

STRETCHING PARALLEL TO THE ROTATION AXIS IN DUCTILE SHEAR ZONES

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The directions of maximum stretch and shear in ductile shear zones need not parallel each other as is frequently assumed. Rather than representing the shear direction, stretching lineations may instead represent the axis of bulk rotation in many rocks deformed by non-coaxial shear.

Several lines of evidence for rotation about the ubiquitous stretching lineation are obtained from amphibolite facies rocks in the 3.5km² Vochelambina study area in the north-eastern Baltic shield.

Deformation took place in the regime of monoclinic pure-shear dominated transpression and resulted in orthogonal orientation of the XZ plane of the finite strain ellipsoid (XYZ) with respect to the vorticity-normal section.

This relationship was established using analysis of deformed quartz vein sets and verified also by other strain markers (deformed pebbles and amygdales) and kinematic indicators (rotated porphyroclasts and rigid inclusions, crystallographic preferred orientation of quartz, evolution of minor folds). All these indicators were formed during progressive deformation in the ductile shear zone simultaneously with the stretching lineation.

The significance of this example is that stretching lineations should not be assumed a-priori to indicate «movement direction». Where stretching axes do represent rotation axes, the directions of shear may be perpendicular to those previously interpreted. Ductile deformation zones formerly attributed to strike flow may be due to dip flow and vice versa.