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Deep structure and Cenozoic evolution of the Kyrgyz Tien Shan: modelling the past to better constrain the present

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In response to the India-Asia collision since ∼50 Ma, deformation propagates heterogeneously in the Eurasian plate. This complex deformation pattern illustrates how structural inheritance can influence the localization of the deformation especially in intraplate domains. In particular, Cenozoic and active deformation in the Tien Shan (TS) appears guided by structures and rheological contrasts inherited from the Paleozoic Variscan orogeny. The Cenozoic deformation is well documented and very intense and the interpolation of geological cross sections at lithospheric scale relies on numerous debated hypotheses about the Paleozoic geodynamic scenarii that are difficult to constrain. Which inherited structures and accommodate Cenozoic strain, and what was the initial geometry of these Paleozoic structures? A previous study based on numerical experiments aimed at testing different existing hypotheses about the vergence and rheology of the paleo-sutures in the Kyrgyz TS. Here, we start from the results obtained in this previous work to explore more accurately the strain localization and the thermo-chronological history of the Kyrgyz Tien Shan. In order to constrain our results we compare numerical models with thermo-chronological data available in the literature. We find that the mechanical behavior of inherited heterogeneities has to be different in the upper and lower crust in order to obtain results compatible with data. Using these results, we propose a mechanically consistent depth-interpolated crustal cross-section of the Kyrgyz Tien Shan, which incorporates available geological and geophysical data.