Inferring tectonic setting using granite sheet orientation, in HU Sverdrupfjella, West Dronning Maud Land, Antarctica.

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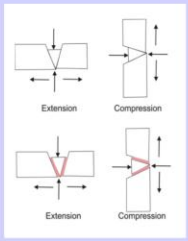
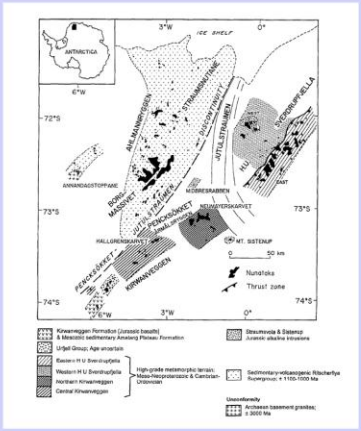
Inferring tectonic setting:

According to Anderson's Theory of faulting rocks will be the most structurally compromised (and therefore accommodating to faults and intrusions) at 30° from the net compressional stress vector (σ1) in an ideal case.

Therefore intrusions will dip at shallow angles if intruded into compressional tectonic settings and dip steeply if intruded into extensional tectonic settings.





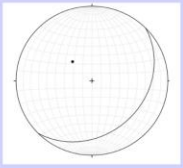
Map showing location and geology around the study area. After Grantham et al. (1995).

Reading stereonets:

In short: planes plot as curves and lineations plot as dots. The orientation of features is shown by their orientation on the stereonet (with North at the top, South at the bottom, etc.) and the closer a feature plots to the edge of the stereo net the shallower it dips.

However plotting many great circles makes a stereonet illegible. Therefore the poles to planes (lineation perpendicular to the plane) are usually plotted.

As an example a plane dipping at 30° to the SE is shown below with the corresponding pole.

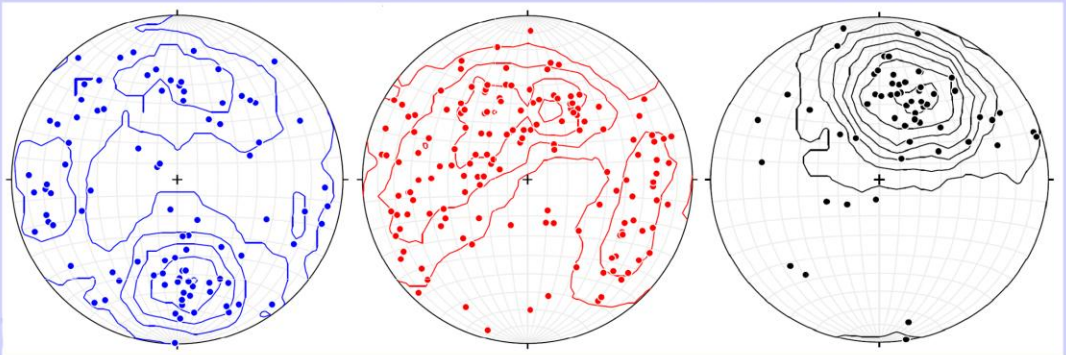


Field relationships:

The two photos below show field relationships. The left photo shows Dalmatian Granite (as defined by Grantham et al., 1991) cross cutting an older suite of pegmatite. The photo on the right shows a younger suite of pegmatite cross cutting Dalmatian Granite. The white square is 10 cm wide.

Structural data:

Below are stereonets showing the poles to the older pegmatites (blue), Dalmatian Granites (red) and younger pegmatites (black) (identified in the field). Note that even though tectonic setting may be dominant, there are various factors controlling the orientation and shape of granite sheets. Therefore data shows significant variation. The older pegmatites appear to dip more steeply in general, indicating that they were emplaced into a compressional tectonic setting preceding the extensional tectonic setting(s) active during the emplacement of Dalmatian Granites. The younger pegmatites dip more steeply and have a different orientation. Indicating a later event or major change.



References:

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Grantham, G. H., Moyes, A. B. and Hunter, D. R. (1991). The age, petrogenesis and emplacement of the Dalmatian Granite, H.U. Sverdrupfjella, Dronning Muad Land, Antarctica. Antarctic Science. 3:197-204