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New $^{40}Ar/^{39}Ar$ ages and geochemical data from the Molasse zone north of Salzburg (Upper Austria)

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The Alpine foreland basin north of the Alpine front is a Tertiary molasse basin which is separated from detached flysch sequences which were incorporated in the Alpine nappe stack (e.g. Nachtmann & Wagner 1987). Volcanic influence is modest or absent in detrital mode both in molasse and flysch sequences. Sandstones are relative high mature. Rare earth element patterns of sandstones from the Molasse zone are shown in Fig. 1. $^{40}Ar/^{39}Ar$ ages of detrital white mica measured from 6-8 grains indicate two different sources (Fig. 2): a) Variscan (320-280 Ma) and b) Cretaceous ages (140-100 Ma). Mixed ages are common due to the variable proportions of grains from these two sources (Schneider et al. 1998).

The sediment input into the Molasse zone originated from two main source areas: In the Upper Eocene (Priabonian) sediments derived from the Variscan Bohemian Massif in the north (Wagner 1980). Ar/Ar-dating of detrital white mica shows plateau-like ages (319.5 ± 1.2 Ma), which fit well with Ar/Ar-ages from inside the Bohemian Massif. Chemical compositions of mica indicate metamorphism at rather low pressure conditions (Fig. 3). Rare earth element pattern display a high diversity within this stage. The terrestic limnic beds show highest REE concentration, which are clue to wash-like, high mature sediments with high contents of heavy minerals. Opposite to this, marine sediments of the hanging wall (limestone-sandstone stage) are depleted in REE (Fig. 1).

Post-Eocene sediments were mainly washed from the rising Alpine mountain belt. These rocks are uniform in REE pattern. Ar/Ar-ages of multi grain-specimens vary in a broad range between 285 Ma and 145 Ma due to mixing of Variscan and Alpine ages.

In Eocene samples no phengitic white mica or phenite occur due to the **regional metamorphic** granites and granodiorites on the southern margin of the Variscan Bohemian Massif where the Eocene sediments derived from. In Oligocene and Miocene sandstones phengite-rich white mica appear. Phengite-rich white mica and phengite indicate exhumation and erosion of high-pressure metamorphic source rocks. Moderate to high phengite values are recorded in Oligocene to lower Miocene. Source rocks should be Cretaceous deformed Austroalpine units of the rising Alpine mountain belt. Highest phengite values in white mica are present in Middle to Upper Miocene sandstones. At this time the deepest tectonic and high-pressure metamorphic unit of the eastern Alps - the Tauern Window - was uplifted and exhumed (Schneider et al. 1997). Further investigations in Ar/Ar single-grain dating, whole-rock geochemistry, and provenance analysis are in progress.

References

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Schneider, D. et al. (1997): Chemische Diversität detritischer Hellglimmer in Molassesedimenten des westlichen Innviertels (Salzburg und Oberösterreich, Österreich). – Terra Nostra, 97/2, 216-217

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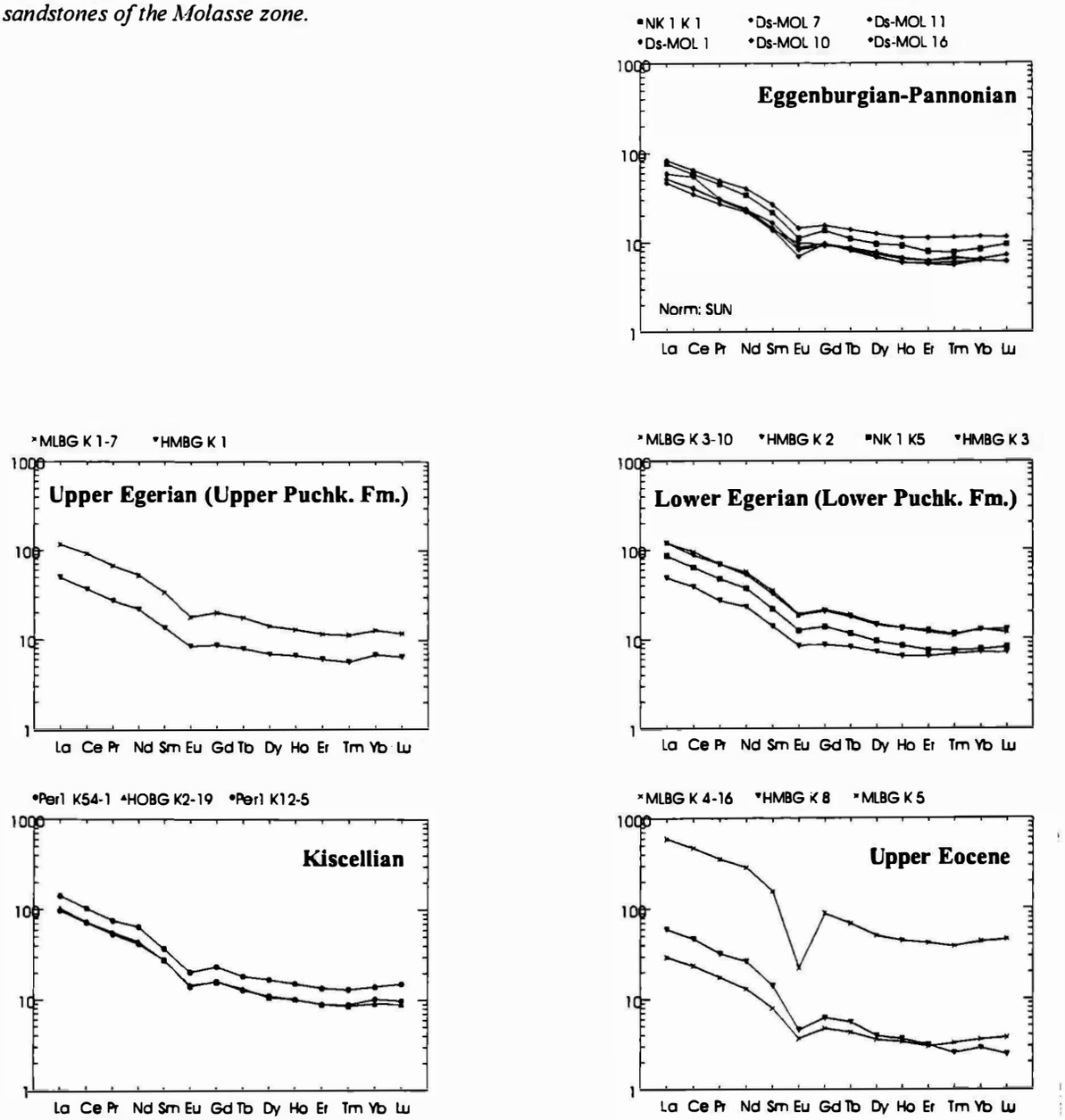
Wagner, L. (1980): Geologische Charakteristik der wichtigsten Erdöl- und Erdgasträger der oberösterreichischen Molasse; Teil I: Die Sandsteine des Obereozän. – Erdoel-Erdgas-Zeitschrift, 96, 338-346.

Fig. 1: Chondrite-normalized rare earth element patterns from sandstones of the Molasse zone.



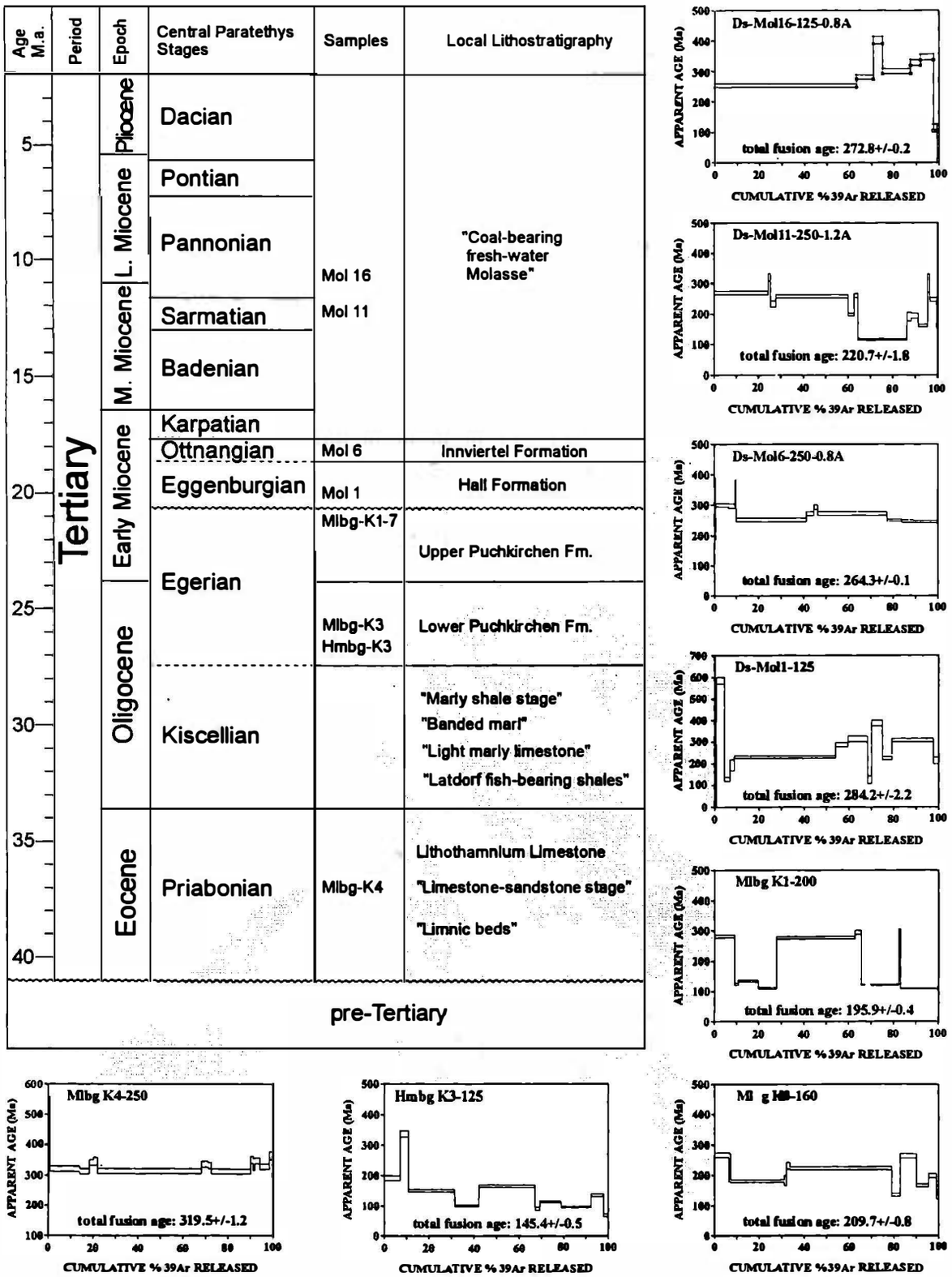
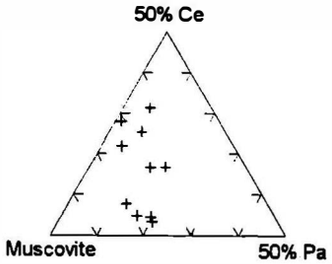
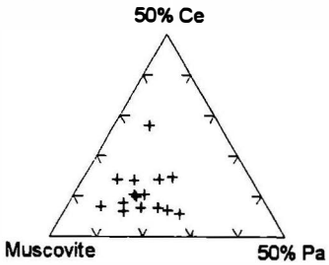


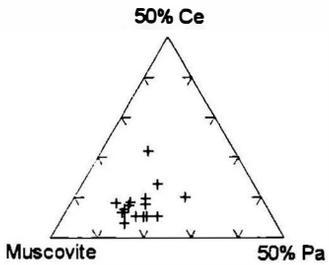
Fig. 2. $^{40}Ar/^{39}Ar$ ages of detrital white from various stratigraphic levels within the Molasse zone.

a) Middle-Upper Miocene (Pannonian): Kobernaußerwald-Gravel (Mol 16)

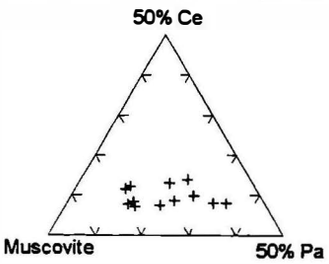


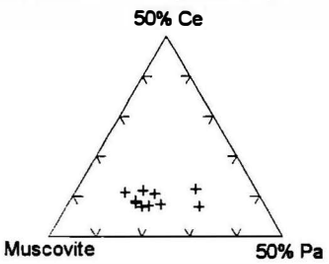
b) Middle Miocene (Sarmatian): Coal-bearing fresh-water Molasse (Mol 11)

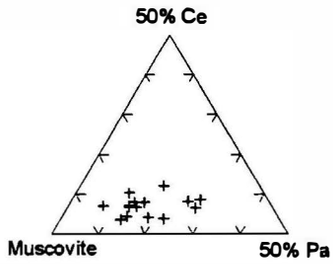




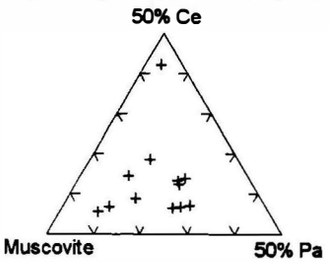
c) Lower Miocene (Ottnangian): Innviertel Fm. (Mol 07)

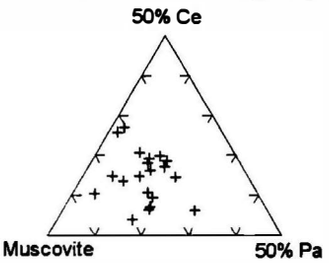






d) Early Miocene (Egerian): Upper Puchkirchen Fm. (Mlbg K1)





e) Upper Eocene (Priabonian): Limnic beds (Mlbg K5)

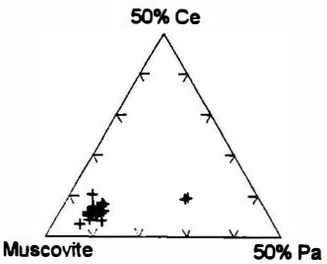


Fig. 3: Chemical diversitiy of detrital white mica. Plotted in a triplot-graph Muscovite - 50% Paragonite - 50 % Celadonite (=Phengite)