

# Some Remarks to the Postvariscic Transgressions and the Age of the Variscic Phases in the Alps

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In the Southern Alps and the eastern part of the Upper East-alpine nappe we distinguish two different developments of the postvariscic transgression: The area in the south of the Periadriatic Lineament, where the variscic structures are covered by marine Upper Carboniferous (Kasimovian, Gshelian) and Permian sediments and where the age of the main variscic phase is Leonian ("Carnian Phase") and the Upper Eastalpine in the north of the lineament, where we find mostly terrestrial sequences. Here the postvariscic sedimentation begins in the southern zone of Carinthia with intramontane Upper Stefanian or Lower Permian Red Beds following the Asturian phase and in a middle zone with a middle-Westfalian-Stefanian molassetrough after the Sudetian ? phase. The development of the northern zone, on the base of the Northern "Kalkalpen", is not so well known, neither in regard to the age of the transgression nor to the age of the variscic phases.

## A. SOUTH OF THE PERIADRIATIC LINEAMENT

The best outcrops of the postvariscic transgression above the elder-paleozoic folded sequences are situated between "Naßfeld" and "Zollner See" in the Carnian Alps. The localities were described by FENNINGER et al. 1976 and LEDITZKY 1974.

There are some temporal different transgressions:

The earliest transgression we know is situated at a section running from the "Marbach" (Rio Malinfier) in the south of the "Straninger Alm" to point 1817 at the Austrian/Italian boundary. In this profile carboniferous slates of the Auernig-Fm. with limestone-boulders rest over Gedinnian limestones. In the higher part of the profile are *Triticites*-leading limestones intercalated. They have a *Protriticites* age (Lower Kasimovian).

The same age have the transgressions of the Auernig-Fm. on the Colendiaul over Upper Devonian or Lower Carboniferous radiolarites, and near the Waidegger-Alm over the middle Carboniferous Hochwipfel-Fm. Possibly the transgressions of the Auernig-Fm. over the Hochwipfel-Fm. near the "Leiten-Kogel" and over limestones of Emsian age on the way from the Straninger-Alm to the Waidegger Alm have also the same age. The lowest transgression on the "Roskofel" seems to be a little younger (KAHLER 1969). At this locality sandstones, siltstones and limestones of the Auernig-Fm. are resting over Middle Devonian reef-limestone. 1975 KAHLER described the genus *Quasifusulina* from this locality, which at first occurred in the Middle Kasimovian. Younger is the transgression on the summit of the Roskofel (FELSNER 1975, FENNINGER et al. 1976). Here an erosion relief of the Devonian limestone is covered by Lower Permian conglomerates, sandstones and limestones belonging to the "Rattendorfer-Fm.". The different age of the transgressive beds and the appearance of Upper Carboniferous *Fusulina*-bearing limestone

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pebbles in the Permian conglomerates are hints to some different orogenic movements at this time. 1975 VAI compared the earliest phase with the Leonian of North-Spain and designated the event as "Carnian phase". On the other side the intrastefanian movements are comparable with the asturian orogenesis.

Paraconform over the middle Carboniferous Dimon-Fm., the Upper Carboniferous Auernig-Fm. and the Lower Permian stratas follow the Middle Permian Grödener-Fm. FENNINGER et al. 1974 described this transgression as a sign of the saalic phase. Angular unconformities between the Grödener-Fm. and their basement are unknown.

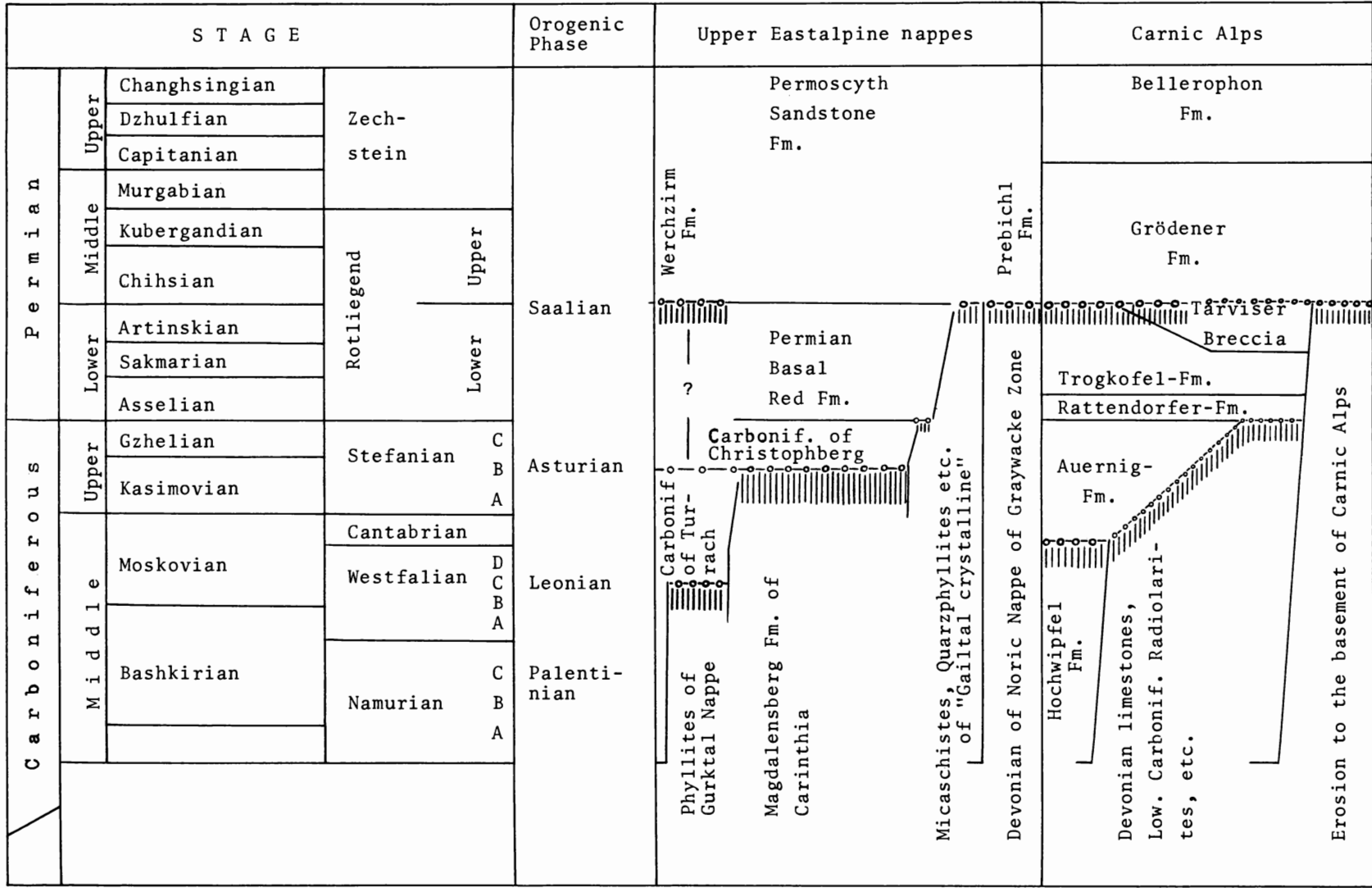
## B. NORTH OF THE PERIADRIATIC LINEAMENT

Contrary to the marine transgression over a variscic basement in the south of the Periadriatic Lineament, in the north of this structure, terrestrial sediments of Upper Carboniferous and Permian age overlay the Upper Eastalpine variscic folded and low-metamorphic paleozoic rocks (FRANK & RIEL-HERWIRSCH 1971). From some localities these postvariscic transgressions of the "Magdalensberg-Fm." were described during the last years in a zone north of the Periadriatic Lineament between Kötschach/Gail-valley in the west and St. Paul/Lavant-valley in the east.

Following RIEHL-HERWIRSCH 1972 and others, the transgression sequence is divided on lithostratigraphic basis into two formations: The lower unit (Permian Basal Red-Fm.) consists of red and grey claystones, siltstones, fanglomerates and—in the upper part—volcanic tuffs and tuffitic rocks, whereas the upper member ("Permoscyth Sandstone" or "Griffener Fm." partim) is composed of more or less ripe red sandstones and conglomerates with pebbles of quartz, quartzit, lydite, metamorphic rocks, quartzporphyry, and other material of the lower unit (NIEDERMAYER 1975). This member graduates into the "Werfener Schichten", which contain Upper Scythian fossils. This partition into two distinctly distinguishable lithological members and the transgression of the "Permoscyth Sandstone" over the Magdalensberg-Fm. demonstrates that an orogenic movement separates both units. 1972 RIEHL-HERWIRSCH and other authors compared this event with the saalic phase. The most western sediments of the postvariscic transgression overlay diaphthoritic granat-micaschists in the north of the Gail-valley near Kötschach (SCHERIAU-NIEDERMAYER & NIEDERMAYER 1973, NIEDERMAYER 1975, AMEROM & BOERSMA 1975, AMERON et al. 1976). The suite is composed of red and grey claystones, silt- and sandstones with the trace-fossil *Planolites montanus* RICHTER and plant assemblages (*Callipteris conferta* (STERNBERG) BRONG., *Ernestiodendron* sp., *Taeniopteris* cf. *jejunata* GRAMD'EURY, *Sphenophyllum angustifolium* (GERMAR) GOEPPERT, and others).

According to AMEROM et al. 1976, the flora indicates a lower Rotliegend age. The thickness of this member is about 130 m. The overlaying quartzporphyry separates this lower unit from the Permoscyth Sandstone-Fm. which is about 200 m thick. The sequence consists in the permian part of red conglomerates with pebbles of quartzporphyry, quartz, gneissic and other metamorphic rocks, red sandstones in the triassic part of slates.

Younger than this transgression are red conglomerates with quartzporphyry-pebbles overlaying a basement of quartzphyllites at the Latschur-mountains between "Weißensee" and Drau-valley (FRITSCH 1961) and north of Nötsch/Gail-valley (COLLINS & NACHTMANN 1974).



The occurrence of quartzporphyrs-pebbles indicates, that the conglomerates belong to the Permoscyth Sandstone-Fm., and not to the Permian Basal Red-Fm.

In the east of this region 1976 AMERON et al. described a transgression from a locality on the "Ulrichsberg", in the north of Klagenfurt. The geological map (KAHLER 1962) of this area shows that the basement consists of low-metamorphic rocks of the Magdalensberg-Fm. Plants of this outcrops (*Odontopteris* sp., *Taeniopteris* sp., cf. *Walchia* sp., *Sphenophyllum* sp., *Pecopteris polymorpha* BRGT., and others) indicate a Stefanian A or a younger age.

The next transgression in the east 1962, 1965 RIEHL-HERWIRSCH described from the Christophberg northeast of Klagenfurt. At this locality grey sandstones, siltstones and claystones rest over rocks of the Magdalensberg-Fm. Following an information of RIEHL-HERWIRSCH, THIEDIG & KLUSSMANN published 1974 that plants, discovered in this sequence (*Alethopteris subelegans* BOT., *Pecopteris arborescens* BGT., *Cordaites principalis* GERM., and others), have an upper Stefanian age.

A transgression described by THIEDIG & CHAIR 1975, THIEDIG & KLUSSMANN 1974 and THIEDIG et al. 1975 from the "St. Pauler Berge" south of St. Paul/Lavant-valley possibly has the same age. Here the basement consists of Silurian volcanic rocks and anchimetamorphic schists of the Magdalensberg-Fm.

The transgressive sequence of grey siltstones, sandstones and pelitic sediments with *Pecopteris polymorpha* BRON., *Pecopteris hemitelioides* BRON. and *Imparipteris* (al. *Neuropteris*) *cordata* BRON. has an Upper Stefanian (or lower Rotliegend?) age. The sequence is overlaid by dark red silt- and claystones of the "Permian Basal Red Fm.", a volcanic horizon with red and green tuffs, and tuffitic rocks with a thickness of about 40 m, and the "Permoscythian Sandstone-Fm.", 200 m thick.

About 10 km westwards of the "St. Pauler Berge" near Griffen this Permoscyth Sandstone-Fm. overlays transgressively the Magdalensberg-Fm. (KLEINSCHMIDT & STEGER 1975) on the "Giffener Berg". The Permian Basal Red-Fm. is unknown in this region.

In obvious contrast to the facies of the Permian in the southern zone of the upper-eastalpine nappe are the postvariscic sediments of the "Carboniferous" of Turrach on the Styrian/Carinthian boundary north of the Red bed-zone. The basement of the Carboniferous Molasse are different phyllites with intercalations of Fe-dolomites of Silurian/Devonian age of the Gurktal-nappe. On account of the alpidic overthrust, the position of the Carboniferous is partially inverse and under a cover of paleozoic phyllites (LIEGLER 1971, TOLLMANN 1974). The thickness of the clastic sequence is more than 400 m (PISTOTNIK 1974). After JONGMANS 1938 plant assemblages of this region have a Westfalian D age. Following a kind information by Dr. TENCHOV, Sofia, there are also layers with floras of a Westfalian C to Stefanian A age. According to these determinations, the premolasse event in this region could be the palentinian or the sudetian orogenesis. The different age of the orogenic phases of the postvariscic transgressions and the different facies of the young-paleozoic development in the southern and northern part of Carinthia indicate a southward migration of the variscic orogen north of the Periadriatic Line: The sediments of Turrach are the rest of an unfolded (?) variscic molassetrough, whereas the Red-beds of South Carinthia are the filling of intra- or intermontane basins.

Paraconform over the Carboniferous of Turrach follow red silty sandstones and conglomerates of the "Werchzirm-Fm." with pebbles of paleozoic limestones. Fossils are unknown, volcanic rocks too. A Permian age is probable.

FLÜGEL 1977 compared the "Werchzirm-Fm." with the "Prebichl-Fm." of the Styrian Graywacke-zone. The best outcrops of this formation are on the "Polster" near Eisenerz.

In this locality conglomerates with limestone-pebbles overlay Devonian limestones with an erosion and an angular unconformity (SOMMER 1972). Above the conglomerates, sandstones and claystones are predominant. The thickness of the sequence is more than 90 m. They graduate into the "Werfener Fm.". The precise age of the transgression is unknown. Possibly the Werchzirm-Fm. can be compared with the "Permoscyth Sandstone". This would be a hint of asturic or saalic movements following the sedimentation of the Upper Carboniferous of Turrach.

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