Geophysical Research Abstracts
Vol. 18, EGU2016-9404, 2016
EGU General Assembly 2016

Folder: a MATLAB-based tool for modelling deformation in layered media subject to layer parallel shortening or extension

Marta Adamuszek (1), Marcin Dabrowski (1,2), and Daniel W. Schmid (2)

(1) Polish Geological Institute - NRI, Warszawa, Poland (marta.adamuszek@pgi.gov.pl), (2) Physics of Geological Processes, University of Oslo, Norway

We present Folder, a numerical tool to simulate and analyse the structure development in mechanically layered media during the layer parallel shortening or extension. Folder includes a graphical user interface that allows for easy designing of complex geometrical models, defining material parameters (including linear and non-linear rheology), and specifying type and amount of deformation. It also includes a range of features that facilitate the visualization and examination of various relevant quantities e.g. velocities, stress, rate of deformation, pressure, and finite strain. Folder contains a separate application, which illustrates analytical solutions of growth rate spectra for layer parallel shortening and extension of a single viscous layer.
In the study, we also demonstrate a Folder application, where the role of confinement on the growth rate spectrum and the fold shape evolution during the deformation of a single layer subject to the layer parallel shortening is presented. In the case of the linear viscous materials used for the layer and matrix, the close wall proximity leads to a decrease of the growth rate values. The decrease is more pronounced for the larger wavelengths than for the smaller wavelengths. The growth rate reduction is greater when the walls are set closer to the layer. The presence of the close confinement can also affect the wavelength selection process and significantly shift the position of the dominant wavelength. The influence of the wall proximity on the growth rate spectrum for the case of non-linear viscous materials used for the layer and/or matrix is very different as compared to the linear viscous case. We observe a multiple maxima in the growth rate spectrum. The number of the growth rate maxima, their value and the position strongly depend on the closeness of the confinement. The maximum growth rate value for a selected range of layer-wall distances is much larger than in the case when the confinement effect is not taken into account. The influence of the wall proximity on the fold shape evolution is presented based on an example of a single layer perturbed with a bell-shape function embedded in the matrix of various heights. We carry out simulations for both linear and non-linear viscous materials of layer and matrix. The numerical studies showed that the confinement effect is more pronounced for the case of the non-linear materials, where it significantly influences number of generated folds and their shape. The close proximity of the wall promotes development of larger number of folds with similar shapes.