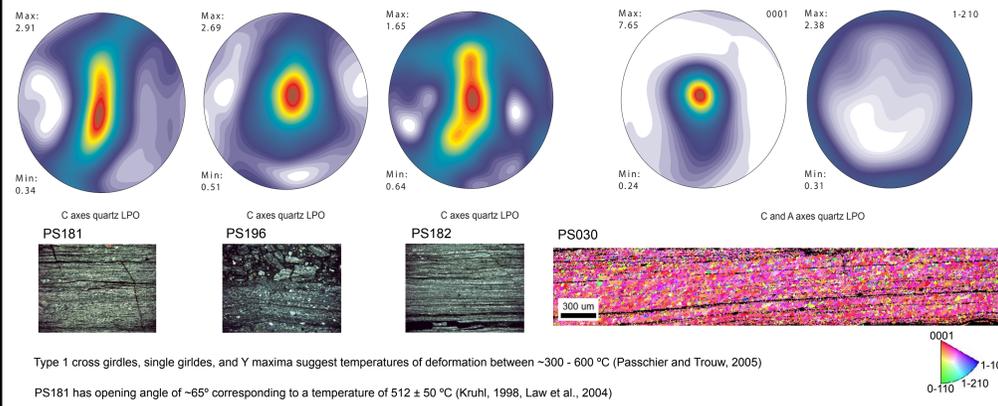
Results

- The Pofadder Shear Zone is a mid-crustal, continental-scale, dextral shear zone, located in Namibia and South Africa. In respect to rock type, scale and kinematics this is an ancient analog to the modern San Andreas Fault. We present a 1:10 scale map of the deformation core of this shear zone.
- Temperatures of deformation estimated from quartz LPOs are ~300 - 600 °C, opening angles suggest a temperature of 512 ± 50 °C.
- Brittle faults occur parallel to the mylonitic foliation and host tensile fracture networks suggestive of dynamic earthquake rupture. Some breccias are plastically healed.
- Pseudotachytes are isoclinally folded and boudinaged, suggestive of the quartz-plastic transitional zone.
- We find a distribution of earthquake markers across the width of the 30 m wide shear zone.

Implications

- Earthquakes on deep (~15 - 20 km) strike slip faults host earthquakes across a wide zone rather than a single fault.
- Ultramylonites, pseudotachytes and dynamic breccias occur near competency contrasts toward the shear zone boundaries. This suggests that rock strength plays a dominant role in earthquake distributions along deep strike slip structures.

Temperature of deformation



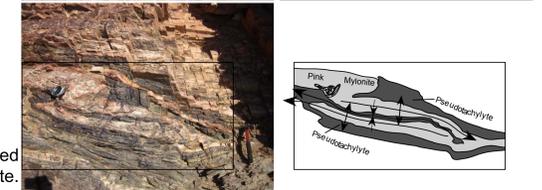
Earthquake Markers

Pseudotachylyte

- Pseudotachylyte injection veins.



- Isoclinally folded pseudotachylyte.

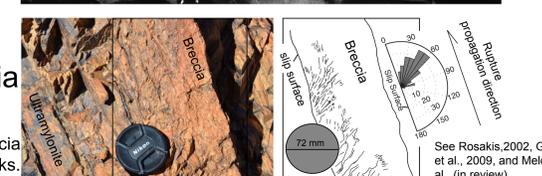


- Pseudotachylyte in CL.

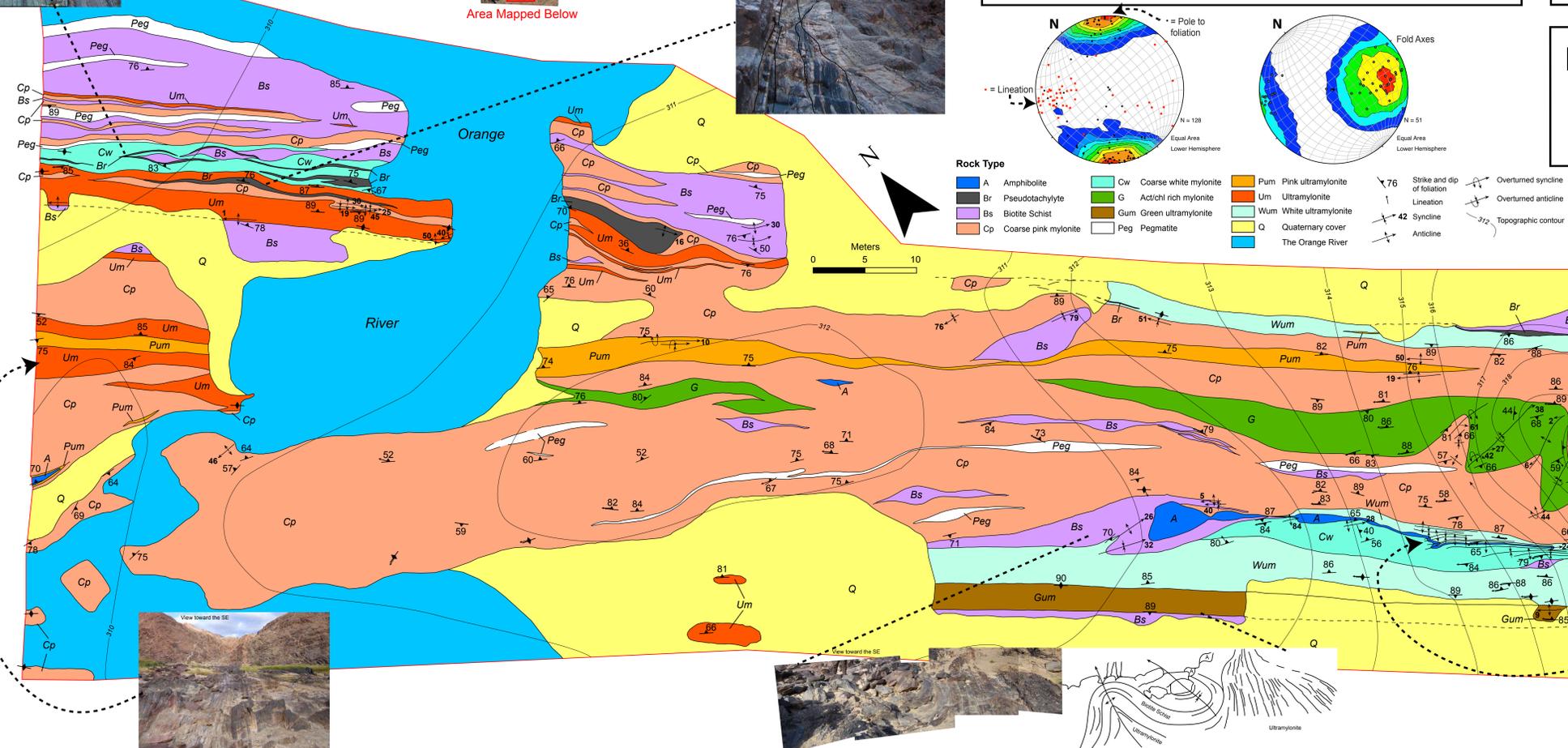
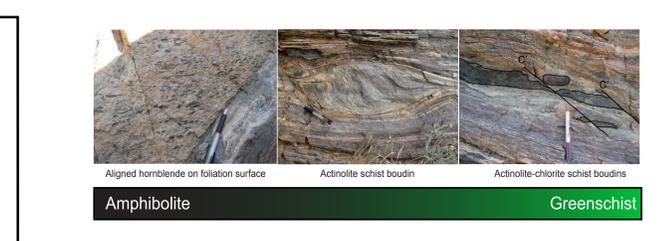
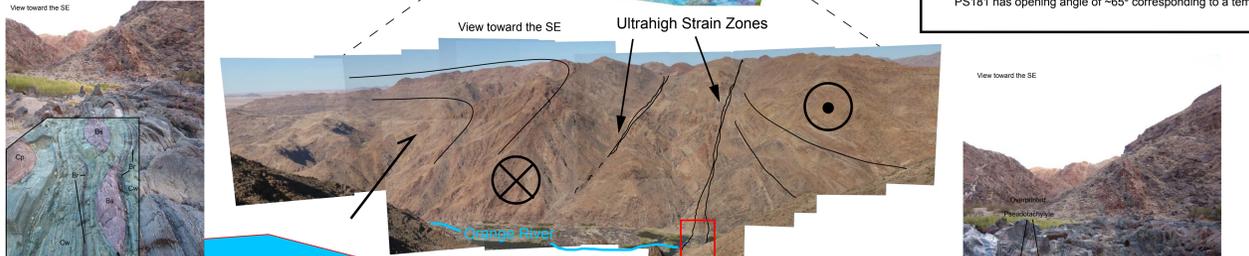
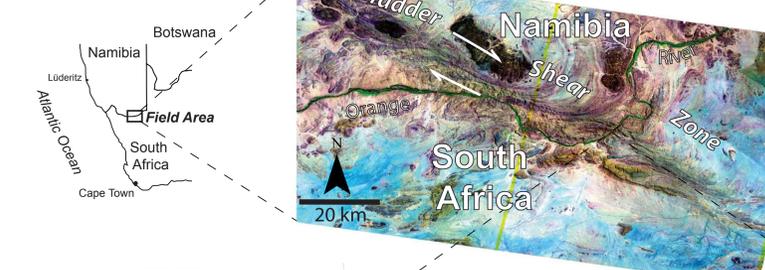


Dynamic Breccia

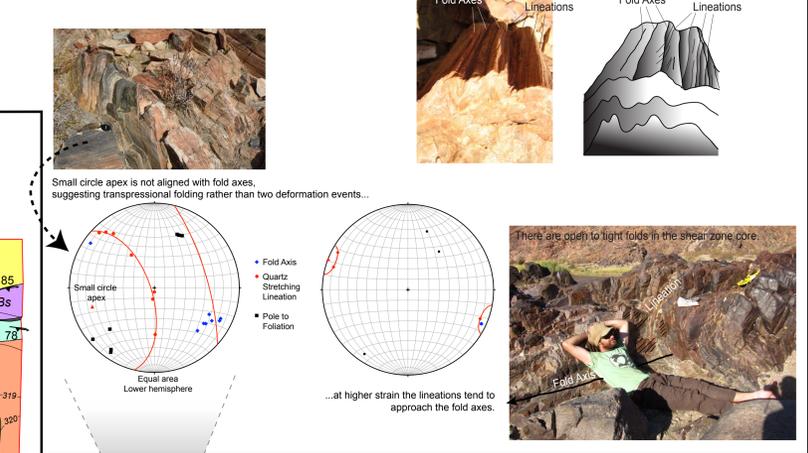
- Dynamic breccia fracture networks.



Location



Folds and Lineations



References

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