

## LATE OROGENIC REBOUND AND OBLIQUE ALPINE CONVERGENCE: CONSTRAINTS FROM SUBSIDENCE ANALYSIS OF THE AUSTRIAN MOLASSE BASIN

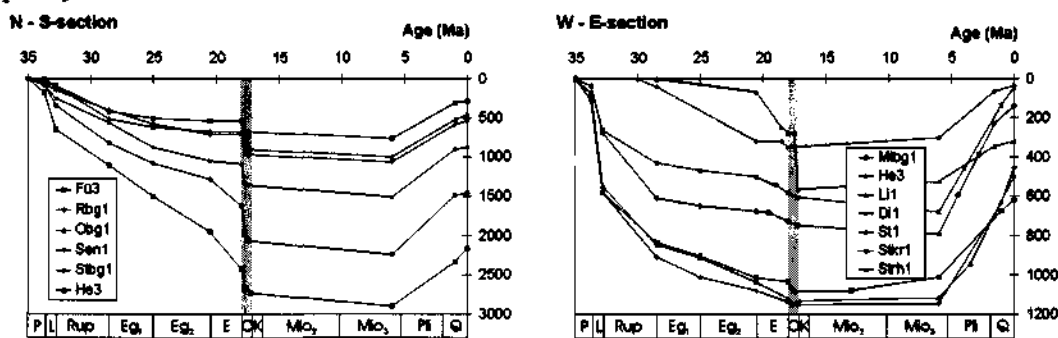
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The Molasse basin, the foreland basin to the Alpine orogen, displays striking lateral changes in basin width and depth, albeit of a straight orogenic front. Subsidence analysis in the Austrian Molasse basin documents also major spatial and temporal changes in basement and tectonic subsidence.

Along a N-S section in the western part of the Austrian Molasse basin, normal to the strike of the basin, all wells show similar temporal subsidence evolutions. Subsidence started in the Late Eocene, in the early Oligocene, the basin strongly subsided to greater water depths and reached already large fractions of the maximum amounts of tectonic subsidence. The basement subsidence curves display for this time slice decreasing subsidence rates, followed by an increase in the Ottnangian. Basement subsidence is mainly driven by sediment loading and thus mainly reflects changing sediment accumulation rates. Only in the Ottnangian minor tectonic subsidence occurred. After the Ottnangian subsidence rates decreased strongly. Subsequently, uplift to the present observed depths occurred with similar, only slightly decreasing amounts away from the orogen along the whole profile. The estimated tectonic uplift is in the order of 500 m, leading to a reduction of the present tectonic subsidence to about a half of its maximum values in the southern part of the basin and to net uplift in the peripheral part of the basin.

Parallel to the Alpine front the basin displays marked differences in its subsidence history. Towards the east, initial subsidence is retarded, occurring only in the late Egerian east of the spur of the Bohemian Massif. There, tectonic subsidence rates strongly increased in the Eggenburgian and Ottnangian, leading to the formation of the present eastern Austrian Molasse basin and the N-S trending spur of the Bohemian Massif. The subsequent tectonic uplift occurred along the whole strike of the basin, decreasing towards the east from about 600 m to 200 m. At the spur of the Bohemian Massif, tectonic subsidence was almost completely reversed.



The progression of main tectonic subsidence from early Oligocene in the western part of the peripheral foreland to the early Miocene in its eastern part reflects a change from oblique dextral to sinistral convergence between the Alpine nappe stack and its foreland. Dextral convergence led to earlier flexural loading in the western part, but subsequent full coupling of the internal orogen with the Molasse basin led to a transition to eastwards directed lateral extrusion, and therefore to progressive loading of more eastern parts of the foreland. The main phase of sediment accumulation was retarded to the early Miocene and must reflect the build-up of topography in the Alpine mountain chain, as the configuration of the basin did not change dramatically in this time span.

The pronounced late-stage regional uplift of the entire Molasse basin marks the transition from lateral extrusion to orthogonal contraction within the Alpine-Carpathian system, but no major phase of near surface orogenic activity in the vicinity of the basin is associated with it. The uplift pattern is not compatible with viscous relaxation or simple unloading of the flexed foreland plate, but must reflect deep-seated changes in geodynamic boundary conditions, most likely delamination and/or convective removal of previously thickened lithosphere.