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Topographic Evolution of the Eastern Alps. The Influence of Strike-Slip Faulting Activity

Kurt Stüwe (1), Thorsten Bartosch (1), and Jörg Robl ()

(1) University of Graz, Earth Science, Graz, Austria (kurt.stuewe@uni-graz.at), (2) University of Salzburg, Earth Sciences

We present results of a numerical model that is used to investigate aspects of the landscape evolution of the Eastern European Alps in the Miocene. The model allows the consideration of strike-slip faulting - an inherent feature of the Miocene tectonics - within a viscous medium. Mechanical deformation is coupled with a landscape evolution model to describe surface processes. For the input variables, the activity history of strike-slip faulting in the Eastern Alps is compiled from literature sources. The results present a major improvement in the predicted topographic development over earlier models in terms of the location and build-up of valleys and mountain ranges that form in response to the strike-slip faulting activity. Intra-montane basin formation is predicted and the metamorphic dome of the Tauern Window evolves dynamically in the simulations, related to well-known east-west striking strike-slip faults in the region. Interestingly, the metamorphic dome formation is predicted by the model without explicit consideration of the low-angle detachments bounding the dome in the west and east, suggesting that metamorphic domes need not form in extensional environments. The model under-predicts the mean elevation of the Eastern Alps by several hundreds of meters, which is interpreted in terms of an independent non-convergence related event of the last 5$\sim$My, that has been inferred previously from other field data. Time series analysis of elevations reveals a clear correlation between maximum height and the amount of strike-slip activity and a nonequilibrium state between uplift and erosion. We interpret this in terms of for future topographical growth of the Eastern Alps. This interpretation is consistent with slope-elevation statistics of both model and field oberservation.