Geophysical Research Abstracts
Vol. 14, EGU2012-7553, 2012
EGU General Assembly 2012

Syn-sedimentary tectonics in the Cretaceous succession of the Wildhorn nappe (SW Switzerland)

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During Early Cretaceous to Early Tertiary times, the area of the future Helvetic Nappes was part of a large ramp-type depositional system on the European margin, in which the area of the Wildhorn nappe was transitional to the more distal and relatively deeper Ultra-Helvetic basin. The Wildhorn nappe includes a late Cretaceous succession bearing clear evidence for post-breakup extensional tectonics such as: synsedimentary geometries related to well oriented, parallel and spaced NE-striking faults; sedimentary dykes; lateral variations in the thickness and facies of formations; anomalous and discordant contacts corresponding to paleoescarpments; and slump folds. This field evidence indicates an important Late Cretaceous extensional tectonic event that affects the older Jurassic passive margin sequence. This process cannot be related to partial or local gravitational collapse, being the faults cross-cut suitable candidates for preferential gliding (e.g. the thick succession of Lower Cretaceous shales). Until now, the regional importance and magnitude of this late Cretaceous extension was not recognized in this part of the Alps. During the Cretaceous, this transitional area experienced three tectonic and sedimentary stages. (1) Post- Cenomanian disruption and exhumation of the Schrattenkalk platform was related to distribute normal faulting, which contributed to the initiation of karst erosion on the topographic highs and sedimentation in the lower parts. (2) During the Campanian and following a marine transgression, the area experienced more localized normal faulting accompanied by subsidence and slope instability directed toward the fault-scarps. A transition from distributed to more localized faulting is observed, related to a final stage in the evolution of the Cretaceous extensional process. The facies and thickness of subsequent post-Campanian sediments reflect a passive adaption to the pre-existing topography of the sea floor, established during the earlier tectonic movements. (3) Post-Maastrichtian north-directed tilting and erosion were caused by normal reactivation of a few main faults. During Eocene-Oligocene, mixed siliciclastic and calcareous deposits passively filled the rejuvenated topography and sealed the fault scarps. The first two stages can therefore be related to widespread post-breakup extension affecting the Mediterranean Tethys during the Late Cretaceous, whereas the later Early Tertiary event can be associated with pre-orogenic flexure of the Alpine foreland.