

5. Zahlreiche schöne Kristalle und Kristalldrüsen von Epidot kommen auf Klüften vor allem in Amphiboliten und Amphibolgneisen vor, z.B. in der Umgebung von Čáslav in Böhmen. Im bekannten Amphibolit-Steinbruch von Markovice bei Čáslav wird Epidot von Klinozoisit, Prehnit, Titanit, Granat, Zeolithen, Datolith, Calcit und anderen Mineralien begleitet. In Klüften in kristallinen Schiefen in der Umgebung von Sobotín in Nordmähren wurden prachtovolle Epidotstufen gefunden (Kristalle bis 14 cm lang und 4,5 cm dick); die Klüfte führen z.B. noch Albit, Quarz, Orthoklas, Titanit, Apatit und Diopsid.

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GEOCHRONOLOGICAL EVIDENCE FOR THE PRE-TERTIARY TECTONIC HISTORY IN AND AROUND THE TAUERN WINDOW, AUSTRIAN ALPS

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Important contrasts between the Tauern Window and its surroundings are evident in both the Mesozoic and pre-Mesozoic geological history. Geochronological data have emphasized differences in the timing of magmatic events as well as contrasts in metamorphic conditions at particular times but many aspects of the geological history remain poorly, if at all, dated isotopically.

The dominant pre-Mesozoic rocks within the Tauern Window are a suite of tonalitic to granitic plutonic rocks, the Zentralgneis. Early Rb-Sr whole rock dating clearly established a broadly Hercynian age for this suite but the analytical quality of much of the data is poor by modern standards and the extent of Alpine metamorphic disturbance of the isochrons is not certain in most cases. For one granodioritic unit in the Teisseck area, a zircon U-Pb age of 315 ± 10 Ma is significantly older than the ca. 270 Ma Rb-Sr whole rock isochron, indicating Alpine rotation of the isochron. Because of such problems the duration of the Hercynian magmatic activity is not known; none of the late leucogranitic lithologies has been dated by the U-Pb method and the Permian age given by Rb-Sr isochrons is likely to be too young as a result of Alpine metamorphic rotation. The country rocks into which the Zentralgneis plutons were emplaced comprise a wide range of lithologies. Of these only a metavolcanic rock of

the Habach Series has been dated at 500 Ma.

Outside the Tauern Window in the Austro-alpine basement complex, the dominant rocks are metasedimentary and Hercynian magmatic activity is much less significant. Many of the granitic orthogneisses that do occur appear to belong to an important phase of mid-Paleozoic orogenic activity. Geochronologically this phase is documented both by Rb-Sr whole rock isochrons and U-Pb ages on zircons; in the Deferegger Alpen zircon ages on two granitic gneisses bracket an important phase of folding at ca. 440 Ma. The metamorphic history of the Austro-alpine basement is complex, with at least two pre-Mesozoic metamorphisms in the mid- and late-Paleozoic. Where mineral ages have not been disturbed by post-Mesozoic metamorphism, they generally reflect the late-Paleozoic, Hercynian metamorphism and an important suite of pegmatites appears to be associated with this metamorphism.

By the end of the Mesozoic the early stages of the Alpine orogeny were under way. The timing of many key aspects of this early Alpine history remains geochronologically poorly defined. Within the Tauern Window there is evidence for an early phase of high pressure, low temperature metamorphism; this is best preserved in a relatively small area along the southern margin of the Tauern Window but there is more widespread evidence in the form of inclusions and zoning preserved within garnet porphyroblasts. The age of this early metamorphism is usually referred to the late Cretaceous by analogy with the Western Alps but so far there is no direct geochronological data from within the Tauern Window.

In the Austro-alpine basement the extent and nature of late mesozoic metamorphism has been controversial. Detailed studies, combining geochronology with careful petrographic analysis have documented a large volume of rock, mostly from lower structural levels of the Austro-alpine basement, in which closely grouped muscovite and biotite ages suggest rapid cooling following a Late Cretaceous metamorphism which locally reached mid-amphibolite facies. Recognizing such Cretaceous minerals in rocks which had already developed amphibolite-facies mineralogy by the end of the Paleozoic can be difficult. To the south of the Tauern Window a complex geochronological pattern has been defined, in which the preservation of muscovite Rb-Sr ages provides the key to distinguishing Hercynian deformation and metamorphism in an area in which both micas yield late Cretaceous K-Ar ages.

RARE-EARTH MINERALS IN THE ALPINE REGION

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The presence of several rare earth minerals in the Alpine region has been known for a long time; however, detailed analytical and crystallographic information is still lacking for too many occurrences.