FOCUS ON IMAGING

IN APPLICATION

Strain Field in Granular Flows

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Analogue modeling methods provide promising results for better understanding of geodynamic processes. These methods enable the visualization of processes which take place in geological times and in the deeper sub-surface.

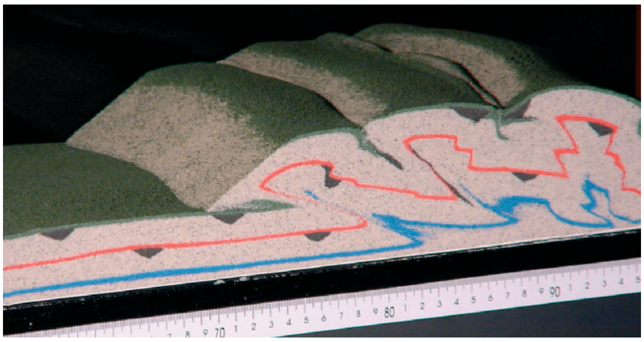

Figure 1
Side and top view of sand box while performing a deformation and mass transfer experiment. Image courtesy of Jo Lohrmann and Jürgen Adam GFZ, Potsdam, Germany

The geodynamic modeling lab of Geo Forschungs Zentrum Potsdam addresses questions like mass transfer patterns and deformation styles in ancient and active convergent margins, stress fields and hydrothermics of fore-arcs, etc. For these purposes GFZ applies sandbox experiments to investigate long-term deformation and material transfer.

To investigate deformation and mass transfer, GFZ develops and builds experimental devices to work with granular materials like quartz sand or micro glass beads. These materials allow scaling with a constant scaling factor for geometry and physical properties like cohesion.
By dragging a conveyor belt with well defined friction beneath a "continental margin", a wide range of processes at convergent margins is investigated including those of frontal and basal accretion, duplex formation and forced and self-controlled erosion. GFZ's experimental concept for convergent margins is being extended to investigate bivergent orogens and 3D mass transfer during oblique convergence.
GFZ uses LaVision's 2D and 3D StrainMaster system to measure internal strain field inside the sand layers and on top of the sand surface.

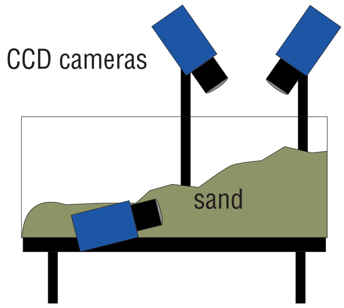

Figure 2, Setup
GFZ uses 2D and 3D StrainMaster System. The 3D system requires two CCD cameras which image from the top to measure 3D deformation and strain field on sand surface. 2D system requires one CCD camera which images from the side to measure deformation and strain field inside sand layers. GFZ uses Kodak ES 4.0 CCDs that offer 2kx2k pixel and up to 15 Hz frame rate.

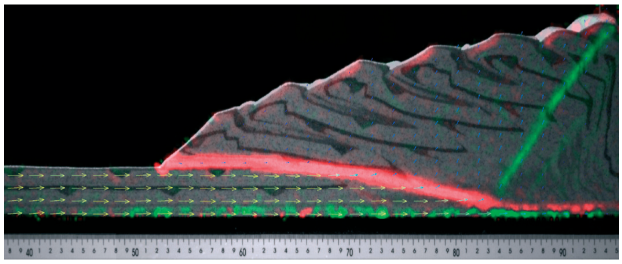

Figure 3, 2D-results
Arrows indicate the deformation inside the sand layers. Length and color of arrows reflect the strength of deformation field. From the deformation field StrainMaster software computes the strain field that is indicated by the overlaid color. There is one „red strain belt" that starts at the beginning of the aggradations and ends at the lower right corner. The other strain field is indicated by green color. If the „green strain belt" reaches the right upper part of the aggradations the structure relaxes immediately. In real world this effect would be an earth quake.

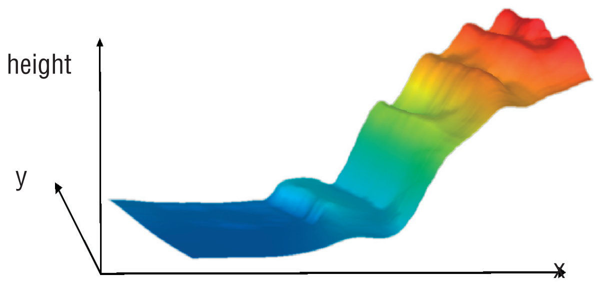

Figure 4, 3D-results
The image shows the measured 3D plane of the sand surface. The color corresponds to the strength of the strain field in the sand surface. Red color indicates the highest blue color the lowest strain field.

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