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Palaeogene–Early Miocene collisional structures of Eastern Alps and motion of Adria

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A number of hitherto unexplained Tertiary-aged structures reveals that kinematics of continent-continent collision in Eastern Alps is more complicated as proposed until now. Here, we introduce these new structures and discuss these in terms of Tertiary kinematics and motion of the Adriatic microplate. In particular, these structures include: (1) the dextral ca. E-trending Kaumberg fault at the boundary Rhenodanubian Flysch (RF) to Northern Calcareous Alps (NCA) separates a narrow exposure of RF in the W from a wide fold-thrust RF belt exposed to the NE of the Kaumberg fault. There, both NCA and RF also change the strike from E-W to NE-SW. In the Wienerwald, the Kaumberg fault obviously accommodated much of shortening in the NE-trending Wienerwald-Aderklaa fold zone (NCA), which is a particular structure partly buried beneath the Neogene Vienna basin. The structural style of north-eastern sectors of the Northern Calcareous Alps exposed in the Wienerwald area markedly differs from that more to the west. North-eastern sectors display narrow, tight to isoclinal folds with a steep fold axial surface, which are in part SSE-vergent whereas gently S-dipping thrusts dominate to the west. The Kaumberg fault accommodated, therefore, pre-Vienna basin top-W to WNW motion of Eastern Alps. Similar structures are widespread in the Eastern Alps. These include the ENE-trending Mandling wedge, which we explain here as dextral strike-slip duplex of NCA wedging into its Grauwackenzone basement. Furthermore, the top W motion of Penninic units exposed in the Tauern window is likely related to these structures. Abundant hitherto unexplained sinistral N-trending strike-slip faults along the central axis of eastern Alps predate ENE-trending sinistral extrusional related Neogene faults and can be explained with the same kinematic framework.

We incorporate these new findings in a succession of well-established Tertiary-aged

structures. We conclude that collision between the Eastern Alps orogenic wedge with the European foreland was dextral transpressive and is strongly affected by the shape of the Bohemian massif in the foreland, which controlled, at depth, tectonic structures like the Kaumberg fault at its southern margin. The motion direction of Adria was towards NW to W. The subsequent extrusion initiated due to NNE motion of Adria and changed later to N-S shortening. The later Late Oligocene/Early Neogene event also folded the Penninic to Austroalpine boundary as we found at NE margins of the Tauern window. The main stage of extrusion follows due to continued N–S shortening in central sectors of Eastern Alps.