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 ofthe 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.

First of all, a considerable number of Alpine monazite specimens (both from fissures and pegmatites) have been investigated. Here, the most remarkable point is the discovery of varieties very rich in uranium or/and thorium; the unit cell data are practically invariant over a wide range of composition.

Alpine xenotime has also been investigated; here, depending on the occurrence, different REE distributions may occur; the most interesting point is the presence of non-negligible amounts of uranium, generally higher than for monazite.

Besides monazite and xenotime, a systematic investigation on the parisite and gadolinite group has also been carried out.

METABASITES IN THE BASEMENT UNITS OF THE WESTERN ALPS

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Metabasics found in the pre-Alpine crystalline sequences of the Western Alps are briefly reviewed. In the internal units, metabasics of the "ancient" basement, banded amphibolites and boudinaged layers, are mostly Ti-rich tholeiites. Their amphibolite facies metamorphism, which post-dated an eclogite phase, may be considered as Cambro-Ordovician or earlier in age. A "younger" basement type, possibly of Upper Ordovician-Silurian age, contains high-Ti tholeiitic basic sills and low-Ti basic magmatic rocks. The possible grade of the Variscan metamorphism in these internal units ranges from nil to low.

The external crystalline massifs contain banded amphibolites, one ophiolite sequence, a plutonic-volcanic complex and various other metabasic bodies. Eclogite relics are found. The protolith ages range from late Proterozoic to Devonian. The original tectonic environments are heterogeneous. Both back-arc and intracontinental magmatisms are proposed to be present.

Attention is drawn to difficulties in interpreting geochronological data, in which the leading part is played by high heat flow periods (e.g. Permian) and tectonic events (e.g. detachment of pieces of lower crust in eclogite or granulite facies).
Comparisons are suggested of 1) the external crystalline with the Tauern crystalline sequences (accreted to Europe in Variscan times), and 2) the Penninic and Austro-Alpine of the Western Alps with the Middle und Upper Austro-Alpine of the Eastern Alps (belonging to Gondwana up to Alpine times).