AGU PUBLICATIONS

Tectonics

Supporting Information for

Tectonic and climatic controls on asymmetric half-graben sedimentation: inferences from 3D numerical modeling

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Introduction

This supporting information file contains text, a figure, and a table. The text section describes the numerical method and parameters used during the modeling. Table S1 shows the parameters of the different lithologies used in the models. Figures S1 shows the porosity-depth relations used in the models.

Text S1.

DionisosFlow 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].

All the physical equations are solved using a finite-volume implicit numerical approach [Gervais and Masson, 2004]. The model assumes that sediment fluxes are proportional to the gradient of the topography and are controlled by lithology dependent diffusion coefficients. The model accounts for the above mentioned mass conservation of each lithology classes in the basin. A Newton-loop is used to invert the non-linear matrix describing the equation system. A dynamic time step is automatically adjusted to ensure that the residual spatial error is always below a given threshold. In our case, the threshold was 10e-5 m. During the modeling, the model results are saved with a time step in the order of a few thousand years.

Three sediment classes are defined in our modelling approach: sand, mud and basement-derived pebble. The diffusion coefficients in the models are summarized in Table S1. During the modeling the sediments are built up by a mixture of the three defined sediment classes. Porosity data is shown in Fig. S1.

	Basement	Sand	Mud
Grain size [mm]	4	0.25	0.0035
Water-driven continental coefficient [km^2/kyr]	80	80	160
Water-driven marine coefficient [km^2/kyr]	0.08	0.08	0.8

Table S1. Applied parameters for the three sediment classes.

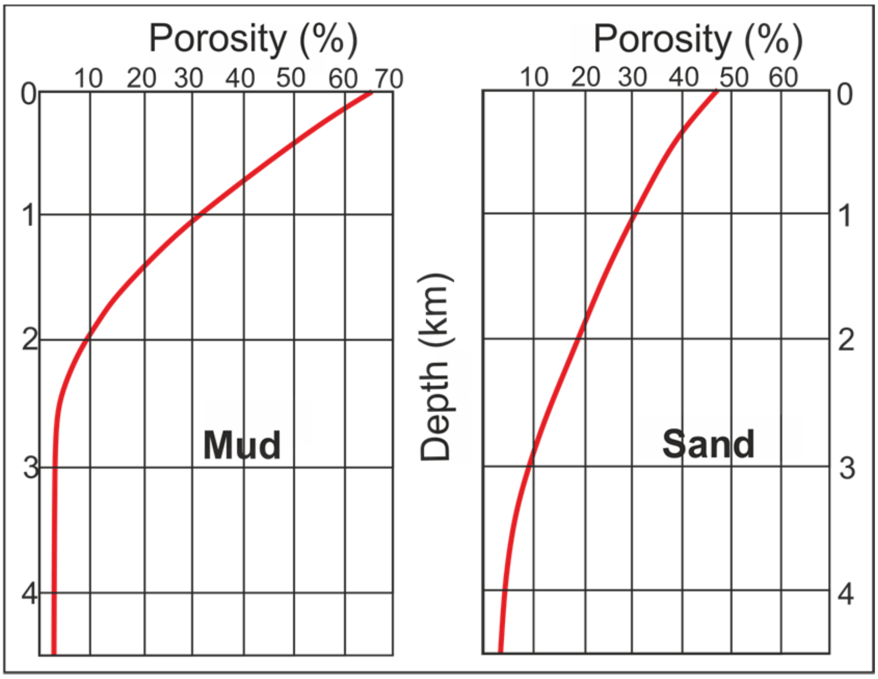

Figure S1. Lithology dependent porosity-depth functions used for sediment compaction [Szalay, 1982]. Basement-derived rocks are assumed to have constant porosity.