

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 164 Graz.

Remarks: -

Complementary references: EBNER (1976), EBNER & HUBMANN (2012).

Hahngraben-Formation / Hahngraben Formation

BERNHARD HUBMANN

Validity: Valid; first description by HERITSCH (1907: "Culmschiefer"); formalized by FLÜGEL (2000: p. 31–32; Hahngraben-Formation).

Type area: ÖK50-UTM, map sheet 4229 Graz (ÖK50-BMN, map sheet 164 Graz).

Type section: No type section defined, but FLÜGEL (2000) proposed a type region at Hahngraben, a trench SE of Gratkorn (east of "Alpengarten" on ÖK50-BMN, map sheet 164 Graz) (N 47°08'45" / E 15°22'44") approx. 15 km northwest of Graz.

Reference section(s): -

Derivation of name: After the valley Hahngraben north of Dult, approx. 15 km northwest of Graz.

Synonyms: Culmschiefer (HERITSCH, 1907); Tonschiefergruppe (CLAR, 1933); Dultschiefer (EBNER, 1975a); Schichten der Dult (H. FLÜGEL, 1975; EBNER, 1978a).

Lithology: Black to grey-green argillaceous shales sometimes intercalated by silt- to sandstones with reworked lydites.

Fossils: Very rare plant remains of very bad preservation.

Origin, facies: Presumably a slightly deeper marine depositional environment; ?distal turbidites.

Chronostratigraphic age: Age is unknown due to the lack of age diagnostic fossils. However, an upper Bashkirian or even younger age is possible (EBNER & HUBMANN, 2012).

Biostratigraphy: -

Thickness: More than 50 m.

Lithostratigraphically higher rank unit: Dult Group.

Lithostratigraphic subdivision: -

Underlying unit(s): Höchkogel Formation.

Overlying unit(s): -

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 164 Graz.

Remarks: CLAR (1933) assumed a Silurian age of the succession because of its lithologic characteristics (mica-rich shales and lydites) albeit HERITSCH (1930b) described a single specimen of "*Calamites* sp. ex gr. *C. goepperti*" (which is lost!).

Complementary references: EBNER (1976, 1998), EBNER et al. (2000).

Remschnigg/Sausal / Remschnigg and Sausal areas

The underground of the Neogene basins in Western and Eastern Styria and South Burgenland is visible on some isolated swells. Most prominent are the Sausal region, the Remschnigg-Poßruck at the Styrian border to Slovenia, some isolated outcrops at the Austrian-Hungarian-Slovenian border triangle in the vicinity of St. Anna am Aigen and Rotterberg/Stadelberg and the isolated hills of Kohfidisch, Hannersdorf and Kirchfidisch (GROSS et al., 2007).

The uplift at the Sausal area and Remschnigg is linked to the "Middle Styrian Swell" [Mittelsteirische Schwelle].

Information is generally very limited since outcrops are isolated and tectonically cut and internally intensively fractured and folded; complete sequences are unknown. The monotonous, fossil-poor rocks suffered at least from green schist metamorphism thus hampering a comparison with successions of the Graz Paleozoic.

In the Sausal area acidic volcanites are interpreted as Late Ordovician in analogy to the Greywacke Zone. Sandy to clayey slates with occasionally interbedded green schists and diabases (carbonate rocks are very subordinate) probably may have a Silurian to Devonian age. At Burgstall-Grillkogel flaserlimestones and crinoidal limestones of Lochkovan to Pragian age are tectonically overlying (SCHLAMBERGER, 1987).

In the Remschnigg and Poßruck areas at the Austrian border to Slovenia, although extremely badly outcropping, a lithologically very variable sequence (not shown in the ASC 2004) is known (WINKLER-HERMADEN, 1933). Similarities in the stratigraphic sequence and tectonic development resemble the situation in the Gurktal Nappe System

(EBNER, 1987). Phyllites and diabases occur in a lower tectonic unit, which may be compared with the Murau Nappe. In the higher nappe ("Stolzalpe Nappe") the sequence includes mafic volcanoclastics (greenschists, diabases, violet tuffs), argillaceous schists, crinoidal limestones containing brachiopods and tabulate corals (HERITSCH, 1933b) and flaser limestones. Conodonts of the limestones indicate Llandovery to Late Devonian ages (EBNER, 1975b).

In contrast to the Graz Paleozoic where sedimentation younger than late Carboniferous is not recorded, red sandstones and conglomerates are developed in the Remschnigg/Poßruck area which might be Permian in age. From isolated locations, which lack contacts to other rocks, quartzitic sandstones and argillaceous shales, marls and platy limestones with remains of *Cidaris* are known. The former rocks are interpreted as equivalents of the Werfen Formation (Lower Triassic); the latter are similar with sediments of the "Raibl level" (Carnian). The succeeding dolomites and cellular dolomites possibly represent the Norian "Hauptdolomit". The succession is terminated by Upper Cretaceous limestones containing rudists and marls with coccoliths (FLÜGEL & NEUBAUER, 1984).

Saure Vulkanoklastika / Acidic Volcanoclastics

BERNHARD HUBMANN

Validity: Invalid; comprehensive description by SCHLAMBERGER (1987: p. 4; "Saurer Vulkanitkomplex").

Type area: ÖK50-UTM, map sheet 4111 Leibnitz (ÖK50-BMN, map sheet 190 Leibnitz).

Type section: No type section defined; SCHLAMBERGER (1987) noticed that in the region of Kitzreck and Demmerkogel (N 46°47'10" / E 15°25'47") boulders of typical rocks of the unit are widespread.

Reference section(s): Generally outcrops are rare in the Sausal region and therefore sections are restricted to deeply incised small valleys only. SCHLAMBERGER (1987) mentioned prominent occurrences on the ridge of the Mandelkogel-Harrachegg-Hochbrudersegg-Mitterriegel to Kogelberg.

Derivation of name: After the most prominent lithology of the unit.

Synonyms: Mandelkogelporphroid (FLÜGEL & NEUBAUER, 1984); Saurer Vulkanitkomplex (SCHLAMBERGER, 1987); Partly: hellgrüne Talkschiefer (HILBER, 1878); Sericitphyllite (LEITMEIER, 1908); Basiskomplex (BOIGK, 1939); Mallitschberg-Serie (SCHIMUNEK, 1958); Porphyroidischer Serizitschiefer (HANSELMAYER, 1961); Orthoserizitschiefer (HANSELMAYER, 1961); Mallitschberg-Gruppe (FLÜGEL, 1964); phyllitische Schiefer (SCHÖNLAUB, 1979).

Lithology: Various volcanic and volcanoclastic rocks. SCHLAMBERGER (1987) mentioned two main types: greenish to white densely foliated types with phenocrysts of 0.1 to 1 mm in diameter, and black to light-green quartzitic types with phenocrysts greater than 3 mm in diameter.

Fossils: -

Origin, facies: Unknown.

Chronostratigraphic age: Unknown; probably pre-Silurian.

Biostratigraphy: -

Thickness: Strong variations; approx. 250 m.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Unknown (crystalline basement?).

Overlying unit(s): Metapelitic Complex.

Lateral unit(s): Kitzreck Slates.

Geographic distribution: Sausal region, ?Remschnigg; ÖK50-BMN, map sheets 190 Leibnitz, 207 Arnfels.

Remarks: Due to exhaustive weathering of the Paleozoic rocks and the long-lasting wine growing, a culture dating back to the Celtic epoch, only very scattered outcrops are known in that region. Lithological similarities with the Blaseneck Porphyry resulted in assumptions of an Ordovician age of the unit.

Complementary references: -

Kitzecker Schiefer / Kitzreck Slates

BERNHARD HUBMANN

Validity: Invalid; description in SCHÖNLAUB (1979): "Mallitschberg-Kitzreck Schiefer", resp. "Mallitschberg-Kitzreck Schichten").

Type area: ÖK50-UTM, map sheet 4111 Leibnitz (ÖK50-BMN, map sheet 190 Leibnitz).

Type section: No type section defined; SCHIMUNEK (1958) mentioned in his unpublished doctoral thesis a "locus typicus" of the "Kitzreck-Serie" along the road Fresing-Kern-Kitzreck-Tischlerwirt-Kroisgraben (N 46°46'02" / E 15°26'15").

Reference section(s): Reference sections (see SCHIMUNEK, 1958) are on the road Fresing-Kitzreck (N 46°46'27" / E 15°27'15") and at Kroisgraben (N 46°46'14" / E 15°26'33").

Remarks: Already in the 1950s outcrops were rather rare; SCHIMUNEK (1958) reported only isolated boulders which cannot be found in a successional sequence.

Derivation of name: After Kitzreck, the highest viticulture village of Europe (564 m altitude).

Synonyms: Meta-Quarzkeratophyre (ANGEL, 1924); Mallitschberg-Kitzreck-Schichten (SCHÖNLAUB, 1979); partly: Mallitschberg-Serie (SCHIMUNEK, 1958); Kitzreck-Serie (SCHIMUNEK, 1958); Mallitschberg-Gruppe (FLÜGEL, 1964).

Lithology: Various tectonized phyllitic quartz-rich slates.

Fossils: Unknown.

Origin, facies: ?

Chronostratigraphic age: Ordovician?, Silurian?

Biostratigraphy: -

Thickness: Strong variations; maximum 200 m.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Unknown.

Overlying unit(s): Metapelitic Complex.

Lateral unit(s): Acidic Volcaniclastics.

Geographic distribution: Sausal and ?Remschnigg; ÖK50-BMN, map sheets 190 Leibnitz, 207 Arnfels.

Remarks: -

Complementary references: FLÜGEL & NEUBAUER (1984).

Metapelitischer Komplex / Metapelitic Complex

BERNHARD HUBMANN

Validity: Invalid; comprehensive description by SCHLAMBERGER (1987: p. 10; "Metapelitischer Komplex").

Type area: ÖK50-UTM, map sheet 4111 Leibnitz (ÖK50-BMN, map sheet 190 Leibnitz).

Type section: No type section defined; SCHLAMBERGER (1987) presents a section of the lower part of the complex (i.e., "calcareous phyllites") at the eastern slope of Demmerkogel (N 46°47'11" / E 15°26'07").

Reference section(s): According to SCHLAMBERGER (1987) some small outcrops are at Steinbachgraben and east of Hohegg (E 15°28'24" / N 46°46'35").

Remarks: Due to bad exposure and intensive tectonic overprint no continuous sequence can be traced.

Derivation of name: After the most prominent lithology (weakly metamorphosed fine grained sediments) of the unit.

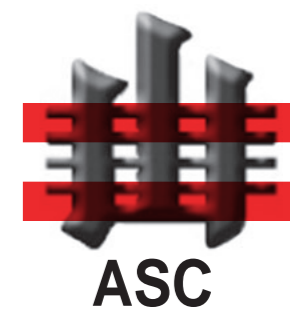
Synonyms: Partly: Gleinstätterberg-Serie (SCHIMUNEK, 1958); Serizitschiefer (HANSELMAYER, 1961); basische Vulkanite und Grünschiefer (SCHÖNLAUB, 1979); Gleinstättenberg-Serie (SCHÖNLAUB, 1979).

Lithology: Brownish to green calcareous phyllites (colors of the rocks depend on degree of weathering), phyllites to quartzitic phyllites (without hints of volcanic influence), dark-green to black metatuffs and metatuffites and marbles.

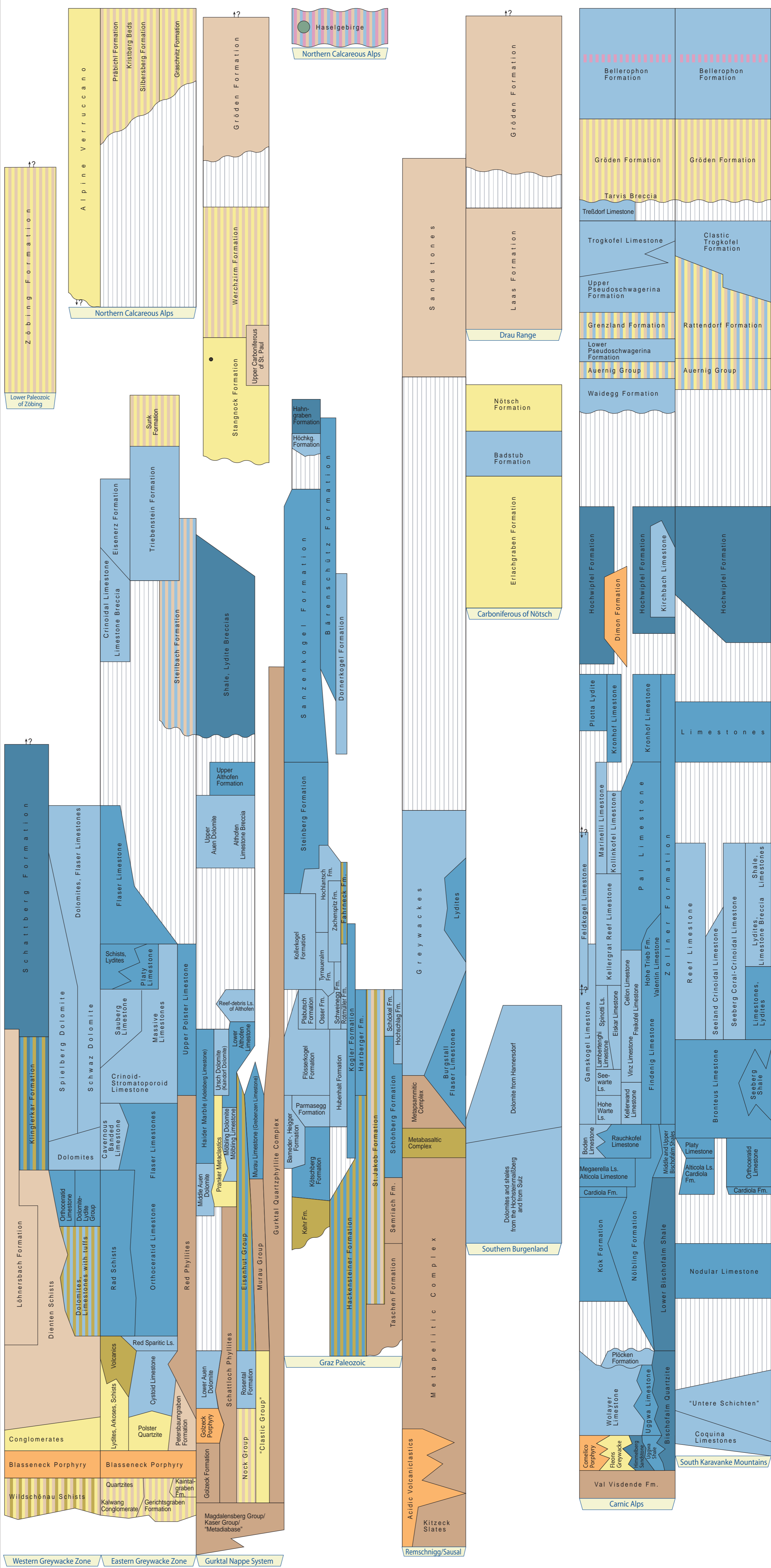
Austrian Stratigraphic Chart 2004 - Paleozoic

(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				
		WUCHIAPINGIAN / Dzhulfian	255						
		CAPITANIAN	260						
		WORDIAN	265						
		ROADIAN	270						
		PERMIAN	LOWER PERMIAN / CISURALIAN			KUNGURIAN	275		
						ARTINSKIAN	280		
						SAKMARIAN	285		
						ASSELIAN	290		
		PERMIAN	UPPER PERMIAN / CARBONIFEROUS			GZHELIAN	295	PERMIAN	LOWER PERMIAN / CISURALIAN
KASIMOVIAN	300								
MOSKOVIAN	305								
BASHKIRIAN	310								
PERMIAN	UPPER PERMIAN / CARBONIFEROUS			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			EMSIA	400		
						405			
		PRAGIAN	410						
		LOCHKOVIAN	415						
		PERMIAN	LOWER DEVONIAN			LUDFORDIAN	420	PERMIAN	LOWER DEVONIAN
						GORSTIAN	425		
HOMERIAN	430								
SHEINWOOD	435								
TELYCHIAN	440								
AERONIAN	443.7								
RHUDDANIAN	445								
HIRNANTIAN	447								
PERMIAN	UPPER ORDOVICIAN			450	PERMIAN	UPPER ORDOVICIAN			
				455					
		460							
		465							
		470							
		475							
		480							
		485							
		488.3							
		490							
PERMIAN	MIDDLE ORDOVICIAN	495	PERMIAN	MIDDLE ORDOVICIAN					
		500							
		505							
		510							
		515							
		520							
		525							
		530							
		535							
		540							
PERMIAN	LOWER ORDOVICIAN	542	PERMIAN	LOWER ORDOVICIAN					
		545							
		550							
		555							
		560							
		565							
		570							
		575							
		580							
		585							
PERMIAN	UPPER CAMBRIAN	590	PERMIAN	UPPER CAMBRIAN					
		595							
		600							
		605							
		610							
		615							
		620							
		625							
		630							
		635							
PERMIAN	MIDDLE CAMBRIAN	640	PERMIAN	MIDDLE CAMBRIAN					
		645							
		650							
		655							
		660							
		665							
		670							
		675							
		680							
		685							
PERMIAN	LOWER CAMBRIAN	690	PERMIAN	LOWER CAMBRIAN					
		695							
		700							
		705							
		710							
		715							
		720							
		725							
		730							
		735							



- 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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