

Appendix B

Model limitations

Our 2D thermo-mechanical experiments involve only the lithosphere and uppermost asthenosphere. Further deep mantle processes are not considered. We applied constant extensional boundary velocities for the syn-rift phase, their variation, i.e., a gradual increase and gradual decrease was not implemented. Our modelling scenario is also limited by constant prerift topography and zero initial water depth. Furthermore, our initial setup contained a laterally homogeneous crust, which assumes that other inherited thrust contacts may provide less significant rheological influence at our applied resolution. However, reactivation of a stack of crustal thrusts locally modifies the extensional kinematics (Le Pourhiet et al., 2004). Magmatic processes, hydration and fluid transport (Mezri et al. 2015; Roche et al., 2018) that could modify the geotherms were not considered in the present simulations.

Stratigraphic models by DionisosFlow simulate the general depositional process during erosion, sediment transport, and deposition at basin scale. The aim of DionisosFlow is not to simulate individual channels, but rather the behaviour of the overall basin system (Granjeon et al., 2014). Another limitation derives from our chosen 2.5 km horizontal resolution. We do not simulate geomorphological features at high resolution, such as incision-driven processes. In this study we only imposed a synthetic eustatic base-level variation, in future studies more sophisticated curves can be used. Finally, full coupling between surface processes and thermo-mechanical evolution is implemented in Flamar by only a zero-order linear diffusion equation and only a one-way coupling method was implemented between Flamar and DionisosFlow.

Stratigraphic code description

DionisosFlow (Granjeon, 2014) is a multi-lithology diffusive 3D stratigraphic modeling software that simulates the infill of sedimentary basins at large spatial and temporal scales taking into account the effects of variable subsidence, uplift, sea-level variations as well as different sediment transport laws [Granjeon, 2014]. In the numerical code, sediments are assumed to be built up by a finite number of different grain-size fractions. The mass conservation equation is solved for each grain-size fraction:

$$(1 - \Phi)c_{s_i} \left(\frac{\partial h}{\partial t} + V \right) = -\nabla Q_{s_i}$$

Where Φ is the porosity, $c_{(s_i)}$ is the concentration of the i -th sediment fraction, h is the elevation [m], V is the basin subsidence rate [m/s], $Q_{(s_i)}$ is the flux of the i -th sediment fraction [m²/s].

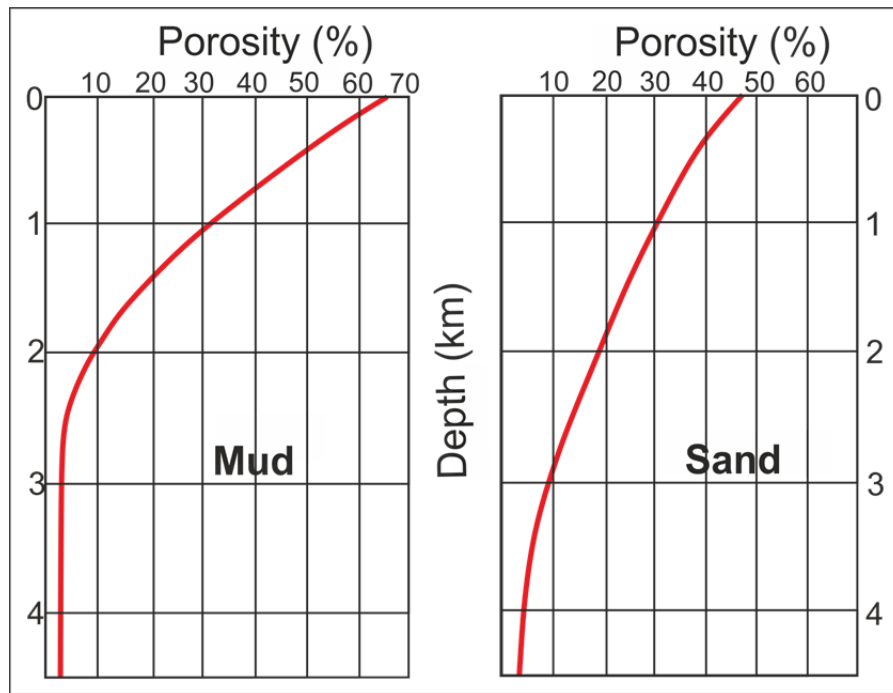


Figure B1. Lithology dependent porosity-depth functions used for sediment compaction (Szalay, 1982). Basement-derived rocks are assumed to have constant porosity.

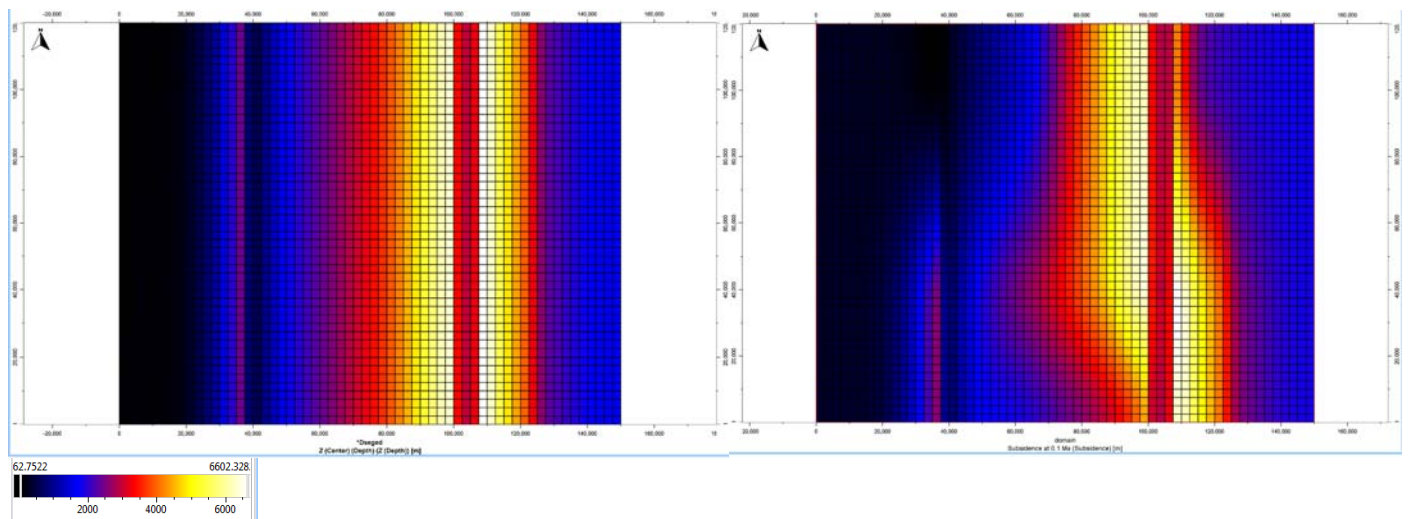


Figure B2. Total basement subsidence maps in the model without and with along-strike variability.

Figure B3. Seismic impedance, P wave velocity and seismic amplitude grids of the stratigraphic model M1wet calculated by DionisosFlow. The parameters used for our simplified calculation are presented in Table B.1.

Figure B4. Seismic wavelet used for the synthetic seismic calculation.

	P wave velocity (m/s)	Density (kg/m ³)
Mud	2000	2400
Sand	2400	2250
Basement	2800	2750

Table B.1. Parameters used for synthetic seismic calculation.