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Petrography of sandstones from the Rhenodanubian Flysch Zone of the Salzburg region

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Introduction

The Rhenodanubian flysch zone comprises a Neocomian to Eocene succession of turbidites intercalated by marls, shales and very subordinate tuffs. The Rhenodanubian flysch zone is interpreted to represent the infilling of a deep sea trough located between the Helvetic/Ulltrahelvetic slope and the Penninic ocean (Fig. 1). On detailed discussion of the paleogeographic origin of this zone, see Egger (1992), Faupl and Wagreich (1992), Schnabel (1992) and Oberhauser (1994).

The Rhenodanubian flysch unit comprises several formations with variable thickness (Fig. 2). These formations include stratigraphically upward Tristel, Reiselsberg, the Seisenburg, Zementmergel, Perneck and Altlengbach Formations. The Seisenburg, Zementmergel and Perneck Formations are dominated by variegated or grey marls. The Altlengbach Fm. includes several subformations. Tristel, Reiselsberg and Altlengbach Formations are dominated by graywackes intercalated within marl and shale. No measured sections exist to these formations.

The goal of the present study is to reveal the respective source regions of these siliciclastic sediments and possible changes during the ca. 80 Ma long history of sediment deposition. Main goals are the study of sandstone composition according to the Dickinson-Gazzi method, chemical composition of some detrital minerals and dating of detrital white mica with the $^{40}Ar/^{39}Ar$ technique.

Sandstone petrography

We investigated the modal composition of ca. 50 sandstone samples from all turbiditic formations, from Tristel to Altlengbach Formations, between the Mondsee and Salzach, mainly from outcrops where stratigraphy is proofed by biostratigraphy (mainly following Egger, 1989, 1992, 1995). We applied the Dickinson-Gazzi method where framework constituents between 0.063 and 2 mm are counted. Main results are (Fig. 3):

- All investigated sandstones have a calcite matrix and are largely interbedded by marls. This constrains deposition above calcite compensation depth.

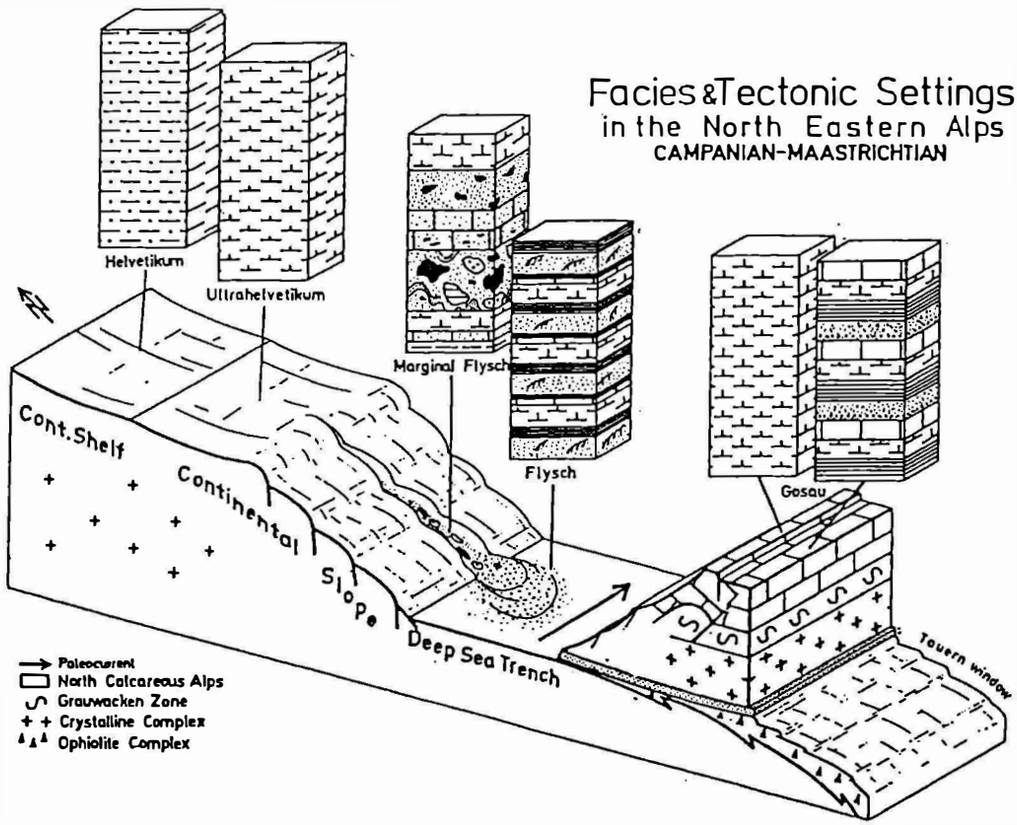

Fig. 1. Block diagram showing the Late Cretaceous arrangement of facies zones in Alps (from Egger et al., 1997.

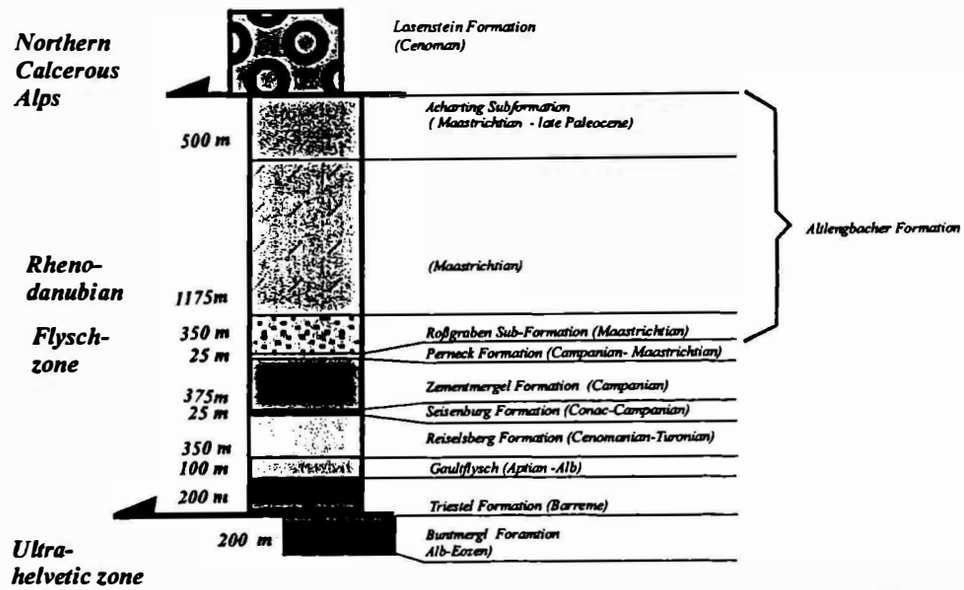

Fig. 2. Succession of formations of the Rhenodanubian Flysch Zone in the Salzburg-Upper Austria region (from Freimüller, 1998, based on Egger, 1992, 1995).

- Most sandstones have abundant carbonate clasts (until ca. 40 percent of framework constituents) including bioclasts like bryozoa, foraminifera and lamellibranchiata which in part constrain shallow water origin of clasts.
- The siliclastic detritus is dominated by monocrystalline quartz. Components from highly metamorphic rocks like sillimanite-bearing gneisses dominate. Volcanic clasts are dominated by acidic, phenocryst-bearing components.
- There is no significant difference in composition between sandstones of different ages. This argues for similar source regions from Early Cretaceous to Eocene.
- The composition of sandstones argues for an origin close to collisional orogenic belt applying discriminations, of e.g., Dickinson (1985).

The composition of detrital white mica suggest the predominance of muscovite. Only very minor phengitic micas were found. Garnet is generally unzoned and of almandine-rich compositions. Feldspars are pure K-feldspar and oligoclase. The composition of these minerals indicates the predominance of temperature-dominated, highly metamorphic rocks in the source region.

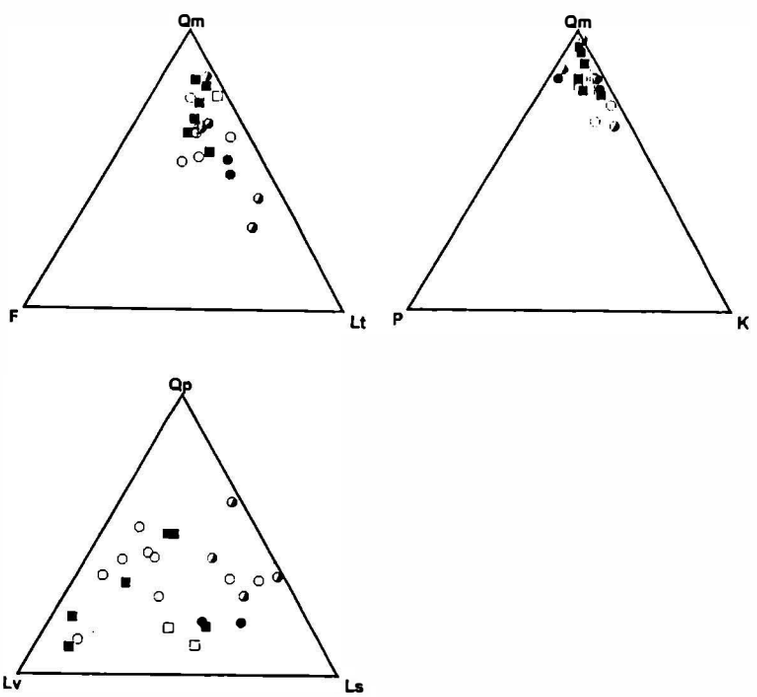

Fig.3. Diagrams from sandstones of Rhenodanubian Flysch Zone displaying the compositional variation and geodynamic significance. In these diagrams, only those samples are plotted where the modal carbonate clast and carbonate cement abundance is below 50 percent. Legend: Qm - monocrystalline quartz; Qp - polycrystalline quartz; Qt - Quartz total (Qm + Qp); K - K-feldsspar, P - plagioclase; F - feldspar (K + P); Lv -lithic volcanic clast; Ls - lithic sedimentary clast; Lt - total lithic clasts (Qp + Lv + Ls). Filled square: Tristel Fm.; Reiselsberg Sandstone; Zementmergel Fm; open and half-filled circles: Altlengbach Fm.

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