FROM COMPRESSION TO EXTENSION: A SIMPLE MODEL ILLUSTRATING THEIR RELATIONS DURING CONVERGENCE

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The causal relationships between extension and compression in orogenic belts are not easy to interpret, in part because of the difficulty of fully understanding two- or even three-dimensional mechanics of deformation. This problem is akin to the confusion that exists in the literature about the kinematic relationships between uplift and exhumation. In order to illustrate the latter, we have presented (in the past) a one-dimensional kinematic model to highlight the relationships between uplift and exhumation during simultaneous lithospheric thickening and erosion. We could show that rocks may move upward or downward in the crust, depending on depth or time, but independent of a constant boundary conditions for the convergence- or erosion rate.Here we present a mechanical extension of this model which can be used to illustrate the causes for the onset of extension during compression, also with no changes in convergence or erosion rate. The model relies on the assumption of homogeneous thickening of a two-layer lithosphere which erodes at the surface with a rate that is proportional to elevation. Because crustal- and mantle-lithospheric thickening have opposite effects on the potential energy changes of the lithospheric column, we can show that two compression phases, separated by a phase of extension may be the normal sequence of events in collisional orogens.