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What are the Characteristic of Late Fractures?

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The morphology of an area and the outcrops reflects the geological memory in that it is for example related to the distribution of rock types and brittle deformation zones. Late fractures, "late" denotes activated late in the structural history of the area, can in many cases be identified by using overprinting criteria. In areas with inconsistent cross-cutting relationships among different set of faults, as in areas with partly reactivated faults and block faulting, the method may not be applicable. A good control of the fracture system of the area is, however, a good base for identification of late structures. Distortion of datum features, e.g. synglacial to postglacial deposits, may indicate very late distortion along a shear zone.

A systematic mapping of late fractures requires a general knowledge about the characteristic features separating these from old structures.

- reactivation of old structures:
  1) engages preexsisting fractures
  2) follows the old structures but forms new fracture surfaces
- formation of new structures:
  1) propagates from old fractures
  2) not related to earlier structures

Among which sorts of structures can we find neo-tectonic structures?

Some regional examples from lineament interpretations of southern Sweden (300 by 400 km) (Tirén and Beckholmen, 1992):

Southwestern Sweden is characterized by lensoidal blocks outlined by curved faults, while southeastern Sweden has a pseudo-orthogonal block configuration outlined byextensive faults. In southwestern Sweden, however, the lensoidal block configuration is overprinted by straight extensive hairline structures. The southwestern area is prone to earthquakes, which can be correlated with the existence of the latter structures.

Examples on a smaller scale (150 by 275 km) in the Norrköping-Ludvika-Hjo-area, central Sweden (Tirén, 1993):

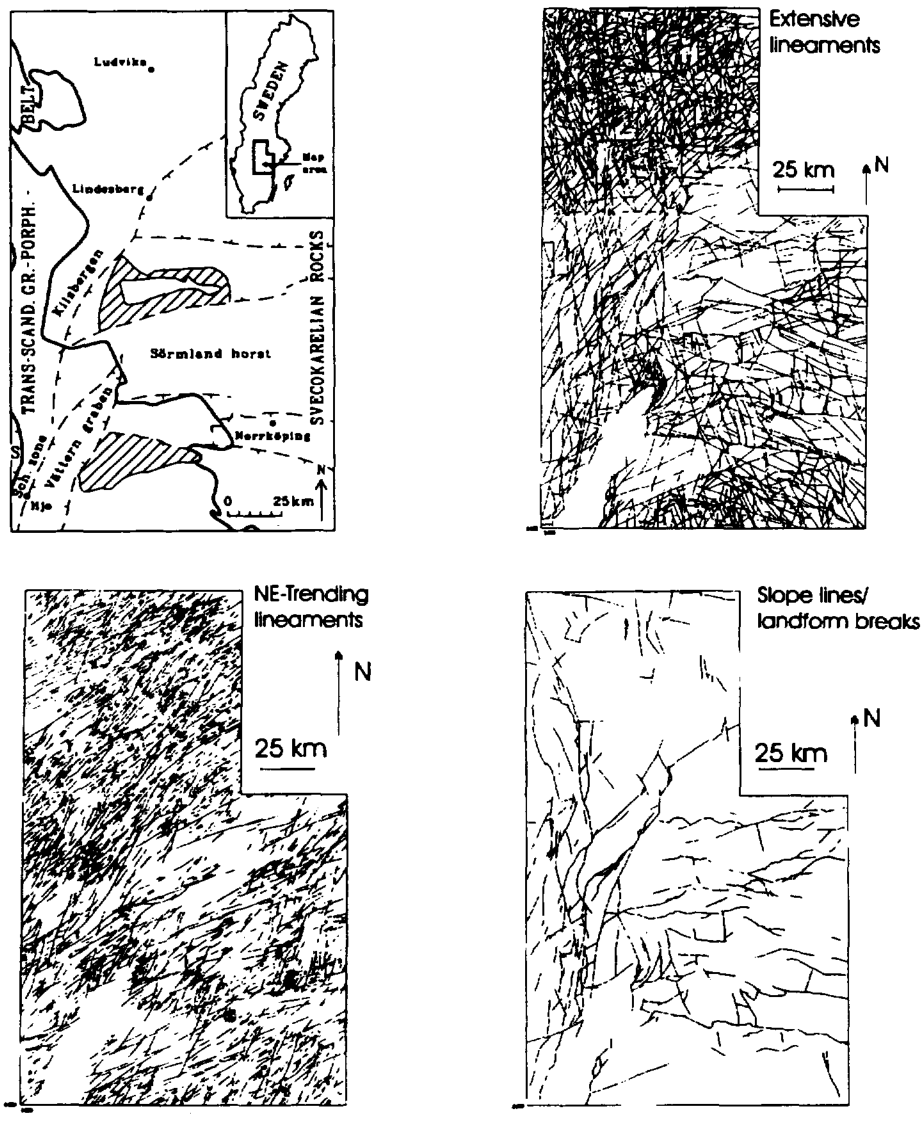
Extensive structures may accommodate strain, Fig. 2
Structures forming lensoidal blocks may allow "plastic" deformation on a regional scale, Fig. 3, cf. geometry of regional dyke swarms (see several papers in Halls and Fahrig, eds.,1987)
Structures forming landform breaks, Fig. 4

Other examples of late structures on an even smaller scale (35 by 50 km) from the Äspö region, southeastern Sweden, where SKB's underground Hard Rock Laboratory is located:

Extensive (some 10 km) straight linear structures with sharp topographical edges, well expressed on DTM showing the second derivate of the topography, (Tirén and Beckholmen, 1989), commonly within wide regional deformation zones but locally also transecting regional rock blocks.

On outcrop scale:

fracture surfaces forming the morphology of the outcrop are found to be parallel to the system of water conductive fracture zones (Tirén, in prep.).



Figures 1 Location of the area (Norrköping-Hjo-Ludvika): Svecokarelian rocks (≥1.8 Ga), Trans-Scandinavian Granite and Porphyry Belt (1.6 - 1.8 Ga), and Cambro-Ordovician Sediments (hatched). 2 Extensive lineaments. 3 North-west trending lineament sets. 4 Landform breaks.

References

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