

Gröden-Formation / Gröden Formation

HANS P. SCHÖNLAUB

Validity: Invalid; the term was introduced by RICHTHOFEN (1860: p. 47) in the Dolomites of northern Italy.

Type area: Gröden Valley (Val Gardena) in the Dolomites.

Type section: No formally designated type section. Bletterbach near Aldein-Radein would be the best candidate (LEONARDI, 1949, 1967; BUGGISCH, 1978; CONTI et al., 1986; MASSARI et al., 1988).

Reference section(s): ÖK50-UTM, map sheet 3110 Kötschach-Mauthen (ÖK50-BMN, map sheet 197 Kötschach) near the small village of Lanz (1,038 m) NNE of Kötschach along the forest road from Lanz to Dellacher Alm and Riedgraben SW of the village of Paternion, respectively (KRAINER, 1990b).

Derivation of name: After the village of Gröden in the Gröden Valley, Italy.

Synonyms: Grödener Schichten, Gröden Sandstein, Griffener Schichten (cf. TOLLMANN, 1977; NIEDERMAYR & SCHERIAU-NIEDERMAYR, 1982; KRAINER 1985, 1987a).

Lithology: In the Naßfeld area the Gröden Formation is developed as marine clastic sediments with carbonatic intercalations (BUGGISCH, 1978). It is predominantly composed of a red, partly greenish-grey alternation of dolomitic mud- and siltstones. Intercalated are nodular dolomitic marls or dolomites. The transition into the overlying Bellerophon Formation is characterized by interbedded grey siltstones, red mudstones, and bituminous dolomite beds.

Remarks: The intensively red-colored pelites of the Gröden Formation are one of the most conspicuous lithologies in the Upper Paleozoic rock sequence. They disconformably overly various metamorphic rocks, as well as marine Upper Paleozoic deposits north and south of the Periadriatic Lineament. In the Southern Alps, the Gröden Formation may rest on lower Paleozoic rocks, on the upper Carboniferous Auernig Group, or on the Lower Permian Trogkofel Limestone. At the base of the Gröden Formation coarse breccias and conglomerates occur (Tarvis Breccia, Trogkofel Breccia) due to partial reworking of the underlying deposits.

Fossils: In the eastern Carnic Alps rare occurrences of stromatolites, smaller foraminifers, ostracods and gastropods.

Origin, facies: The depositional environment of the Gröden Fm. has been controversially discussed in the literature as either predominantly continental or mainly marine. BUGGISCH (1978) favored prevailing marine conditions from fossils and geochemical data. In the Naßfeld area at least short-term marine incursions can be inferred from the marine fauna and bioturbation. However, pedogenic concretions, hardpans and root traces hint to prolonged time of subaerial exposure (SCHÖNLAUB & FORKE, 2007).

Chronostratigraphic age: Generally, a late Middle Permian (Guadalupian) to early Late Permian (Lopingian) age can be inferred from the position between the underlying Trogkofel Limestone, an assumed prolonged interval of erosion and non-deposition and the more fossiliferous Bellerophon Formation above.

Biostratigraphy: For a precise correlation the available fossil data from the Dolomites, i.e., plants, tetrapod tracks, and rare cephalopods cannot be used. In addition,

in thin sections stromatolitic algae, smaller foraminifers, ostracods and gastropods were observed (BUGGISCH, 1978).

Magnetostratigraphy provides additional results for global correlation: The "Illawara Reversal-Event", which has been identified in the Paularo section (MAURITSCH & BECKE, 1983) as well as in the Dolomites (DACHROTH, 1988), is dated as 265 Ma (latest Wordian/Capitanian) by MENNING (2001).

Thickness: Ranging between 30 m in the Reppwand cliff and some 100 m northwest of Passo del Cason di Lanza.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Tarvis Breccia, Trogkofel Limestone or Auernig Group west of the Naßfeld area, lower Paleozoic strata or weakly metamorphosed rocks in the eastern Dolomites and western Carnic Alps, respectively.

Overlying unit(s): Bellerophon Formation.

Lateral unit(s): -

Geographic distribution: Carnic Alps of northern Italy and southern Austria (Naßfeld area, surroundings of Straniger Alm and Passo del Cason di Lanza, area surrounding mountain Seikofel east of Sexten in the western Carnic Alps).

Remarks: Italian name of the Gröden Formation: Val Gardena Formation.

Complementary references: SCHÖNLAUB & FORKE (2007).

Bellerophon-Formation / Bellerophon Formation

HANS P. SCHÖNLAUB

Validity: Invalid; the term was introduced by HOERNES (1876: p. 38–44).

Type area: ÖK50-UTM, map sheet 3116 Sonnenalpe Naßfeld (ÖK50-BMN, map sheet 198 Weißbriach), Carnic Alps, Austria.

Type section: Not defined.

Reference section(s): Eastern part of Reppwand cliff below "Sauboden".

Derivation of name: After the frequently occurring gastropod genus *Bellerophon* in this unit of the Dolomites.

Synonyms: Bellerophonschichten (HOERNES, 1876); Bellerophonkalk (HERITSCH et al., 1934); Bellerophondolomit (KAHLER & PREY, 1963).

Lithology: The lower part consists of dolomite, dolomitic marls and rauhwacke, followed by platy to coarse bedded dolomitic grain- and mudstones. Grainstones yield abundant smaller foraminifers, dasycladacean algae and intraclasts. Mudstones contain mainly ostracods and radiolarians.

Fossils: Smaller foraminifers, dasycladacean algae, ostracods, radiolarians, gastropods and few conodonts.

Origin, facies: The sedimentary environment reflects an alternation of evaporitic and high-energy, open marine environments in the lower part and restricted, low-energy conditions in the upper part (BUGGISCH, 1975).

Chronostratigraphic age: Late Permian (late Wuchiapingian/late Dzhulfian to Changhsingian/Dorashamian).

Biostratigraphy: Smaller foraminifers are represented by a *Globivalvulina-Hemigordius* assemblage similar to the fauna in the adjacent western areas of the Southern Alps (BOECKELMANN, 1988; JENNY-DESHUSSES, 1991). Despite the absence of larger foraminifers, the presence of *Paraglobivalvulina* and *Paradagmarita* indicates Late Permian.

Thickness: The Bellerophon Formation has a measured thickness of 175 m.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Gröden Formation.

Overlying unit(s): Werfen Formation.

Lateral unit(s): The sections in the Carnic Alps suggest a stronger marine influx than in the Dolomites where bituminous limestones, rauhwackes, marls and gypsum layers dominate. This neritic-lagoonal facies was termed "Batiotic Facies" by ACCORDI (1959). In northern Slovenia similar lithologies like in the Carnic Alps occur which change towards east and west between open marine and lagoonal to evaporitic sequences (Zazar Formation).

Geographic distribution: In Austria the *Bellerophon* Formation occurs mainly in the Naßfeld and Gartnerkofel area.

Remarks: -

Complementary references: -

Karawanken / Karavanke Mountains

Pre-Variscan Sequence

Pre-Variscan sediments of the Karavanke Mountains are more or less constricted to occurrences at the Eisenkappel and Seeberg area (SIEWERT, 1984). Corresponding deeper marine sections are exposed within the Trögen area (MOSHAMMER, 1987). The units of the southern Karavanke Mountains, close to the Slovenian border (RAMOVŠ, 1999), show affinities to the Carnic Alps in their depositional development of mainly neritic to pelagic carbonates. Both regions are located south of the Periadriatic Lineament (BAUER, 1984; BAUER & SCHERMANN, 1984), which implies a similar palaeolatitudinal setting within the southern realm of the Rheic Ocean. The pre-Variscan sediments of the Karavanke Mountains (Text-Fig. 4) crop out within an area of about 25 km in W-E extension and 3.5 km in N-S extension. During the Ordovician mainly shallow marine sediments were deposited. During the Silurian to Middle Devonian times in the Seeberg area only pelagic limestones and deeper marine shales including tuffs occur. The environmental conditions changed to a shallow marine carbonate facies with reef complexes during the Middle and Late

Devonian. However, Mid-Devonian reefs are not as well developed as the Givetian reefs in the Carnic Alps. Subsequently, lower Carboniferous pelagic limestones and flysch sediments became the dominant facies which closely resembles the succession in the Carnic Alps.

Schillkalke / Coquina Limestones

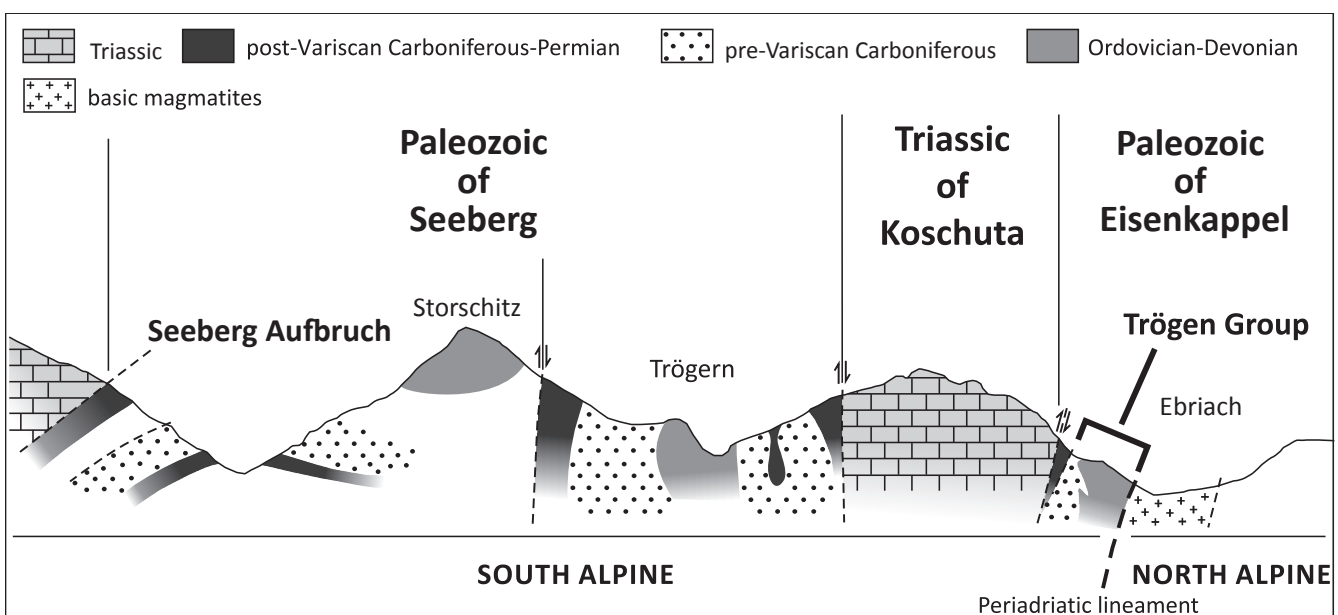
THOMAS J. SUTTNER

Validity: Invalid; described by KUPSCH et al. (1971); biostratigraphy by MOSHAMMER (1989).

Type area: ÖK50-UTM, map sheet 4114 Bad Eisenkappel (ÖK50-BMN, map sheets 212 Vellach, 213 Bad Eisenkappel).

Type section: -

Reference section(s): Feistritzgraben (SCHÖNLAUB, 1979); Trögen Klamm section-group A (MOSHAMMER, 1989, 1990), N 46°28'04" / E 14°30'28".

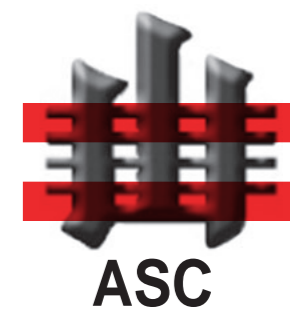


Text-Fig. 4. Simplified S-N transect through the Eastern Karavanke Mountains.

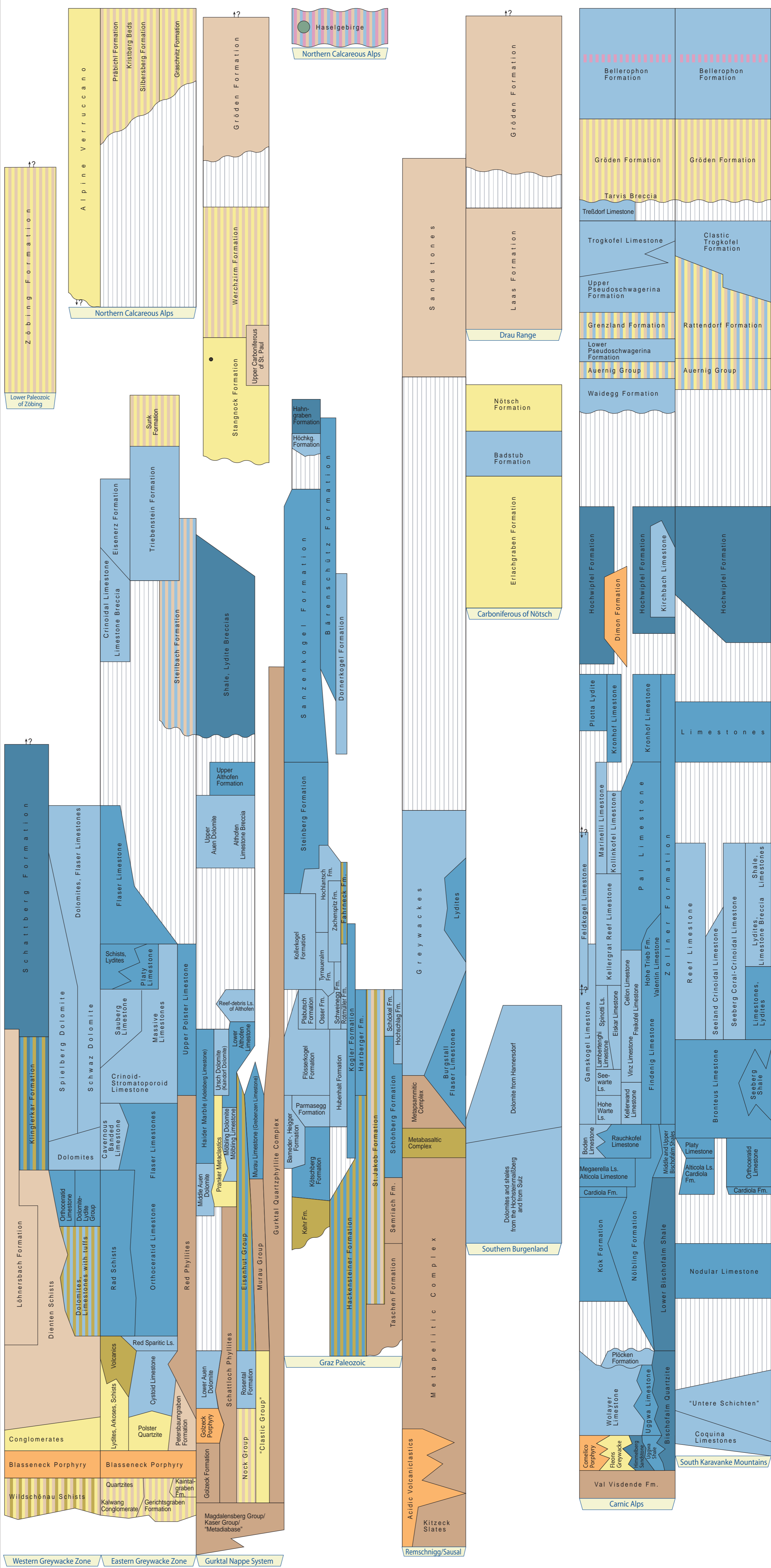
Austrian Stratigraphic Chart 2004 - Paleozoic

(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 / Dzhulfian	255						
		CAPITANIAN	260						
		WORDIAN	265						
		ROADIAN	270						
		PERMIAN	LOWER PERMIAN / CISURALIAN			KUNGURIAN	275		
						ARTINSKIAN	280		
						SAKMARIAN	285		
						ASSELIAN	290		
		PERMIAN	TRIAS			GZHELIAN	295	TRIAS	U. CARBONIFEROUS / PENNSYLVANIAN
KASIMOVIAN	300								
MOSKOVIAN	305								
BASHKIRIAN	310								
TRIAS	LOWER CARBONIFEROUS / MISSISSIPPIAN			SERPUKHOVIAN	315				
				VISEAN	320				
				TOURNAISIAN	325				
PERMIAN	DEVONIAN			FAMENNIAN	350	DEVONIAN	UPPER DEVONIAN		
				FRASNIAN	355				
				GIVETIAN	360				
		EIFELIAN	365						
		DEVONIAN	LOWER DEVONIAN	EMSIAN	370				
				LOCHKOVIAN	375				
		PERMIAN	DEVONIAN	LUDFORDIAN / GORSTIAN	380			DEVONIAN	MIDDLE DEVONIAN
				HOMERIAN / SHEINWOOD	385				
				TELYCHIAN	390				
				AERONIAN	395				
RHUDDANIAN	400								
DEVONIAN	UPPER ORDOVICIAN			DARRIWILIAN	405				
				TREMA-DOCIAN	410				
PERMIAN	DEVONIAN			WEN-LUD-LOCK / LOW	415	DEVONIAN	LOWER DEVONIAN		
				HORNBIAN	420				
				LLANDOVERY	425				
		AERONIAN	430						
		RHUDDANIAN	435						
		DEVONIAN	UPPER ORDOVICIAN	HORNBIAN	440				
				TREMA-DOCIAN	445				
		PERMIAN	DEVONIAN	WEN-LUD-LOCK / LOW	450			DEVONIAN	LOWER DEVONIAN
				HORNBIAN	455				
				LLANDOVERY	460				
AERONIAN	465								
RHUDDANIAN	470								
DEVONIAN	UPPER ORDOVICIAN			DARRIWILIAN	475				
				TREMA-DOCIAN	480				
PERMIAN	DEVONIAN			WEN-LUD-LOCK / LOW	485	DEVONIAN	LOWER DEVONIAN		
				HORNBIAN	490				
				LLANDOVERY	495				
		AERONIAN	500						
		RHUDDANIAN	505						
		DEVONIAN	UPPER ORDOVICIAN	DARRIWILIAN	510				
				TREMA-DOCIAN	515				
		PERMIAN	DEVONIAN	WEN-LUD-LOCK / LOW	520			DEVONIAN	LOWER DEVONIAN
				HORNBIAN	525				
				LLANDOVERY	530				
AERONIAN	535								
RHUDDANIAN	540								
DEVONIAN	UPPER ORDOVICIAN			DARRIWILIAN	545				
				TREMA-DOCIAN	550				



- 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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Cutout and English adaptation of the "Die Stratigraphische Tabelle von Österreich 2004": Geological Survey of Austria

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