

Complementary references: TOLLMANN (1977), SCHÖNLAUB (1979, 1980a, 2001), EBNER et al. (1989), HEINISCH & SCHÖNLAUB (1993).

Erzführende Kalke / Metalliferous Limestones

FRITZ EBNER

Validity: Invalid; general working term for not subdivided Devonian limestones in the E-GWZ.

Type area: ÖK50-UTM, map sheet 4215 Eisenerz (ÖK 50-BMN, map sheets 101 Eisenerz and 131 Kalwang), ÖK50-UTM, map sheet 4211 Neuberg an der Mürz (ÖK50-BMN, map sheet 103 Kindberg).

Type section: -

Reference section(s): -

Derivation of name: After siderite-ankerite mineralizations which are frequently hosted by mainly Devonian limestones (CZERMAK, 1931; TOLLMANN, 1977; WEBER, 1997a, b).

Synonyms: See remarks.

Lithology: Variegated bedded flaser limestones hosting irregular metasomatic stocks of siderite and ankerite mineralizations (WEBER, 1997a, b).

Fossils: See remarks.

Origin, facies: See remarks.

Chronostratigraphic age: Devonian; see remarks.

Biostratigraphy: See remarks.

Thickness: See remarks.

Lithostratigraphically higher rank unit: -

Lithostratigraphic subdivision: -

Underlying unit(s): -

Overlying unit(s): -

Lateral unit(s): -

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

Remarks: Since the beginning of geologic research in the E-GWZ (STUR, 1865, 1866) the general term Metalliferous Limestones was used cumulatively for mainly Devonian limestones which include irregular stocks of metasomatic iron mineralizations. Later parts of these limestones, especially in the Eisenerzer Alpen, were assigned as informal lithostratigraphic units (SCHÖNLAUB 1979, 1980a, 1982a, b; FLAJS & SCHÖNLAUB, 1976). In the Veitsch area of the E-GWZ (ÖK50-UTM, map sheet 4211 Neuberg an der Mürz; ÖK50-BMN, map sheet 103 Kindberg) isolated outcrops of Metalliferous Limestones above the Rad Schists (NIEVOLL, 1983, 1987) yielded conodont faunas representing the entire Devonian period (EBNER, 1973, 1974; NIEVOLL 1983, 1987).

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

Veitsch Nappe

In the ASC 2004 the stratigraphic sequence of the Veitsch Nappe is shown in the Tournaisian to Moskavian parts of the column "E-Grauwackenzone" (E-Greywacke Zone) right of the Eisenerz Formation.

The Veitsch Nappe is situated in the E-GWZ (Styria, Lower Austria) at the tectonic footwall of the Greywacke Zone and is composed of Carboniferous (lower Visean–Moskavian) marine shallow water sediments. They were only affected by Alpine (Cretaceous) deformation and low grade metamorphism (RATSCHBACHER, 1984, 1987; NEUBAUER et al., 1994; RANTITSCH et al., 2004; EBNER et al., 2007, 2008). NEUBAUER et al. (1994) proposed to summarize these sediments within the Veitsch Group (not shown in the ASC 2004).

In the western part of the E-GWZ the sequence of the Veitsch Nappe was formerly subdivided into three formations: Steilbachgraben Formation, Triebenstein Formation, and Sunk Formation (RATSCHBACHER, 1984). In a restricted area SE Kapfenberg the Sunk Formation is superposed by (?) Permian ochre shales and sandstones (= Graschnitz Formation; NEUBAUER, 1983; NEUBAUER et al., 1994). It is not clear if RATSCHBACHER's subdivision into formations is also applicable for the eastern parts of the Veitsch Nappe. Nevertheless, magnesite and dark clastic sediments rich in graphite and plants resembling the Sunk Formation also occur in the eastern parts of the Veitsch Nappe. Especially in the magnesite deposit of Veitsch dolomites and clastics below the magnesite are rich in fossils (corals, brachiopods, crinoids, trilobites, gastropods, agglutinated foraminifers, spicula, ostracods; KOCH, 1893; KLEBELSBERG, 1927; HERITSCH, 1928a, 1930a; METZ, 1937; FELSER & FLÜGEL, 1975; HAHN & HAHN, 1977; KRÄINER, 1992). Trilobites indicate lower Visean (HAHN & HAHN, 1977) and corals upper Visean *Dibunophyllum* Zone (FELSER & FLÜGEL, 1975; FELSER, 1977), however, a correlation with the sequence of Hohentauern/Sunk is problematic.

The abundance of magnesite and graphite is also responsible to assign some parts of the Veitsch Nappe as the "Magnesite Carboniferous" (EBNER, 1997) and the "Graphite Carboniferous" (e.g., HAMMER, 1924). The Carboniferous of the Veitsch Nappe represents post-orogenic sediments (in relation to an early Carboniferous [= Bretonic] tectonic phase) deposited in a shallow marine foredeep (FLÜGEL, 1977; NEUBAUER & VOZAROVA, 1990; EBNER, 1992; EBNER et al., 1991, 2007, 2008). The metasomatic magnesite deposits, all most probably situated in the Steilbachgraben Formation or its equivalents, form the Veitsch Nappe magnesite (talc) district. The Sunk Formation hosts the Veitsch Nappe graphite district (WEBER, 1977a, b).

Steilbachgraben-Formation / Steilbachgraben Formation

FRITZ EBNER

Validity: Valid; formal description by RATSCHBACHER (1984).

Type area: Rottenmanner Tauern; ÖK50-UTM, map sheet 4214 Trieben (ÖK50-BMN, map sheet 130 Trieben).

Type section: Overlapping parts of the type section are situated around the abandoned magnesite mine NW of Hohentauern (N 47°26'53" / E 14°27'59"). Sections 8–11 (RATSCHBACHER, 1984: Figs. 1–3) are situated at the NE-ridge of Sunkmauer (altitude 1,180 m), the southern margin of the magnesite open pit, in the upper Steilbachgraben (N 47°26'22" / E 14°29'57" to N 47°26'26" / E 14°30'06") and within the magnesite open pit.

Reference section(s): -

Derivation of name: After the Steilbachgraben (N 47°26'22" / E 14°29'57" to N 47°26'26" / E 14°30'06") NE of Hohentauern (N 47°26'04" / E 14°29'01"), ÖK50-UTM, map sheet 4214 Trieben (ÖK 50-BMN, map sheet 130 Trieben).

Synonyms: Steilbach Formation in the ASC 2004. "Magnesit Karbon" (EBNER, 1997) according to the magnesite deposits in the Steilbachgraben Formation. The sparry magnesite of the Veitsch Nappe is known in the international mineral deposits' literature as "Veitsch type magnesite" (EBNER et al., 2004a, b).

Lithology: Fine grained clastics with intercalations of sandstone and layers/lenses of grey, bedded limestones and dolomites. Lenses and irregular stocks of sparry magnesite are included in the dolomitic parts. Intercalations of volcanic layers (metatuffs) derived from tholeiitic intraplate basalts occur outside the type area (PROCHASKA & EBNER, 1989). Some layers of gypsum and anhydrite are known from clastic sediments closely related to the magnesite deposits of Hohentauern (PETRASCHECK, 1978) and Oberdorf (SCHROLL et al., 1989).

Fossils: Corals, brachiopods, crinoids, trilobites, gastropods, agglutinated foraminifers, spicula, ostracods especially from the Hohentauern area and the abandoned magnesite mine in Veitsch (ÖK50-UTM, map sheet 4211 Neuberg an der Mürz, ÖK50-BMN, map sheet 103 Kindberg) (HERITSCH, 1907, 1917a, 1933a; KLEBELSBERG, 1927; KOCH, 1893; FELSER, 1977; HAHN & HAHN, 1977; KRÄINER, 1992, 1993a).

Origin, facies: Shallow marine, mixed siliciclastic-carbonatic shelf environment formed in a marine foredeep (molasse) environment after an early Carboniferous orogeny (FLÜGEL, 1977; KRÄINER, 1992; EBNER, 1992; EBNER et al., 2007, 2008).

Chronostratigraphic age: Lower Carboniferous (?Tournaisian–upper Visean). $\delta^{34}\text{S}$ values of gypsum/anhydrite intercalations indicate Carboniferous ages (PETRASCHECK, 1978; SCHROLL et al., 1989). $^{86}\text{Sr}/^{87}\text{Sr}$ ratios from limestones are increased relative to the Visean seawater curve (EBNER et al., 2008; AZIM-ZADEH et al., 2008).

Biostratigraphy: Trilobites indicate the lower Visean (HAHN & HAHN, 1977) and corals upper Visean *Dibunophyllum* Zone (H. FLÜGEL, 1975; FELSER, 1977).

Thickness: Up to 230 m.

Lithostratigraphically higher rank unit: Veitsch Group (NEUBAUER et al., 1994).

Lithostratigraphic subdivision: -

Underlying unit(s): Middle Austroalpine Crystalline unit (tectonic contact) (TOLLMANN, 1977; RANTITSCH et al., 2004; NEUBAUER et al., 1994).

Overlying unit(s): Triebenstein Formation.

Lateral unit(s): Clastic sediments (RATSCHBACHER, 1984, 1987) and other parts of the "Magnesite Carboniferous".

Geographic distribution: E-GWZ; Styria, Lower Austria.

Remarks: In ASC 2004 this formation is wrongly named "Steilbach-Formation" instead of Steilbachgraben Formation.

Complementary references: SCHÖNLAUB (1979, 1980a), EBNER et al. (1989, 1991), KRÄINER (1993a), EBNER & PROCHASKA (2001).

Triebenstein-Formation / Triebenstein Formation

FRITZ EBNER

Validity: Valid; first nomination by RUMPF (1874), formal description by RATSCHBACHER (1984).

Type area: Rottenmanner Tauern, ÖK50-UTM, map sheet 4214 Trieben (ÖK50-BMN, map sheet 130 Trieben).

Type section: At mountain Triebenstein (N 47°26'43" / E 14°29'14") north of Hohentauern (N 47°26'04" / E 14°29'01"). Section 7 (RATSCHBACHER, 1984: Fig. 3) represents only a small part (~ 60 m) of the formation.

Reference section(s): -

Derivation of name: After the mountain Triebenstein (N 47°26'43" / E 14°29'14") north of Hohentauern (N 47°26'04" / E 14°29'01"), ÖK50-UTM, map sheet 4214 Trieben (ÖK50-BMN, map sheet 130 Trieben).

Synonyms: "Triebensteinkalk" in the older literature (HERITSCH, 1933a; TOLLMANN, 1977) before formalization by RATSCHBACHER (1984); "Triebensteinkalkmarmor" (RATSCHBACHER, 1984).

Lithology: Bedded, partly fossiliferous limestone marbles with metapelitic and rare metapsammitic/psephitic intercalations. Locally lenses of pure limestone marbles of greater thickness (RATSCHBACHER, 1984).

Fossils: Crinoids, corals, brachiopods, bivalves in the lower parts (HERITSCH, 1908, 1917a, 1933a).

Origin, facies: Carbonatic shelf facies interfingering with individual bioherms.

Chronostratigraphic age: Uppermost Visean–Serpukhovian.

Biostratigraphy: Lower parts within the *Dibunophyllum* Zone (HERITSCH, 1933a; FELSER, 1977).

Thickness: 35–300 m (RATSCHBACHER, 1984).

Lithostratigraphically higher rank unit: Veitsch Group (NEUBAUER et al., 1994)

Lithostratigraphic subdivision: -

Underlying unit(s): Steilbachgraben Formation (note typological error "Steilbach-Formation" in the ASC 2004).

Overlying unit(s): Sunk Formation.

Lateral unit(s): -

Geographic distribution: E-GWZ; Styria, Rottenmanner Tauern.

Remarks: -

Complementary references: TOLLMANN (1977), SCHÖNLAUB (1979, 1980a), EBNER et al. (1989, 1991, 2007, 2008), KRÄINER (1992, 1993a), EBNER & PROCHASKA (2001).

Sunk-Formation / Sunk Formation

FRITZ EBNER

Validity: Valid; formal description by RATSCHBACHER (1984).

Type area: Rottenmanner Tauern, ÖK50-UTM, map sheet 4214 Trieben (ÖK50-BMN, map sheet 130 Trieben).

Type section: Sections 1–6 (RATSCHBACHER, 1984: Fig. 3) around the abandoned graphite mine Sunk (N 47°27'49" / E 14°28'29") 3.4 km N of Hohentauern (N 47°26'04" / E 14°29'01"), ÖK50-UTM, map sheet 4214 Trieben (ÖK50-BMN, map sheet 130 Trieben).

Reference section(s): -

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	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	LOWER DEVONIAN			PRAGIAN	405				
				LOCHKOVIAN	410				
PERMIAN	DEVONIAN			WEN-LUD-LOCK / LOW	415	DEVONIAN	LOWER DEVONIAN		
				HOMERIAN / SHEINWOOD	420				
				TELYCHIAN	425				
		AERONIAN	430						
		RHUDDANIAN	435						
		DEVONIAN	LOWER DEVONIAN	PRAGIAN	440				
				LOCHKOVIAN	445				
		PERMIAN	DEVONIAN	HIRNANTIAN	447			DEVONIAN	UPPER ORDOVICIAN
				WOLYER	450				
				DARRIWILIAN	455				
TREMA-DOCIAN	460								
DEVONIAN	LOWER DEVONIAN			PRAGIAN	465				
				LOCHKOVIAN	470				
PERMIAN	DEVONIAN			PAIBIAN	475	DEVONIAN	MIDDLE ORDOVICIAN		
				WOLYER	480				
				DARRIWILIAN	485				
				TREMA-DOCIAN	490				
		DEVONIAN	LOWER DEVONIAN	PRAGIAN	495				
				LOCHKOVIAN	500				
		PERMIAN	DEVONIAN	PAIBIAN	505			DEVONIAN	UPPER CAMBRIAN
				WOLYER	510				
				DARRIWILIAN	515				
				TREMA-DOCIAN	520				
DEVONIAN	LOWER DEVONIAN			PRAGIAN	525				
				LOCHKOVIAN	530				
PERMIAN	DEVONIAN			PAIBIAN	535	DEVONIAN	MIDDLE CAMBRIAN		
				WOLYER	540				
				DARRIWILIAN	545				
				TREMA-DOCIAN	550				
		DEVONIAN	LOWER DEVONIAN	PRAGIAN	555				
				LOCHKOVIAN	560				
		PERMIAN	DEVONIAN	PAIBIAN	565			DEVONIAN	LOWER CAMBRIAN
				WOLYER	570				
				DARRIWILIAN	575				
				TREMA-DOCIAN	580				
DEVONIAN	LOWER DEVONIAN			PRAGIAN	585				
				LOCHKOVIAN	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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