Numerical Modeling of the Development of Kink-bands

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Uncertainties with Extrapolating Lab Rheology to Natural Deformation

- **Strain Rate:** (6 to 9 orders of magnitude)
- **Amount of Strain:** (1 to 2 orders of magnitude)
- **Scale Effect:** (3 to 9 orders of magnitude)
- **Anisotropy:** (difficult to handle)
- **Non-steady flow and Time-dependent Rheology**
Rheological information from “signatures” of natural deformation

Geological Structures
Rheology
Initial geometry
Boundary conditions

FORWARD
MODELING

Model Predictions:
Geometrical evolution
Kinematic history

Observations:
Structures on various scales
(De wey 1965)
Fast Lagrangian Analysis of Continua

A finite difference numerical modeling code for geomechanical analysis

FISH (FLACish) programming language
Why Anisotropic Plasticity?

- Occur as localized bands
- Occur in well-foliated rocks and anisotropic crystals
- Most common in low grade rocks
- Late in deformation history
Confining pressure (500 MPa)

100m
Degree of Anisotropy

\[ m = \frac{\text{bulk strength}}{\text{strength of ‘foliation’}} \]
m=2, simple KB’s
m=5, composite KB’s and Kinks
m=2, phi=20
m=10, phi=20
Simple kbs.

Composite kbs.

Kinking