

The tectonic significance of these Carboniferous rocks has raised many controversial statements in the past. In fact, the true relationship between the Carboniferous sediments and the surrounding units of the Gailtal Crystalline Complex and the Permo-Triassic sequence of the Drauzug has long been a matter of debate and has not yet been solved satisfactorily.

### Erlachgraben-Formation / Erlachgraben Formation

HANS P. SCHÖNLAUB

**Validity:** Valid; first denomination and formalization by SCHÖNLAUB (1985d: p. 677–679).

**Type area:** ÖK50-UTM, map sheet 3111 Spittal an der Drau (ÖK50-BMN, map sheets 199 Hermagor, 200 Arnoldstein), Carinthia.

**Type section:** Southern slope of Erlachgraben (N 46°37'47" / E 13°35'36").

**Reference section(s):** Southwest dipping section between the Erlachgraben and its northern tributaries and the mountain Badstuben.

**Derivation of name:** After the valley of Erlachgraben west of the village of Bleiberg-Kreuth.

**Synonyms:** Erlachgraben-Folge of KODSI & FLÜGEL (1968, 1970); northern part of Nötschgraben-Folge below the Badstub Formation; Pölland Gruppe (KODSI & FLÜGEL, 1970).

**Lithology:** Dark grey arenaceous shales with interbedded quartz-rich conglomerates in the lower part grading into sandstones and micaceous siltstones above.

**Fossils:** Brachiopods, nautiloids, trilobites, bivalves (see SCHÖNLAUB, 1985d; SCHRAUT, 1999), crinoids, corals, gastropods, goniatites, smaller foraminifers, calcareous algae, trace fossils and plants (KABON, 1997; VAN AMEROM & KABON, 1999, 2000, 2003).

**Origin, facies:** Sediments of an upper continental slope with redeposited fossils from shallow marine areas (KRAI-NER, 1992).

**Chronostratigraphic age:** Uppermost Visean or lower Serpukhovian ("Namurian").

**Biostratigraphy:** Flora with *Archaeopteridium tschermakii* indicates Arnsbergium (middle Namurian A).

**Thickness:** > 500 m.

**Lithostratigraphically higher rank unit:** -

**Lithostratigraphic subdivision:** -

**Underlying unit(s):** No basement known.

**Overlying unit(s):** Badstub Formation.

**Lateral unit(s):** -

**Geographic distribution:** Gail Valley between Windische Höhe in the west and Mount Dobratsch (Villacher Alpe) in the east. It culminates in the peak Badstube (1,369 m) and is crossed by the Nötsch River (see map by SCHÖNLAUB, 1985d).

**Remarks:** -

**Complementary references:** -

### Badstub-Formation / Badstub Formation

HANS P. SCHÖNLAUB

**Validity:** Valid; first denomination and formalization by SCHÖNLAUB (1985d: p. 679–682).

**Type area:** ÖK50-UTM, map sheet 3111 Spittal an der Drau (ÖK50-BMN, map sheets 199 Hermagor, 200 Arnoldstein), Carinthia.

**Type section:** Nötsch Creek (N 46°37'05" / E 13°36'49").

**Reference section(s):** Middle part of Nötsch River (Nötschbachgraben) where the bipartite Badstub Formation is exposed on the eastern and western hillsides. The best outcrop is quarried in the huge Jakomini Quarry.

**Derivation of name:** Named after the mountain Badstube (1,369 m), the highest peak in the region occupied by the Carboniferous sequence of Nötsch.

**Synonyms:** Badstub-Brekzie (SCHÖNLAUB, 1985d), Badstub-Serie (FELSER, 1935), Diabas I, II (SCHÖNLAUB, 1973).

**Lithology:** Greenish matrix-supported breccia consisting of angular to subrounded cm to dm-sized clasts of amphibolites, gneisses, granites, micaschists, quartzites, marbles and limestones.

**Fossils:** Brachiopods (*Gigantoproductus*), conodonts, foraminifers.

**Origin, facies:** Marine debris flows and turbidites on an upper slope.

**Chronostratigraphic age:** Serpukhovian.

**Biostratigraphy:** Based on conodonts (*Lochriea nodosa*), foraminifers (*Howchinia bradyana* (HOWCHIN)) and plants (*Lepidodendron* sp.) in exotic limestone clasts (FLÜGEL & SCHÖNLAUB, 1990).

**Thickness:** 350–400 m.

**Lithostratigraphically higher rank unit:** -

**Lithostratigraphic subdivision:** -

**Underlying unit(s):** Erlachgraben Formation.

**Overlying unit(s):** Nötsch Formation.

**Lateral unit(s):** -

**Geographic distribution:** Northern side of Gail Valley between Windische Höhe in the west and Mount Dobratsch (Villacher Alpe) in the east (see map by SCHÖNLAUB, 1985d).

**Remarks:** -

**Complementary references:** -

### Nötsch-Formation / Nötsch Formation

HANS P. SCHÖNLAUB

**Validity:** Valid; first denomination and formalized by SCHÖNLAUB (1985d: p. 682–684).

**Type area:** ÖK50-UTM, map sheet 3111 Spittal an der Drau (ÖK50-BMN, map sheets 199 Hermagor, 200 Arnoldstein), Carinthia.

**Type section:** Composite section in the middle part of Nötsch River (Nötschbachgraben) (N 46°36'50" / E 13°36'41").

**Reference section(s):** The area around Fischerhube (Oberhöher) and the area west of mountain Badstube between Windische Höhe, Pölland and Matschiedl.

**Derivation of name:** Named after the village of Nötsch in the Gail Valley.

**Synonyms:** Upper part of the Nötschgraben-Gruppe and Pölland-Gruppe in FLÜGEL & KODSI (1968) and KODSI & FLÜGEL (1970).

**Lithology:** Clastic sequence of greyish shales, mudstones, siltstones, sandstones and medium to coarse grained conglomerates.

**Fossils:** Trilobites, rugose corals, brachiopods, goniatites, nautiloids, gastropods, crinoids, echinoids, ophiocistoids, bryozoans, phyllocarids, arachnids (spiders), monoplacophores, serpulids, plants (see SCHRAUT, 1999).

**Origin, facies:** Shallow marin, below storm wave base.

**Chronostratigraphic age:** Serpukhovian.

**Biostratigraphy:** Based on corals and plants (*Lepidophyta*, *Calamites*).

**Thickness:** 400–600 m.

**Lithostratigraphically higher rank unit:** -

**Lithostratigraphic subdivision:** -

**Underlying unit(s):** Badstub Formation.

**Overlying unit(s):** Gröden Formation (?). The contact between the two units is, however, not exposed.

**Lateral unit(s):** -

**Geographic distribution:** Northern side of Gail Valley between Windische Höhe in the west and Mount Dobratsch (Villacher Alpe) in the east (see map by SCHÖNLAUB, 1985d).

**Remarks:** -

**Complementary references:** -

## Drauzug / Drau Range

The base of the Mesozoic Drau Range is composed of late to post-Variscan sediments of early to late Permian ages. These sediments reach up some 500 m in thickness and overlie unconformably different types of metamorphic rocks ("Gailtalkristallin"). The sedimentary sequence is characterized by molasse-type sediments deposited in intermontane basins which were formed by block and wrench faulting during the late orogenic stage of the Variscan cycle. The Permian sedimentation took place under increasingly semiarid to arid climatic conditions; the sudden alteration in sedimentation (Alpine Buntsandstein), obviously caused by a climatic change presumably represents the Permian/Triassic boundary (KRAINER, 1993c).

### Laas-Formation / Laas Formation

HANS P. SCHÖNLAUB

**Validity:** Valid; first denomination and formalized by NIEDERMAYR & SCHERIAU-NIEDERMAYR (1982: p. 35–40).

**Type area:** ÖK50-UTM, map sheet 3110 Kötschach-Mauthen (ÖK50-BMN, map sheet 197 Kötschach), Carinthia, between Gailberg Pass and Maiengraben near the village of St. Daniel.

**Type section:** N 45°41'39" / E 13°00'57". Northeast of the small village of Lanz (1,038 m) NNE of Kötschach at an altitude of 1,300 m along the forest road from Lanz to Stelzling Hütte (NIEDERMAYR & SCHERIAU-NIEDERMAYR, 1982: p. 37; KRAINER, 1990b: p. 64)

**Reference section(s):** Tiebelgraben, Riedgraben between the villages Paternion and Stockenboi (KRAINER, 1990b) on ÖK50-BMN, map sheets 199 Hermagor, 200 Arnoldstein.

**Derivation of name:** Named after the village of Laas northwest of Kötschach-Mauthen.

**Synonyms:** Postvariszische Transgressionsserie, Liegende Serie, Serie von Laas, Laaser Schichten, Kontinentaldetritisches Perm, Freudenberg Schichten (RIEHL-HERWIRSCH, 1965, 1972; NIEDERMAYR, 1975; NIEDERMAYR & SCHERIAU-NIEDERMAYR, 1982; KRAINER, 1985, 1990b, 1993b).

**Lithology:** Conglomerates, breccias, red and grey sandstones and siltstones.

**Fossils:** Plants, ostracods, *Spirorbis*, fish scales, tetrapod imprints (*Ichniotherium cottae*), root and soil horizons, plants.

**Origin, facies:** Clastic proximal to distal alluvial fan deposits intercalated with highly bioturbated playa-sediments and up to 80 m thick rhyolitic pyroclastics (ash flow tuffs, ignimbrites) in the upper part.

**Chronostratigraphic age:** Asselian (Lower Permian).

**Biostratigraphy:** *callipteris conferta* Zone.

**Thickness:** Up to 150 meters.

**Lithostratigraphically higher rank unit:** -

**Lithostratigraphic subdivision:** -

**Underlying unit(s):** Gailtal Crystalline Complex.

**Overlying unit(s):** Coarse clastics of the Gröden Formation.

**Lateral unit(s):** -

**Geographic distribution:** Northern side of Gail Valley overlying the Gailtal Crystalline Complex in the surroundings north of Kötschach-Mauthen (see map by SCHÖNLAUB, 1985c) as well as on the northern side of the Gailtal Alps (Drauzug).

**Remarks:** -

**Complementary references:** -

### Gröden-Formation / Gröden Formation

(see also description in Carnic Alps)

HANS P. SCHÖNLAUB

**Validity:** See entry Gröden Formation in Carnic Alps.

**Type area:** See entry Gröden Formation in Carnic Alps.

**Type section:** See entry Gröden Formation in Carnic Alps.

**Reference section(s):** See entry Gröden Formation in Carnic Alps.

**Derivation of name:** See entry Gröden Formation in Carnic Alps.

**Synonyms:** See entry Gröden Formation in Carnic Alps.

**Lithology:** Coarse clastic sequence of conglomerates interbedded with red-colored sandstones interpreted as alluvial fan sequence of a braided river system in an semi-arid to arid climate. The red color is derived from finely dispersed hematite. Locally, in the middle part magnesite and dolomite bearing sand- and siltstones occur containing caliche crusts and playa sediments indicating a temporal evaporitic environment.

# Austrian Stratigraphic Chart 2004 - Paleozoic

(sedimentary successions)

Austrian Stratigraphic Commission



ERA	SYSTEM / PERIOD / SERIES / EPOCH	STAGE / AGE	DURATION Ma	Global Classification					
				ERATHM / ERA	SYSTEM / PERIOD / SERIES / EPOCH				
PALEOZOIC	PERMIAN	CHANGHSINGIAN / Dorashanian	251	PERMIAN	MID PERMIAN / GUADALUPIAN / LOPINGIAN				
		WUCHIAPINGIAN / Dufuflian	255						
		CAPITANIAN	260						
		WORDIAN	265						
		ROADIAN	270						
		PERMIAN	LOWER PERMIAN / CISURALIAN			KUNGURIAN	275		
						ARTINSKIAN	280		
						SAKMARIAN	285		
						ASSELIAN	290		
		PERMIAN	UPPER PERMIAN / CARBONIFEROUS / PENNSYLVANIAN			GZHELIAN	295	PERMIAN	LOWER PERMIAN / CISURALIAN
KASIMOVIAN	300								
MOSKOVIAN	305								
BASHKIRIAN	310								
PERMIAN	UPPER PERMIAN / CARBONIFEROUS / PENNSYLVANIAN			SERPUKHOVIAN	315				
				VISEAN	320				
					325				
PERMIAN	LOWER PERMIAN / MISSISSIPPIAN			TOURNAISIAN	330	PERMIAN	LOWER PERMIAN / MISSISSIPPIAN		
				335					
				340					
		345							
		350							
		355							
		359.2							
		365							
		370							
		375							
PERMIAN	UPPER DEVONIAN	FAMENNIAN	380	PERMIAN	UPPER DEVONIAN				
		FRASNIAN	385						
		GIVETIAN	390						
		EIFELIAN	395						
		DEVONIAN	LOWER DEVONIAN			EMSIAN	400		
						405			
		PRAGIAN	410						
		LOCHKOVIAN	415						
		PERMIAN	LOWER DEVONIAN			LUDFORDIAN / GORSTIAN	420	PERMIAN	LOWER DEVONIAN
						HOMERIAN / SHEINWOOD	425		
TELYCHIAN	430								
AERONIAN	435								
RHUDDANIAN	440								
HIRNANTIAN	443.7								
445									
450									
455									
460									
PERMIAN	UPPER ORDOVICIAN	DARRIWILIAN	465	PERMIAN	UPPER ORDOVICIAN				
		470							
		475							
		480							
		485							
		488.3							
		490							
		495							
		500							
		PERMIAN	MIDDLE CAMBRIAN			PAIBIAN	505	PERMIAN	MIDDLE CAMBRIAN
510									
515									
520									
525									
530									
535									
540									
542									
CAMBRIAN	LOWER CAMBRIAN			545	CAMBRIAN	LOWER CAMBRIAN			
		550							
		555							
		560							
		565							
		570							
		575							
		580							
		585							
		590							



- Legend**
- pelagic, offshore, siliciclastic
  - pelagic, nearshore, calcareous
  - shallow marin, neritic
  - terrestrial-continental, coarse clastic
  - terrestrial-continental, fine clastic
  - evaporite (chloride, sulphate)
  - rhyolite, dacite
  - (basaltic) andesite, trachyandesite
  - basalt
  - phyllite
  - mixed-facies (in corresponding colors)
  - coal (may include several seams)
  - ? position/age doubtful/controversial
  - | equal units
  - \ older unit left \ younger unit right
  - hiatus
  - unconformity
  - GSSP
  - Fm. Formation
  - Ls. Limestone

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