

Palæo-DEM and erosion/sedimentation through time

Contact persons:

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Context

A global plate tectonics model, PANALEISIS, is being developed at the University of Geneva. Like the UNIL model (now abandoned) which it replaces, PANALEISIS (V  rard, 2019.a & .b) is developed under arcGIS and contains in particular polylines and polygons (shape files, *.shp).

A code (in dotNet) was developed a few years ago (V  rard et al., 2015) to convert these maps into 3D topographic surfaces (i.e. paleo-DEM).

We are looking for a student with strong computer skills to entirely rewrite and improve this code in order to obtain paleo-DEM throughout geological time, and to define a strategy to quantify the associated erosion-sedimentation at global scale.

Objectives and Methods

The master's work consists of two phases:

1. **Skills development:** Fully rewrite the code in a more modern language, optimize and improve the algorithm for better rendering of synthetic topographies (creation of rasters; i.e. pal  o-DEM) on approximately 90 maps ranging from 888 million years (Ma) to current (0 Ma).
2. **Research:** Define an algorithm to assess, from the pal  o-DEMs created, the quantities of eroded and sedimented material on a global scale.

The master's work will be supervised in collaboration by Jean-Luc Falcone (algorithmic-code, Department of Computer Science), S  bastien Castellort (erosion-sedimentation, Department of Geology) and Christian V  rard (tectonics-paleogeography, Department of Geology).

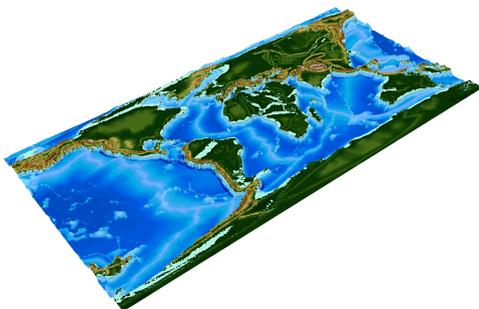
Literature

V  rard, C., Hochard, C., Baumgartner, P.O., Stampfli, G.M., 2015. 3D pal  o-geographic reconstructions of the Phanerozoic versus sea-level and Sr-ratio variations. *Journal of Pal  o-geography*, 4 (1), 64-84.

V  rard, C., 2019.a. Plate tectonic modelling: Review and perspectives. *Geol. Mag.*, 156 (2), 208-241.

V  rard, C., 2019.b. PANALEISIS: Towards global synthetic pal  o-geographies using integration and coupling of manifold models. *Geol. Mag.*, 156 (2), 320-330.

Example of pal  o-DEM at 33 Ma.



WEB sites

Choice of orientation :

1) Sedimentary, Environmental and Reservoir Geology / 2) Geochemistry, Alpine tectonics, Ore Deposits / 3) Geological Risks