



Indian Institute of Technology, Kanpur

Department of Earth Sciences

ESO213A: Fundamentals of Earth Sciences

Lecture 16. Deformation of Rocks - II

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Different ways of studying Deformed Rocks



DIRECT METHODS

Geometric Models (Structural Analysis): *Qualitative or Quantitative*

- a. 2D or 3D interpretation of form and orientation of structures
- b. based on data obtained from field studies (mapping, geophysical data)
- c. represented by cross sections and maps.

Kinematic Model (Strain Analysis): *mostly Quantitative*

- a. reconstructing specific history of motion, displacement
(Plate tectonics is a kinematic model)

Mechanical Model (Dynamic Analysis): *Quantitative*

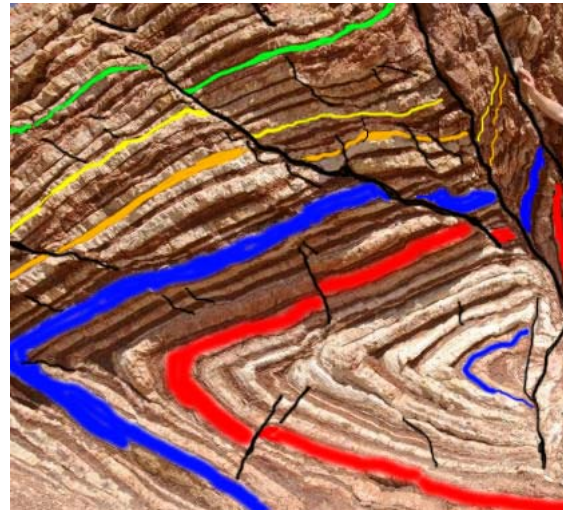
- a. reconstructing the mechanical processes that resulted in rock deformation
- b. deals with forces, rheology, deformation mechanism etc.

INDIRECT METHODS

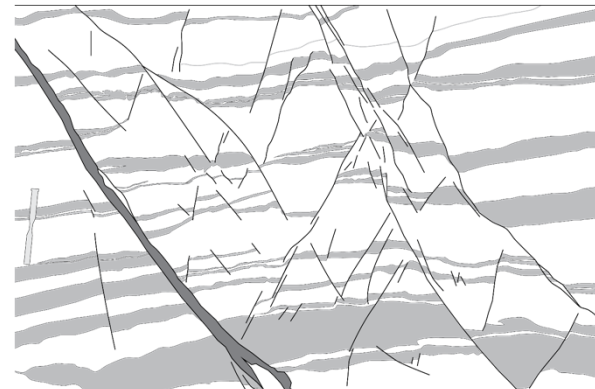
Analytical Model

- a. hypothesis
- b. model derivation
- c. additional data collection
- d. compare with natural observations

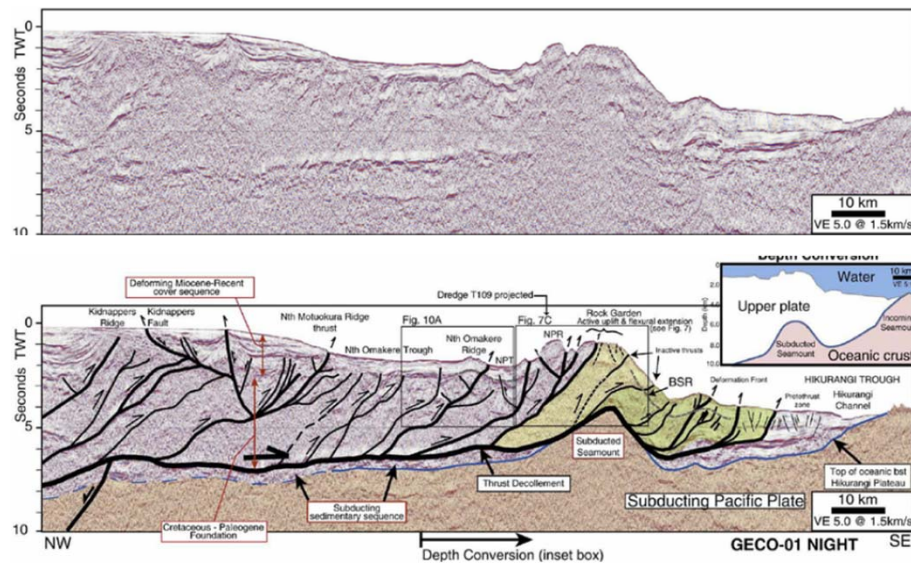
Geometric Model - Example



Geometric Model - Example

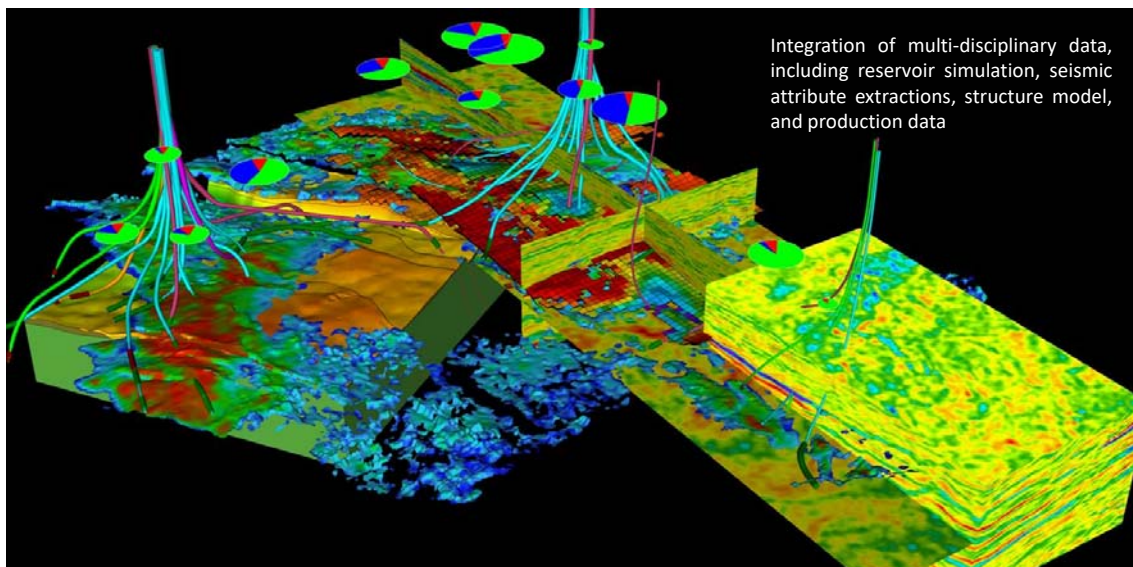


Geometric Model - Example



Lamarche et al., 2008

Geometric Model - Example

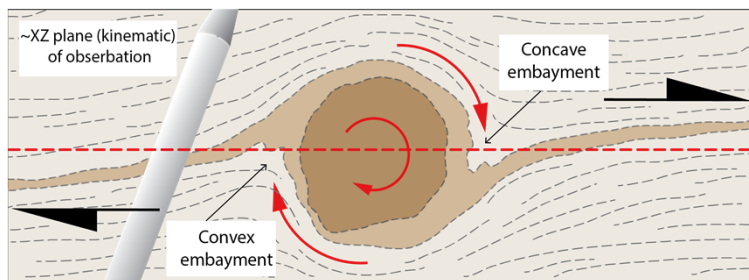


Dynamic Graphics (www.dgi.com)

Kinematic Model - Example



Photo-source: Unknown



Kinematic Model - Example

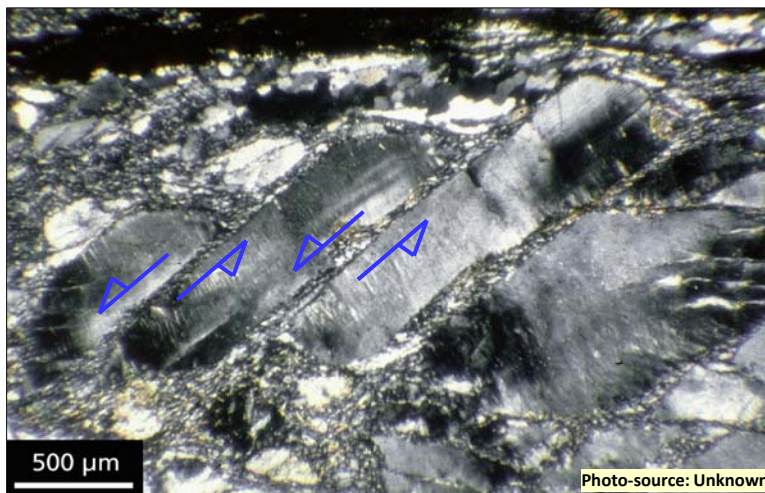
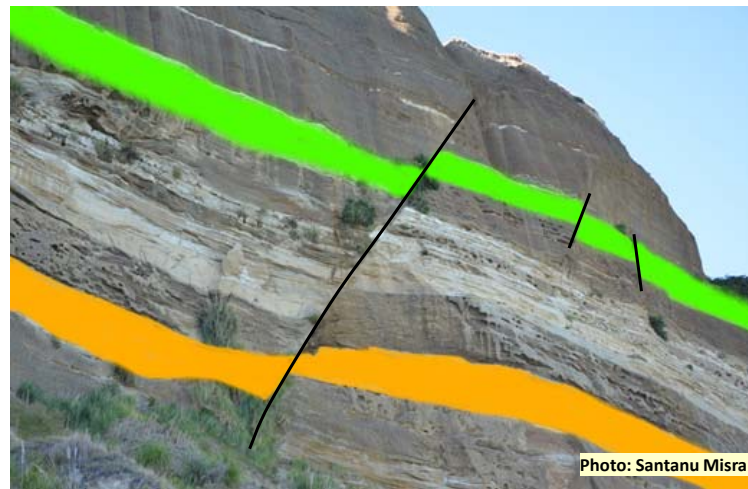


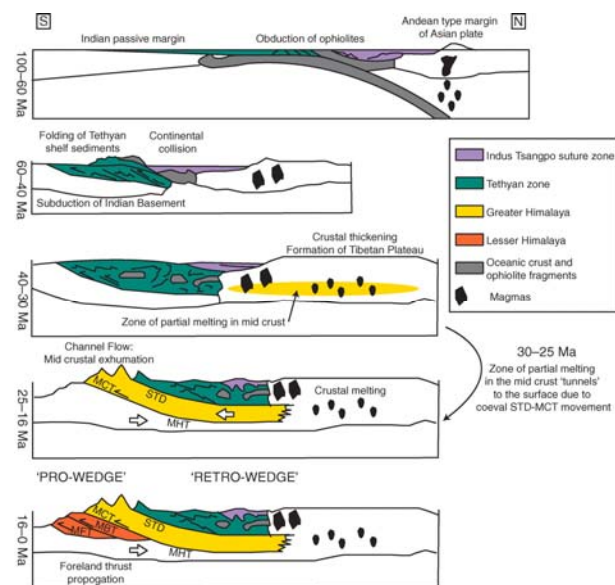
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Kinematic Model - Example



Kinematic Model - Example



Streule et al., 2010

Dynamic Model - Example



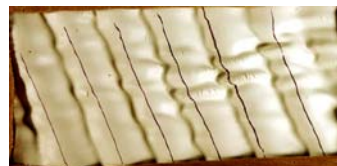
Dynamic Models - Example



Superposition of folding



Stage 1



Stage 2

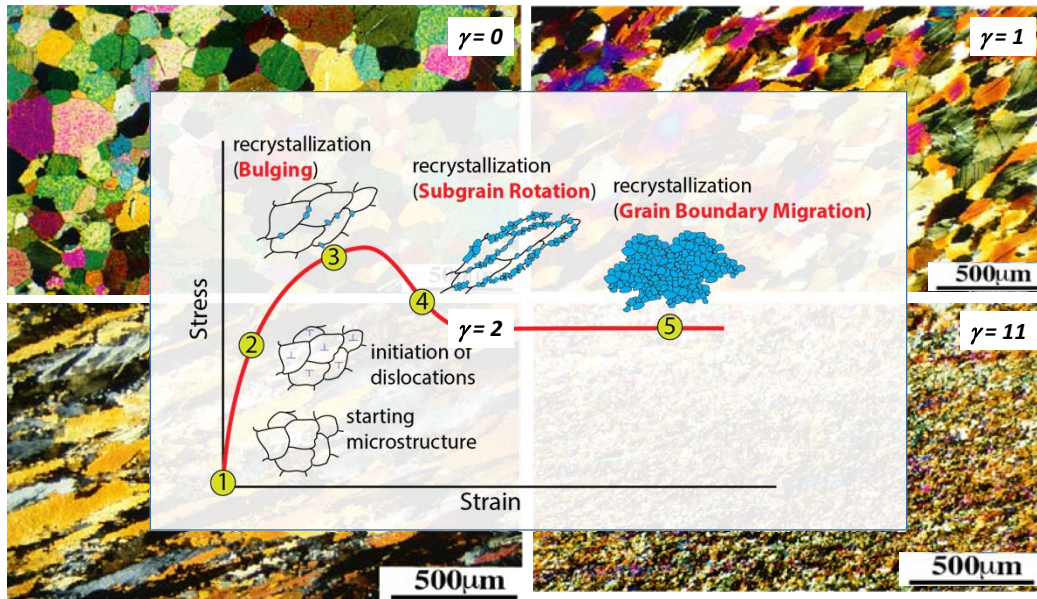


Stage 3



Stage 4

Dynamic Models - Example



Dynamic Models - Example



Next Lecture



To understand the structures, it is important to identify and measure different *structural elements* (lines, planes and their mutual relationships). In the next lecture, we shall cover this topic.