

Post-orogenic unrooting and collapse in double suture systems: insights from the Western Dabie Orogen

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Post-orogenic extension is the last stage of a tectonic process towards the end of each Wilson cycle in both ancient and modern continental collisional zones, but their dynamics, controlling parameters and roles for the post-orogenic extension processes remain debatable. We present the first two-dimensional thermo-mechanical numerical model of double sutures inspired by the Western Dabie Orogen to investigate the dynamics of post-orogenic extension. Our results indicate that the pro-continent re-subduction can delay or stop regional extensional deformation and subsequent voluminous magmatic activity caused by slab break-off in the collision zone. After the end of the collision stage, the re-subduction slab under the residual lithosphere in the model with lower convergence, as a strong unit, can maintain the gravitational balance of the whole post-orogen system, whether crust eclogitization is considered or not. If the oceanic crust and micro-continental crust eclogitization are applied to the model with medium convergence, the lower crust and the residual lithospheric mantle in the collision zone will be completely removed by the gravitational instability and upwelling of asthenospheric mantle, and the lithospheric architecture of this result is very similar to the present-day tomography (Fig.1). However, in the model with higher convergence, lithosphere delamination can occur only by upwelling of asthenosphere, whether crustal eclogitization is considered or not. Based on a comparison of numerical results with field data from the Western Dabie Orogen, we suggest that the dynamics of post-orogenic extension in the Western Dabie Orogen is controlled by re-subduction of the North China Block and crustal eclogitization after HP/UHP collision. Thus, the observed regional extensional deformation and voluminous magmatic activity in the Western Dabie Orogen can be self-consistently explained by interactions between the two sutures and crustal eclogitization.

Keywords: crustal eclogitization, double suture system, numerical models, post-orogenic extension, Western Dabie Orogen



