Formation and inversion of the Salzburg-Reichenhall Gosau basin, Eastern Alps

F. Neubauer

Institut für Geologie und Paläontologie, Universität Salzburg, A-5020 Salzburg, Austria

The Late Cretaceous to Eocene Salzburg-Reichenhall basin is exposed close to northern leading edge of the Northern Calcareous Alps and is interpreted to have initially formed as pull-apart basin at a sinistral overstep within an E-trending wrench fault. The early formation stage is therefore governed by longitudinal infilling, mainly from E to SE, and lateral steep basin margins. Later, during Santonian to Paleocene, marl deposition suggests loss of the pronounced palaeo-topography, which re-appears with siliciclastic turbidites of Late Paleocene/Eocene.

The stratigraphic succession dips generally NW and N and includes: The thick basal Glasenbach Conglomerate in the east and the Untersberg Formation exposed at the northern slope of the Untersberg. The latter comprises thin reddish lateritic breccia, grayish limestone conglomerate/breccia and grayish marl (Upper Coniacian to Lower Santonian) and is separated from the Glanegg Formation (Lower Coniacian to Lower Santonian) with mainly grayish hemipelagic marls with intercalations of pebbly sandstones by the E-trending Glanegg fault. The overlying Nierental Formation includes greenish-reddish marls of Late Cretaceous age and grades upwards into decimeter-bedded Paleocene to Eocene turbidites with shale intercalations, which also comprises some recently reported levels of Late Paleocene bentonites.

Sandstone compositions of Glasenbach, Glanegg and Nierental Fms have been investigated using the Dickinson-Gazzi method. All sandstones are dominated by carbonate framework constituents and calcitic cement. Carbonate clasts mainly include micritic limestone, monocrystalline calcite grains and bioclasts. The siliciclastic content of framework constituents varies from ca. 1 to maximum 20 percent. In the Glasenbach Formation, sand clasts include metamorphic poly-crystalline quartz, chert, subordinate monocrystalline quartz grains, phyllite, shale-type lithic and volcanic clasts, comprising vitric shards and microcrystalline fragments, and locally abundant serpentinite clasts. Except serpentinite, sandstones of the Glanegg Formation have similar siliciclastic clasts and abundant angular volcanic clasts with a doleritic fabric and shards with micro-crystalline quartz/feldspar. These fragile angular shards argue for contemporaneous volcanism (likely from the “banatites” of Carpathian and Balkan regions). Sandstones from the Eocene formations similarly comprise monocrystalline and polycrystalline quartz, some plagioclase and K-feldspar, white mica and angular volcanic clasts with doleritic and microcrystalline quartz/feldspar-rich fabrics. Most samples plot into fields of orogenic sources using Dickinson-Gazzi-type discrimination diagrams.

Principal structures delimiting the Salzburg-Reichenhall basin are strike-slip faults along margins. These include the sinistral E-trending Glanegg fault along the southern margin and the Zistel, Kobenzl and Gersalm faults at its northern margin. The latter also forms the southern slope of the Kapuzinerberg within Salzburg city. Fault and striae data indicate the following successions of paleostress patterns: (1) Deformation stage D_1 comprises W and SE dipping normal faults resulting in a NW-SE extensional paleostress tensor. (2) Deformation stage D_2 includes N-S and E-W trending conjugate strike-slip faults due to NE-SW transpressional deformation, likely due to early stages of pull-apart formation. These sinistral slickensides are spectacularly exposed along southern slope of the Kapuzinerberg within Salzburg city. (3) Deformation stage D_3 with NW- and NE-trending faults and dextral reactivation of E-trending faults is explained to result from ca. N-S to NNW-SSE transpression. (4) Deformation stage D_4: Sinistral reactivation of E-trending faults by mainly NE-SW shortening, most likely as part of the Inn-Amstetten fault system. (5) Finally, a number of steep strike-slip faults are formed due to E-W transpressive shortening.

The data presented above reveals that formation of the Salzburg-Reichenhall Gosau basin can be explained to result from a fault overstep in a strike-slip fault system respectively wrench corridor. The leading fault comprises an E-W trending master fault system along northern and southern margins, and subordinate normal faults in the east and west. Early Late Cretaceous stratigraphic sequences are exposed along eastern and southern margins, Paleocene-Eocene sequences in the southern and western center. This suggests that initial subsidence was more pronounced in the east than in the west, and a sort of roll-over structure may have formed in eastern sectors of the basin. We interpret therefore the Salzburg-Reichenhall basin as pull-apart basin that opened along a left-hand overstep along a sinistral master fault system during Late Cretaceous. The ophiolite detritus preserved in sandstones of the Glasenbach Conglomerate suggests the presence of a nearby source located to the east or southeast of the Salzburg-Reichenhall basin.