

Geographic distribution: W-GWZ; Tyrol, Kitzbüheler Alpen.

Remarks: See remarks at unit “Dolomites”.

E-Grauwackenzone / Eastern Greywacke Zone (E-GWZ)

The E-GWZ is dominated by Variscan fold and thrust tectonics as well as Alpine imbrication and thrust tectonics. The Alpine structure was arranged during the Eo-Alpine (Early to Mid-Cretaceous) thrusting and the formation of top to the NW directed ductile fabrics under low grade metamorphic conditions, which did not exceed significantly 350–400°C (NEUBAUER et al., 1994; RANTITSCH et al., 2004). All units of the E-GWZ were covered primarily by Permo-Mesozoic sediments. For the primary arrangement of the individual tectonic units before Alpine thrusting the following position is suggested from ESE to WNW (NEUBAUER et al., 1994): Noric Nappe – Kaintaleck Nappe – Silbersberg Nappe – Veitsch Nappe – “Middle Austroalpine” Unit (= Silvretta-Seckau Nappe; SCHMID et al., 2004).

The key area for stratigraphic investigations in the Noric Nappe is around Eisenerz (ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 101 Eisenerz) where detailed stratigraphic studies were carried out mainly on the basis of conodonts by FLAJS and SCHÖNLAUB in the 1970s and 1980s. During this period summarizing lithological terms used earlier, as e.g., “Feinschichtige Grauwackenschiefer” and “Erzführender Kalk” were replaced by lithostratigraphic units documented in the ASC 2004 (PILLER et al., 2004). However, most of these units are only described as working terms in an informal way and named according to their characteristic lithologies. In the very eastern parts of the Noric Nappe modern stratigraphic studies are entirely missing.

Modern stratigraphic research of the Veitsch Nappe was concentrated at the Hohentauern-Sunk area (RATSCHBACHER, 1984, 1987). The sequences of the Kaintaleck and the Silbersberg Nappes are not represented in the ASC 2004. The first includes a pre-middle Paleozoic metamorphic basement and the second is composed of Lower Paleozoic quartzphyllite and Verrucano-type (Permo-Triassic) metaclastics (NEUBAUER et al., 1994). Additionally, the Silbersberg Nappe is intruded at one site (Gloggnitz) by a 110(?)–140 Ma old magmatic rock (Riebeckit gneiss; NEUBAUER et al., 1994).

Noric Nappe

The stratigraphic sequence of the Noric Nappe is similar to that of the W-GWZ. Especially the Blasseneck Porphyry forms an excellent stratigraphic marker, which can be followed along the GWZ for 320 km from Gloggnitz (Lower Austria) in the E as far as to Schwaz in Tyrol in the W.

Kalwang Konglomerate / Kalwang Conglomerate

FRITZ EBNER

Validity: Invalid; lithologically well described unit (DAURER & SCHÖNLAUB, 1978) of uncertain age and position.

Type area: Eisenerzer Alpen (ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 131 Kalwang).

Type section: Lange Teichen valley (N 47°28'16" / E 14°48'35") NE Kalwang (ÖK50-UTM, map sheet 4215

Complementary references: TOLLMANN (1977), SCHÖNLAUB (1979, 1980a), EBNER et al. (1989), SCHÖNLAUB & HEINISCH (1993).

Eisenerz, ÖK50-BMN, map sheet 131 Kalwang) (DAURER & SCHÖNLAUB, 1979; LOESCHKE et al., 1990).

Reference section(s): -

Derivation of name: After the village of Kalwang (N 47°25'39" / E 14°45'26"), ÖK50-UTM, map sheet 4215 Eisenerz (ÖK50-BMN, map sheet 131 Kalwang) and the lithology.

Synonyms: “Kalwang Gneiskonglomerat” (DAURER & SCHÖNLAUB, 1978).

Lithology: Greenschists (metatuffs; chlorite-actinolite-epidote schists) including a package of banded greenschists (metatuffs) with pebbles of gneisses (=Kalwang Conglomerate with pebbles of quartz-rich metagranitoids, albite-granite gneisses and quartz). The greenschists are overlain by white micamarble (DAURER & SCHÖNLAUB, 1978; LOESCHKE et al., 1990).

Fossils: -

Origin, facies: Debris flow within greenschists in the Lange Teichen valley (LOESCHKE et al., 1990) or a transgressional conglomerate above the Kaintaleck metamorphic complex (NEUBAUER et al., 1994).

Chronostratigraphic age: Ordovician or post-Devonian. The latter is depending on the correctness of the correlation of the Kalwang Conglomerate with the conglomerate at Frauenberg (NEUBAUER, 1985; NEUBAUER et al., 1994).

Biostratigraphy: -

Thickness: Lange Teichen valley: greenschists 50 m, conglomerates 15 m, marble 15 m; Frauenberg: conglomerate 15 m.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Units of the Veitsch Nappe in tectonic contact (SCHÖNLAUB, 1979).

Overlying unit(s): Gerichtsgraben Formation.

Lateral unit(s): Conglomerate at Frauenberg (NEUBAUER, 1985) – not indicated in the ASC 2004.

Geographic distribution: E-GWZ; Styria, Eisenerzer Alpen, ESE of Kapfenberg.

Remarks: The position of the Kalwang Conglomerate is strongly under discussion. Previously, as also shown in the ASC 2004, the Kalwang Conglomerate was regarded as the pre-Late Ordovician structural base of the Noric Nappe of the E-GWZ (DAURER & SCHÖNLAUB, 1978; SCHÖNLAUB, 1979, 1982a, b; LOESCHKE et al., 1990). Later, supported by thrust planes mapped above the Kalwang Conglomerate in the Lange Teichen valley, LOESCHKE et al. (1990) interpreted the Kalwang Conglomerate as a tectonic unit below the Noric Nappe. Finally, the Kalwang Conglomerate is regarded as an equivalent of gneiss conglomerates superposing the Frauenberg metamorphic complex ESE Kapfenberg (area of Frauenberg, N 47°25'29" / E 15°20'33"; ÖK50-UTM, map sheet 4217 Kindberg, ÖK50-BMN, map sheet 134 Passail) (NEUBAUER, 1985). There age data for metamorphism and magmatism range from 520 to 360 Ma

(DALLMEYER et al., 1992; HANDLER et al., 1999) and the unconformable sedimentary contact between the metamorphics and the conglomerates suggests a post-Middle Devonian age and a position of this conglomerate within the Kaintaleck Nappe of the E-GWZ (NEUBAUER et al., 1994).

Complementary references: SCHÖNLAUB (1979, 1980a, 1982a), EBNER et al. (1989), SCHÖNLAUB & HEINISCH (1993).

Gerichtsgraben-Formation / Gerichtsgraben Formation

FRITZ EBNER

Validity: Invalid; first detailed description in the rank of a group by FLAJS & SCHÖNLAUB (1976). In the ASC 2004 this unit was regarded as a formation, it is, however, not formalized.

Type area: Präbichl area SE Eisenerz (ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 101 Eisenerz).

Type section: NE flank of Gerichtsgraben SE of Eisenerz (N 47°32'11" / E 14°55'39"; ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 101 Eisenerz) along the road from Präbichl Pass to Gsollgraben.

Reference section(s): -

Derivation of name: After the Gerichtsgraben SE of Eisenerz (ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 101 Eisenerz).

Synonyms: Partim "Feinschichtige quarzitische Grauwackenschiefer" (HAMMER, 1925); "Silurdevon" (HIESSLEITNER, 1929), "Gerichtsgraben Gruppe" (FLAJS & SCHÖNLAUB, 1976); partim "Untere Schiefer" (FLAJS & SCHÖNLAUB, 1976); "Schichten unter dem Porphyroid" (DAURER & SCHÖNLAUB, 1978; SCHÖNLAUB, 1982a).

Lithology: Uniform grey sericite schists, microfolded phyllitic schists, platy sandstones and schists with detrital mica; subordinate greywacke and graphite schists. Relicts of graded bedding and cross bedding are rare. Intercalations of grey-yellowish and sometimes banded limestones occur especially in three levels along the road from Präbichl to Eisenerz at the NE flank of the Gerichtsgraben. Laterally, they interfinger with metamarls and predominantly dark schists. Other intercalations are banded lydites (FLAJS & SCHÖNLAUB, 1976; SCHÖNLAUB, 1982a).

Fossils: Conodonts (FLAJS & SCHÖNLAUB, 1976).

Origin, facies: Fine-clastic, sometimes calcareous and euxinic basinal environment.

Chronostratigraphic age: Upper Ordovician (Katian) (FLAJS & SCHÖNLAUB, 1976).

Biostratigraphy: Conodonts from the limestone intercalations belong to the *Amorphognatoides ordovicicus* Zone (upper Katian–Hirnantian).

Thickness: Strong regional variation from 300 m (Polster area; ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 101 Eisenerz) to > 1,000 m in the Lange Teichen valley (ÖK50-UTM, map sheet 4215 Eisenerz, ÖK50-BMN, map sheet 131 Kalwang).

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): Deeper tectonic units of the E-GWZ (Kaintaleck Nappe, Silbersberg Nappe, Veitsch Nappe) (SCHÖNLAUB, 1979; NEUBAUER et al., 1994).

Overlying unit(s): Blasseneck Porphyry.

Lateral unit(s): Due to the superposition by the Blasseneck Porphyry the sequences around the Präbichl Pass and along the Lange Teichen valley should be at least partly stratigraphic equivalents.

Geographic distribution: E-GWZ; Styria, Eisenerzer Alpen.

Remarks: In the Präbichl area the strata below the Blasseneck Porphyry were summarized as the Gerichtsgraben Group by FLAJS & SCHÖNLAUB (1976). For a possible position of the Kalwang Conglomerate at the structural base of the Gerichtsgraben Formation see the description of the Kalwang Conglomerate.

Complementary references: SCHÖNLAUB (1980a), EBNER et al. (1989), SCHÖNLAUB & HEINISCH (1993).

Quarzite / Quartzites

FRITZ EBNER

Remarks: Metaclastics of the Gerichtsgraben Fm. always include intercalations of metasandstones and quartzites. A prominent occurrence of quartzite as shown in the ASC 2004 is overestimated and therefore not mentioned in Text-Fig. 2.

Kaintalgraben-Formation / Kaintalgraben Formation

FRITZ EBNER

Validity: Invalid; first description as "Kaintal-Porphyroid" by HERMANN (1992) which was later named Kaintalgraben Formation (NEUBAUER et al., 1994).

Type area: ÖK50-UTM, map sheet 4216 Bruck an der Mur (ÖK50-BMN, map sheets 132 Trofaiach and 133 Leoben).

Type section: Along Kaintalbach valley, ~4,6 km NNE Trofaiach (N 47°26'39" / E 15°04'17"), ÖK50-UTM, map sheet 4216 Bruck an der Mur (ÖK50-BMN, map sheet 132 Trofaiach). In the early literature (HAUSER, 1938) micaschists were described from this location.

Reference section(s): -

Derivation of name: After the valley Kaintalgraben (ÖK50-UTM, map sheet 4216 Bruck an der Mur, ÖK50-BMN, map sheet 132 Trofaiach).

Synonyms: "Kaintal-Porphyroid" (HERMANN, 1992); "Kaintalgraben Porphyroid" (NEUBAUER et al., 1994).

Lithology: Light, strongly deformed and mm-laminated porphyroids with porphyroblastic texture (with potassium feldspar, plagioclase and quartz).

Fossils: -

Origin, facies: Ignimbrite, caused by a pyroclastic density current.

Chronostratigraphic age: ?Upper Ordovician.

Biostratigraphy: -

Thickness: Up to 80 m.

Lithostratigraphically higher rank unit: "Norische Gruppe" (invalid) (HERMANN, 1992).

Lithostratigraphic subdivision: -

Underlying unit(s): Phyllites of the Gerichtsgraben Formation.

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 / Dufallian	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	MIDDLE DEVONIAN			Dalejian	400		
						EMSIAN	405		
		DEVONIAN	LOWER DEVONIAN			Zlichovian	410		
						PRAGIAN	415		
		PERMIAN	LOWER DEVONIAN			LOCHKOVIAN	420	PERMIAN	LOWER DEVONIAN
						425			
430									
435									
440									
443.7									
445									
450									
455									
460									
PERMIAN	UPPER ORDOVICIAN	LUDFORDIAN / GORSTIAN	465	PERMIAN	UPPER ORDOVICIAN				
		HOMERIAN / SHEINWOOD	470						
		TELYCHIAN	475						
		AERONIAN	480						
		RHUDDANIAN	485						
		HIRNANTIAN	490						
		495							
		498.3							
		499							
		500							
PERMIAN	MIDDLE ORDOVICIAN	DARRIWILIAN	505	PERMIAN	MIDDLE ORDOVICIAN				
		510							
		515							
		520							
		525							
		530							
		535							
		540							
		542							
		PERMIAN	LOWER ORDOVICIAN			TREMA-DOCIAN	545	PERMIAN	LOWER ORDOVICIAN
550									
555									
560									
565									
570									
575									
580									
585									
590									
PERMIAN	UPPER CAMBRIAN	PAIBIAN	595	PERMIAN	UPPER CAMBRIAN				
		600							
		605							
		610							
		615							
		620							
		625							
		630							
		635							
		640							
PERMIAN	MIDDLE CAMBRIAN	PAIBIAN	645	PERMIAN	MIDDLE CAMBRIAN				
			650						
			655						
			660						
			665						
			670						
			675						
			680						
			685						
			690						
PERMIAN	LOWER CAMBRIAN	PAIBIAN	695	PERMIAN	LOWER CAMBRIAN				
			700						
			705						
			710						
			715						
			720						
			725						
			730						
			735						
			740						



- 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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