Early Miocene tectono-sedimentary shift in the eastern North Alpine Foreland Basin and its relation to changes in tectonic style in the Eastern Alps

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A striking difference along the Alpine Orogen is the style of collisional tectonics during the Oligo-Miocene, with the onset of escape tectonics in the Eastern Alps (Fig. 1A). The indentation of the Adriatic Plate into the Eastern Alpine Orogen resulted in the formation of conjugate dextral and sinistral strike-slip faults in the vicinity of the Tauern Window. Moreover, major changes occurred in the foreland of the Eastern and Southern Alps in the Early Miocene, with the cessation of the northern Alpine front propagation and the onset of thrusting along the Southern Alpine Front. In this study, we present new results from structural, stratigraphic and subsidence analyses of the eastern North Alpine Foreland Basin (NAFB; Fig. 1B) as part of the "Mountain Building in 4 Dimensions" project, German branch of the European AlpArray initiative, which aims at better understanding the deep crustal-mantle structures of the Alpine Orogen and their relation to surface processes.

Our results show a first phase of onset of foreland sedimentation in the eastern NAFB between c. 33-28 Ma, followed by a strong tectonic-driven subsidence between c. 28-25 Ma ending by a phase of erosion and the formation of a basin-wide Northern Slope Unconformity (NSU; Fig. 1C & 1D). During this time period, the rift-related Mesozoic normal faults of the European platform were reactivated and are capped by the NSU (Fig. 1D). We interpret this phase as an increase in the flexure of the subducting European Plate under the growing Alpine Orogen. Between 25-19 Ma, the eastern NAFB remained in a deep-marine, underfilled state with a gently increase in subsidence. A major shift took place around 19-17 Ma with strong tectonic-driven uplift, ranging from 200 m (absolute minimum) to 1200 m depending on uncertainties on paleo-water depths, and rapid sedimentary infill of the basin (Fig. 1C & 1D). We discuss the possible causes for this major tectono-sedimentary shift in the eastern NAFB in relation to contemporaneous changes in collisional tectonics within the Eastern and Southern Alps, and with a potential Early Miocene slab break-off event beneath the Eastern Alps.

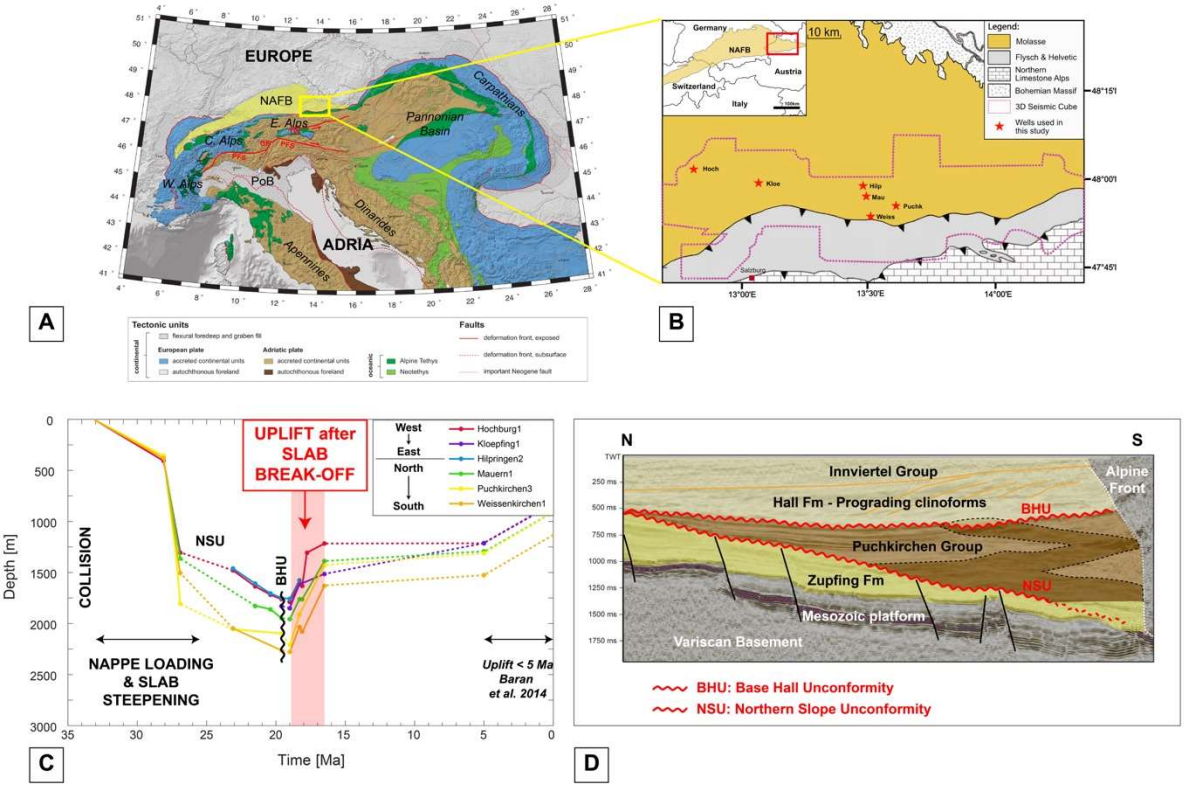

Figure 1. A: Tectonic map modified from M.R. Handy based on sources listed in Handy et al. (2019), yellow box shows location of our Study Area, **B:** Location of 3D seismic cube and wells used for subsidence analysis, modified after Masalimova et al. (2015), **C:** Tectonic subsidence curve (mean) for all wells (location in B.), and **D:** Seismic profile through the eastern NAFB showing the general stratigraphy of the eastern NAFB. Note the normal faults (black lines) in the Zupfing Fm, which reactivated Mesozoic rift-related normal faults and are capped by the NSU. Abb.: GF: Giudicarie Fault, NAFB: North Alpine Foreland Basin, PFS: Periadriatic Fault System, PoB: Po Pain, TW: Tauern Window.

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