The influence of evaporites on the architecture of cover units in Eastern Alps: Middle-Late Triassic raft tectonics, Early Cretaceous thrusting and Neogene overprint

Franz Neubauer*, Christoph Leitner, Anja Schorn
Department of Geography and Geology, University of Salzburg, Austria; * franz.neubauer@sbg.ac.at

Based on a new methodological approach (field structure and microfabrics of evaporites associated with Ar-Ar dating of K-sulphates polyhalite and langbeinite), a conceptual model is developed how different evaporite minerals react at changing temperature conditions and how the P-T conditions of these processes can be revealed in time. The model allows transfer to other orogenic belts.

Based on this methodology and study of magmatic and metamorphic blocks of all major evaporite bodies from the Northern Calcareous Alps (NCA; Permian-Lower Triassic Haselgebirge Fm.) reveal a number of hitherto processes not recognised before. These processes include: (1) Blocks of Permian magmatic rocks indicate the genesis in a Permian rift postdating thick Permian siliciclastic successions, which formed within syn-rift halfgrabens. Langbeinite of Hall indicates the first stage of a strong thermal overprint of evaporites at the Permian-Triassic boundary. (2) Numerous Ar-Ar ages of polyhalite mainly formed in extensional structures indicate a Middle-Triassic thermal overprint, pervasive fluid flow and lateral and vertical motion of the evaporite bodies. We explain this Middle-Triassic phase as ocean-ward directed gravity-driven raft tectonics directed to the oceanic Meliata-rift on the developing Austroalpine passive margin. (3) A few potentially Jurassic blueschists occur as blocks in the evaporites indicating Jurassic subduction (but not necessarily of the evaporites). (4) The evaporite bodies were emplaced during the latest Early Cretaceous NW-directed (present-day coordinates) thrusting, forming two different types of structural assemblages: compressional diapirs of halite-dominated evaporites and sheet-like decollement structures of sulphate-dominated evaporites. This phase of deformation also partly challenge the hypothesis of Jurassic gravity tectonics because of NW-directed continent-ward transport along ductile evaporite mylonite zones well preserved mainly in sulphates (anhydrite, polyhalite) and partly dated at ca. 110 Ma. (5) In other cases, these structures are overprinted by Late Cretaceous (?) ductile normal faults resulting in a break of the metamorphic profile. (6) Study of halite and gypsum fabrics indicates that these structures were strongly affected by Neogene and even recent tectonic processes modifying the previous structures, e.g., by strike-slip shearing. Similar very young (Pliocene?) structures of the Bellerophon Fm. were found in the Southern Alps, where the Fella-Sava strike-slip fault developed by shearing gypsum-rich evaporites.