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Inversion tectonics, intracontinental fold-and-thrust belts and complex stress fields in central Europe: the history of the Franconian Basin revealed by paleostress analysis, geological maps and field observations.

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The Franconian Basin in SE Germany has seen a complex stress history indicative of several extensional and compressional phases e.g. the Iberia-Europe collision acting on a pre-faulted Variscan basement. Early Cretaceous extension is followed by Late Cretaceous inversion with syntectonic sedimentation and deformation increasing progressively from SW to NE culminating in the Franconian Line where basement rocks are thrusted over the Mesozoic cover. The development of this intracontinental fold-and-thrust belt is followed by Paleogene extension associated with the formation of the Eger Graben, which is then succeeded by a new compressional event as a consequence of the Alpine orogeny.

We use existing data from literature and geological maps and new field data to construct balanced cross-sections in order to reveal the architecture of the Cretaceous fold-and-thrust belt. In addition, we undertake paleostress analysis using a combination of fault slip information, veins and tectonic and sedimentary stylolites to identify stress events in the study area, as well as their nature and timing. Furthermore, we try to understand how basement faults influence younger faults in the cover sequence.

Our paleostress data indicates that at least five different stress events existed in Mesozoic to Cenozoic times (from old to young): (1) an N-S directed extensional stress field with E-W striking normal faults, (2) a NNE-SSW directed compressional stress field causing thrusting and folding of the cover sequence, (3) a strike slip regime with NE-SW compression and NW-SE extension, (4) an extensional event with NW-SE extension and the formation of ENE-WSW striking faults according to the formation of the Eger Graben in the E, and finally (5) a strike slip regime with NW-SE compression and NE-SW extension related to Alpine stresses. The geometry of faulting and deformation varies significantly over the regions with respect to the influence of and distance to inherited Variscan structures.

We argue that the extensional event of stress field (1) provides spacing for Early Cretaceous sedimentation in the Franconian Basin. This is followed by the creation of an intracontinental fold-and-thrust belt during stress fields (2) and (3) with a slight rotation of the main compressive stress during these events in Late Cretaceous. We associate the following extension to the development

of the Eger Graben in Miocene time. Finally, a NW-SE directed compression related to Alpine stresses in an intracontinental strike-slip regime is following. Reconstruction of the Cretaceous fold-and-thrust belt reveals mainly fault propagation folding with deep detachments sitting below the cover sequence indicating thick-skinned tectonics. We argue that the Franconian Line is a thrust with a steeply dipping root that belongs to the same fold-and-thrust belt.