Supporting Information for:

Structural evolution of orogenic wedges: interplay between erosion and weak décollements

Luca Dal Zilio[1], Jonas Ruh[2], Jean-Philippe Avouac[1]

[1] Division of Geological and Planetary Sciences, California Institute of Technology (Caltech), 91125 Pasadena, California, United States

[2] Structural Geology and Tectonics group, Geological Institute, Department of Earth Sciences, ETH Zürich, Sonneggstrasse 5, 8092 Zürich, Switzerland

Contents of this file

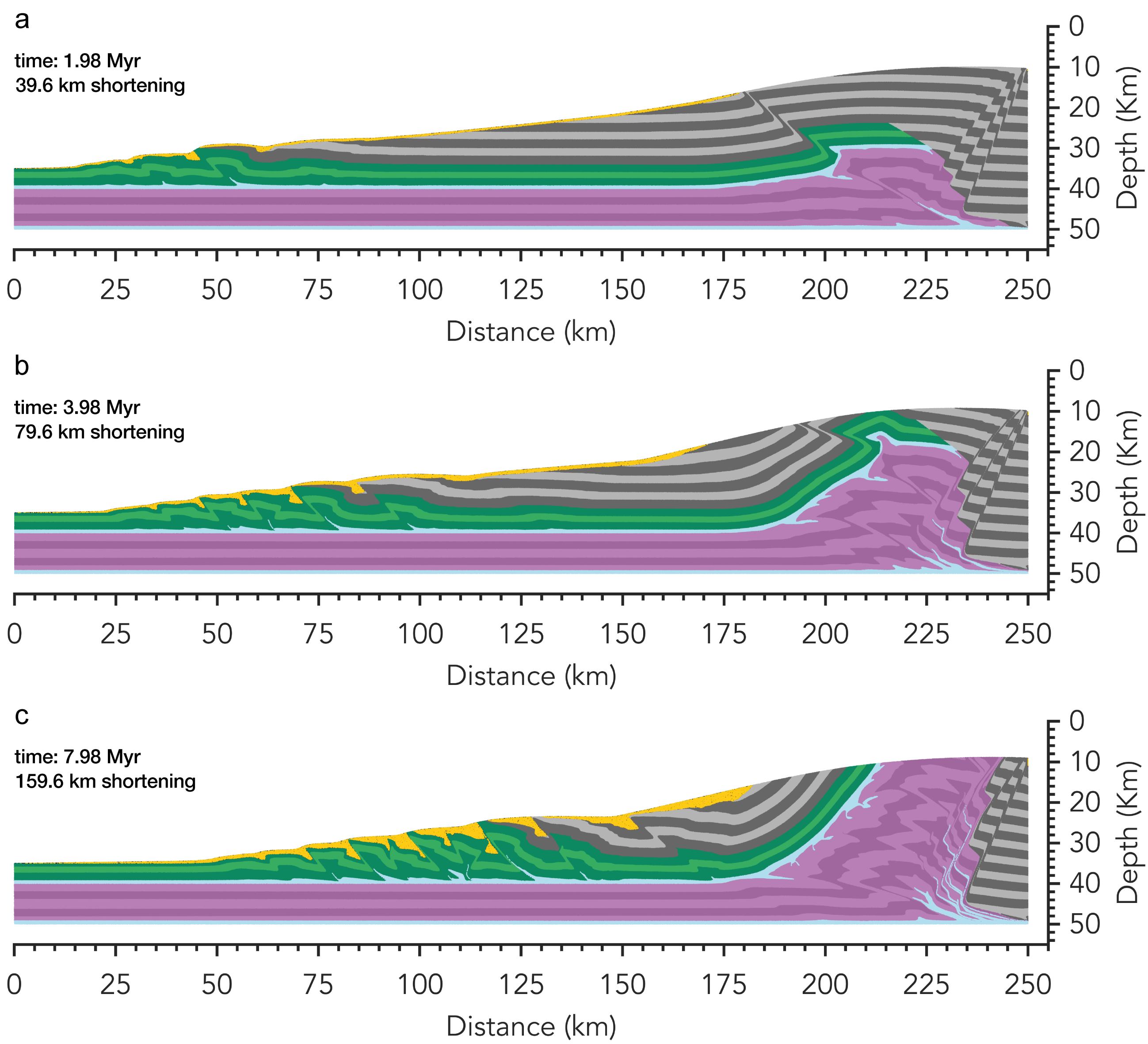

Figure S1. ***Model–M4.*** Structural evolution of a model with an intermediate décollement weaker than the basal one. The model shows the development of mid-crustal ramps, a duplex structure, and two wedges: an outer wedge controlled by the intermediate décollement, and an inner wedge controlled by the basal décollement.

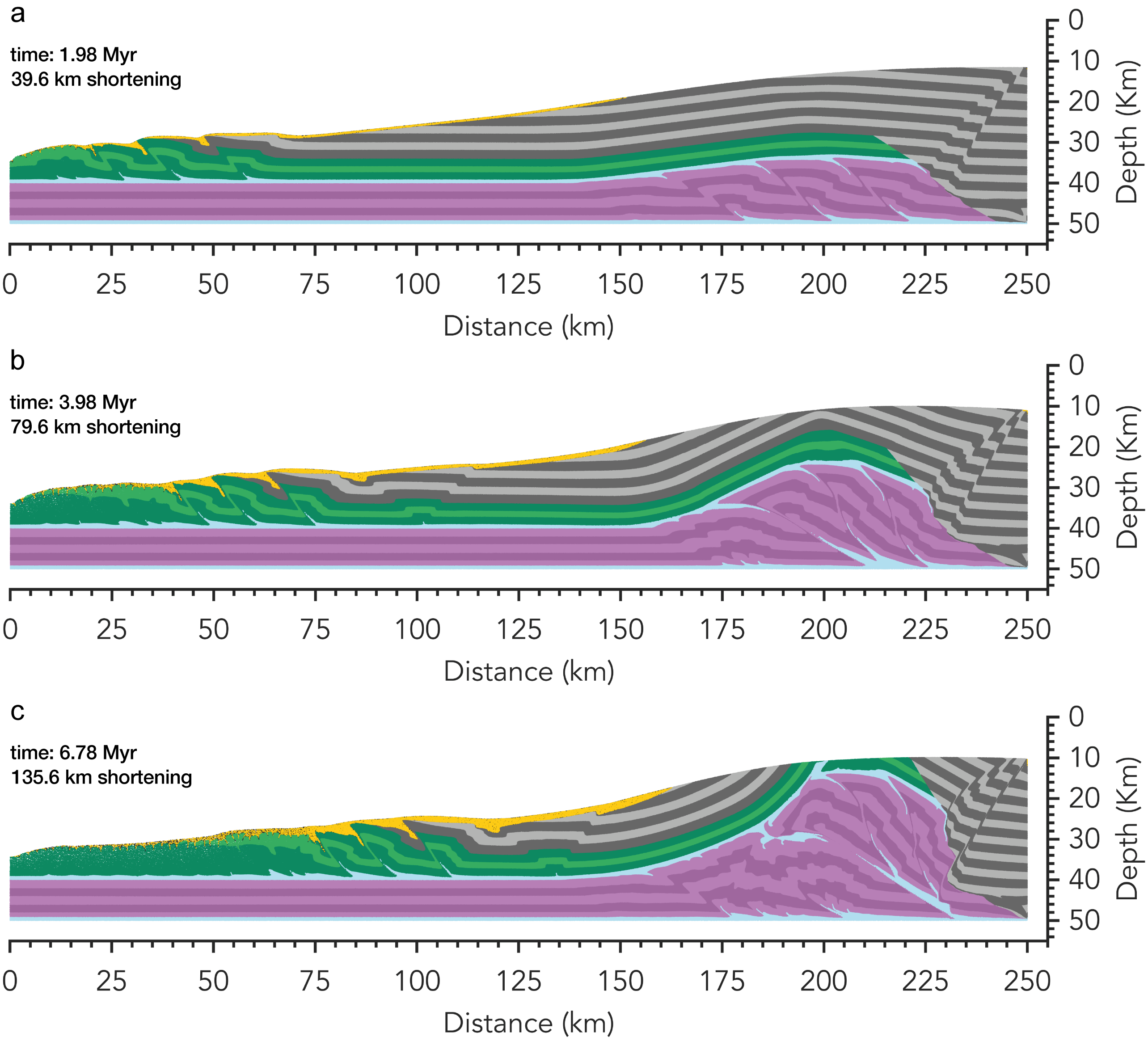

Figure S2. ***Model–M6.*** Structural evolution of a model with an intermediate décollement weaker than the basal one. The model shows the development of mid-crustal ramps, and a duplex structure.

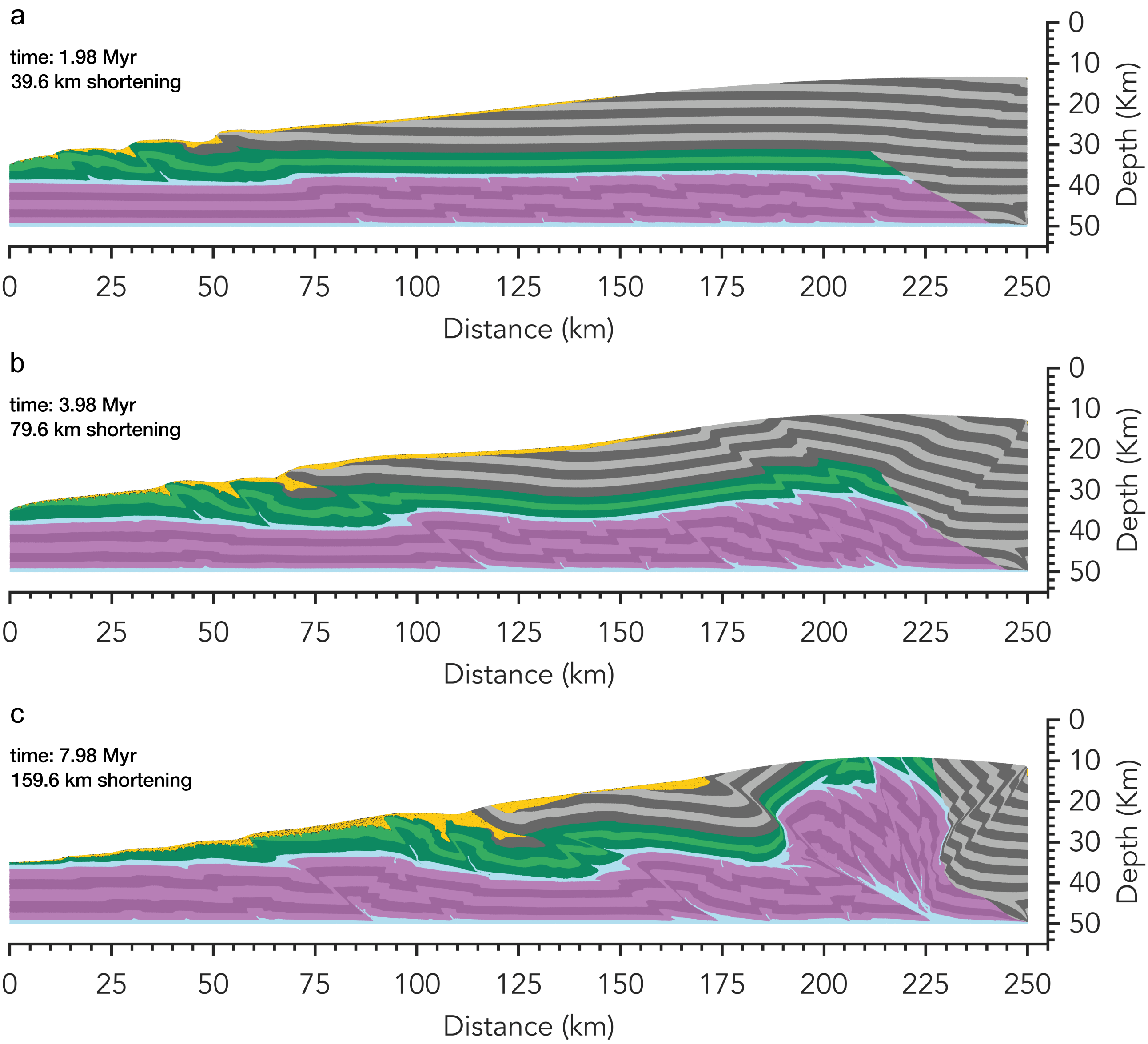

Figure S3. ***Model–M7.*** Temporal evolution of a model with the same yield strength for the basal and intermediate décollement. The model shows the initial development of in-sequence mid-crustal ramps, which is followed by out-of-sequence thrusting.

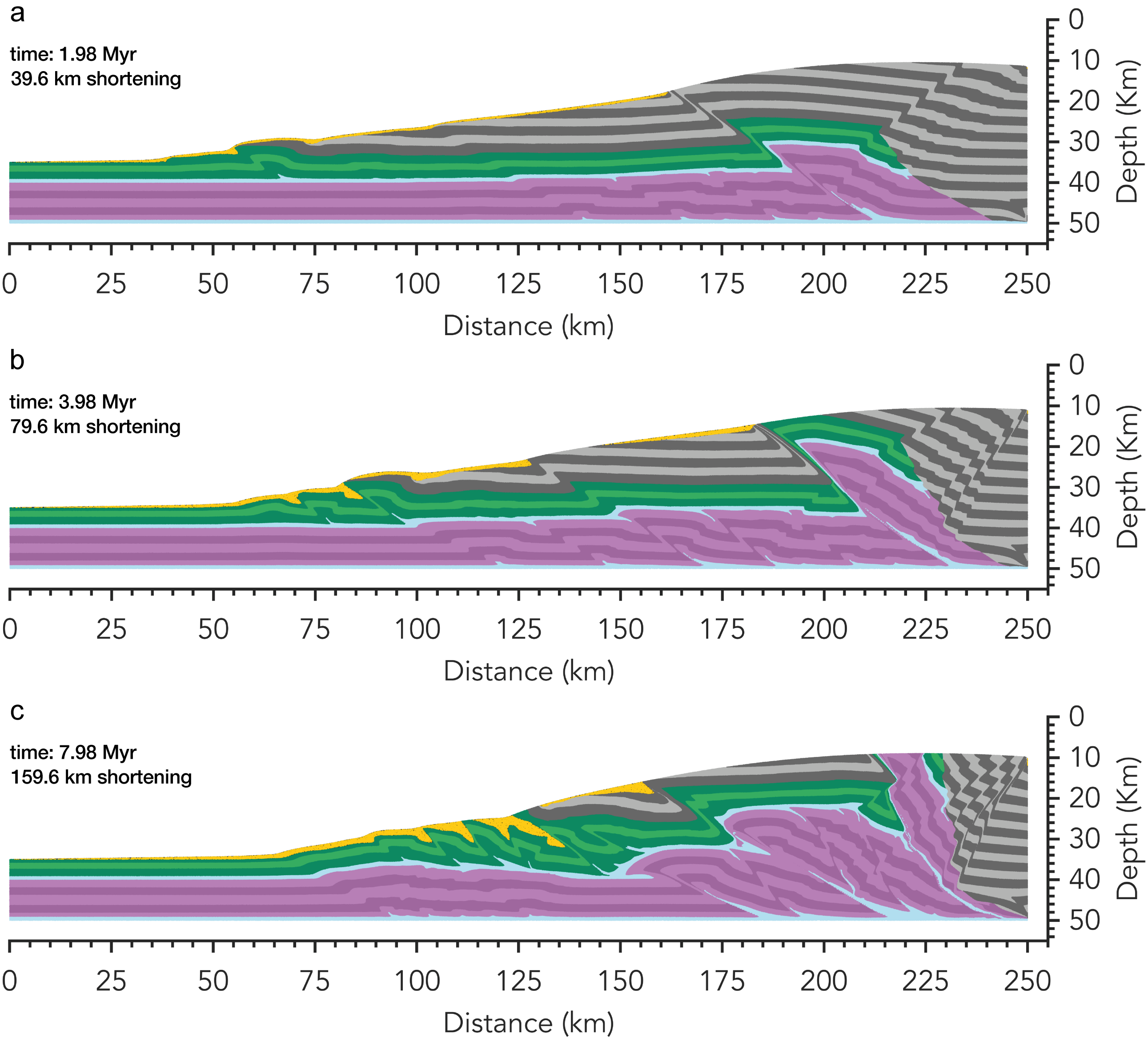

Figure S4. ***Model–M9.*** Numerical experiments assuming the same strength for the basal and the intermediate décollement. Since the strength is the same between the two décollements, the final architecture reveals only one critical angle, whereas the wavelengths on the surface depends on the thickness of the upper sequence. Ramping of the lower sequence occurs with no preferred distance between thrusts.

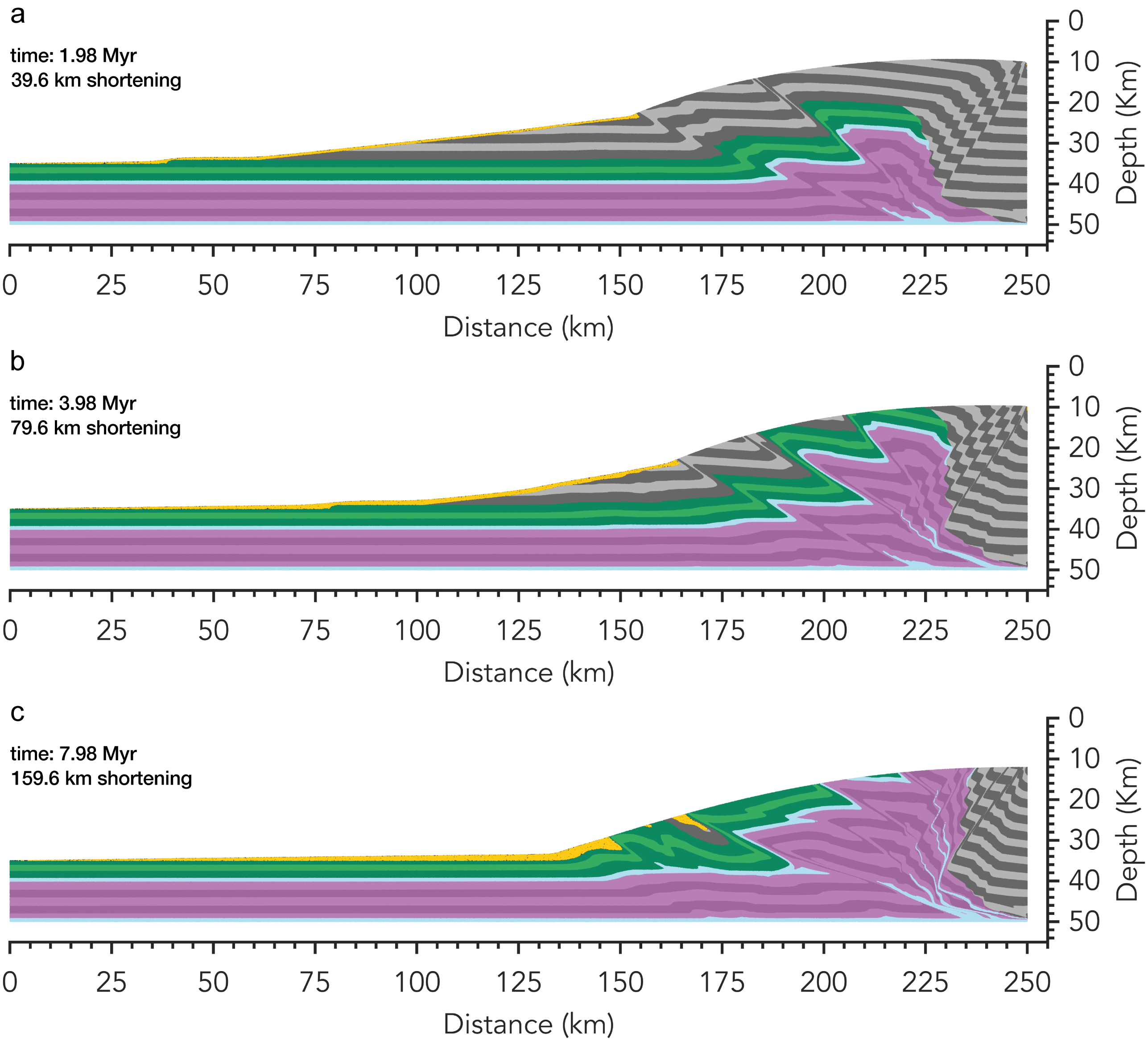

Figure S5. ***Model–M10.*** Temporal evolution of a model assuming the same strength for the basal and the intermediate. Since the strength of both décollements is relatively higher with respect to the reference *Model–M3*, the structural evolution depends on the internal strength of the wedge. The model results in a fold-and-thrust belt dominated by an in-sequence propagation of thrust sheets. The final structure reveals only one critical angle, which depends on the strength of the basal décollement.

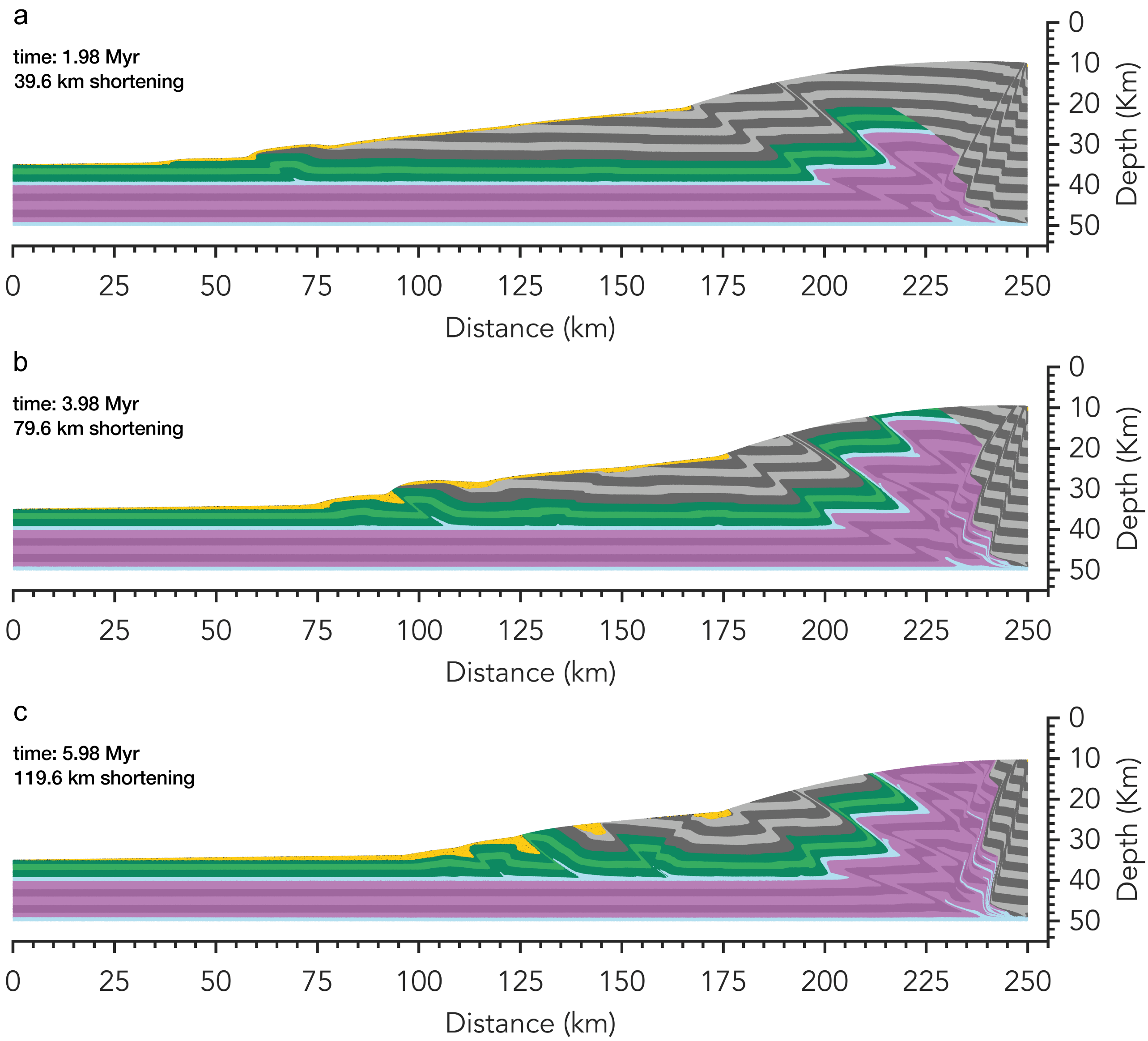

Figure S6. ***Model–M11.*** Temporal evolution of a model with an intermediate décollement weaker than the basal one. Since the strength of both décollements is relatively higher with respect to the reference (*Model–M3*), the structural evolution depends on the strength of the wedge. The model shows a fold-and-thrust belt dominated by an in-sequence propagation of thrust sheets. Due to a relatively weaker intermediate décollement, the model also shows the forward development of shallow ramps.

Movie S1. Long-term evolution of the reference model (*Model–M3*). Upper panel: rock composition. Middle panel: strain rate. Lower panel: cumulative strain. Time is incremented from the start of the experiment.