Chronostratigraphic age: Carboniferous (?)
Remarks: The age of the formation is unknown but due to the presence of undeterminable fragmental plant remains a Carboniferous age is proposed (HASENHÜTTL, 1994).

Biostratigraphy: -

Thickness: Probably several hundreds of meters.

Lithostratigraphically higher rank unit: Laufnitzdorf Group (FLÜGEL, 2000).

Lithostratigraphic subdivision: -

Underlying unit(s): Tectonic boundary to the Schattleitner Member (St. Jakob Formation).

Overlying unit(s): ?

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 134 Passail.

Remarks: -

Complementary references: -

Bärenschütz-Formation / Bärenschütz Formation

BERNHARD HUBMANN

Validity: Valid; first description by ZIER (1981: "Karbonkalke", "Mixnitzer Karbon"); formalized by FLÜGEL (2000: p. 37; Bärenschütz-Formation).

Type area: ÖK50-UTM, map sheet 4223 Weiz (ÖK50-BMN, map sheet 134 Passail).

Type section: No type section selected, although ZIER (1981) described four sections in the area of the Rote Wand (Hochlantsch region) ÖK50-BMN, map sheet 134 Passail (N 47°21'54" / E 15°25'47").

Reference section(s): See above.

Derivation of name: After "Bärenschützklamm", a gorge west of Mixnitz, approx. 45 km north of Graz.

Synonyms: Partly Hochlautschkalk [sic!] (CLAR, 1874), Hochlantsch-Kalk (H. FLÜGEL, 1975).

Lithology: Reddish to yellow and grey cephalopod limestones with cherts.

Fossils: Conodonts, cephalopods.

Origin, facies: Open marine environment with pelagic organisms.

Chronostratigraphic age: Tournaisian–Serpukhovian ("Namurian B"); not Moskovian as indicated in the ASC 2004.

Biostratigraphy: *declinognathodus noduliferus* conodont zone.

Thickness: About 100 m.

Lithostratigraphically higher rank unit: Mixnitz Group (FLÜGEL, 2000).

Lithostratigraphic subdivision: At the base of the Bärenschütz Formation red-brown brecciated limestones and dolostones are developed following an erosional relief. This breccia horizon is integrated into the Nadelspitz Bed (FLÜGEL, 2000).

Underlying unit(s): Hochlantsch Formation.

Overlying unit(s): -

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 134 Passail.

Remarks: -

Complementary references: -

Höchkogel-Formation / Höchkogel Formation

BERNHARD HUBMANN

Validity: Valid; first nomination and description by CLAR (1933: "Kalkschiefer vom Höchkogel"); formalized and redescribed by FLÜGEL (2000: p. 30–31; Höchkogel-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 Höchkogel near Gratkorn (elevation spot 643 m on ÖK50-BMN, map sheet 164 Graz) (N 47°09'22" / E 15°22'36") 16 km northwest of Graz.

Reference section(s): -
Remarks: CLAR's (1933) conception of the "Kalkschiefer vom Höchkogel" integrated different stratigraphic units (see FLÜGEL, 2000) and therefore the term was re-interpreted by FLÜGEL (2000). EBNER (1978a) summarized those units following the Steinberg and Sanzenkogel Formations to the "Folge der Dult" which he subdivided into two lithologically different parts. Limestones of the lower part which are developed upon an erosional surface (i.e., "Kalke der Dult" sensu EBNER, 1978a = Höchkögel Formation) are overlain by shales (i.e., "Schiefer der Dult" sensu EBNER, 1978a = Hahngraben Formation).

Derivation of name: After the hill Höchkogel 16 km northwest of Graz.

Synonyms: Kalke der Dult (EBNER, 1978a); partly: Kalke mit *Cladochonus* (HERITSCH, 1930b); Kalkschiefer vom Höchkogel (CLAR, 1933).

Lithology: Dark grey-brownish to black micritic limestones.

Fossils: Conodonts

Origin, facies: Shallow marine deposits.

Chronostratigraphic age: Bashkirian.

Biostratigraphy: Conodonts of the *Declinognathodus-Idiognathoiodes* group indicate an early Bashkirian age (EBNER, 1977, 1980a).

Thickness: Up to 20 m in thickness.

Lithostratigraphically higher rank unit: Dult Group.

Lithostratigraphic subdivision: FLÜGEL (2000) distinguished two members:

Hartbauer Member (= Typ II-Kalk, EBNER, 1975a = Basiskalk, EBNER 1978a): Black massive limestones with crusts of hematite; locally dolostones, breccias and shales; maximum thickness of 20 m.
Schrausbauer Member (= Typ III-Kalk, EBNER, 1975a): Black argillaceous shales and oolithic limestones with birdseye-structures; some few meters in thickness.

Underlying unit(s): Sanzenkogel Formation (erosional contact).

Overlying unit(s): Hahngraben Formation.

Lateral unit(s): -

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 metamorphosis 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 Lochkovian 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 volcaniclastics (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 Volcaniclastics

BERNHARD HUBMANN

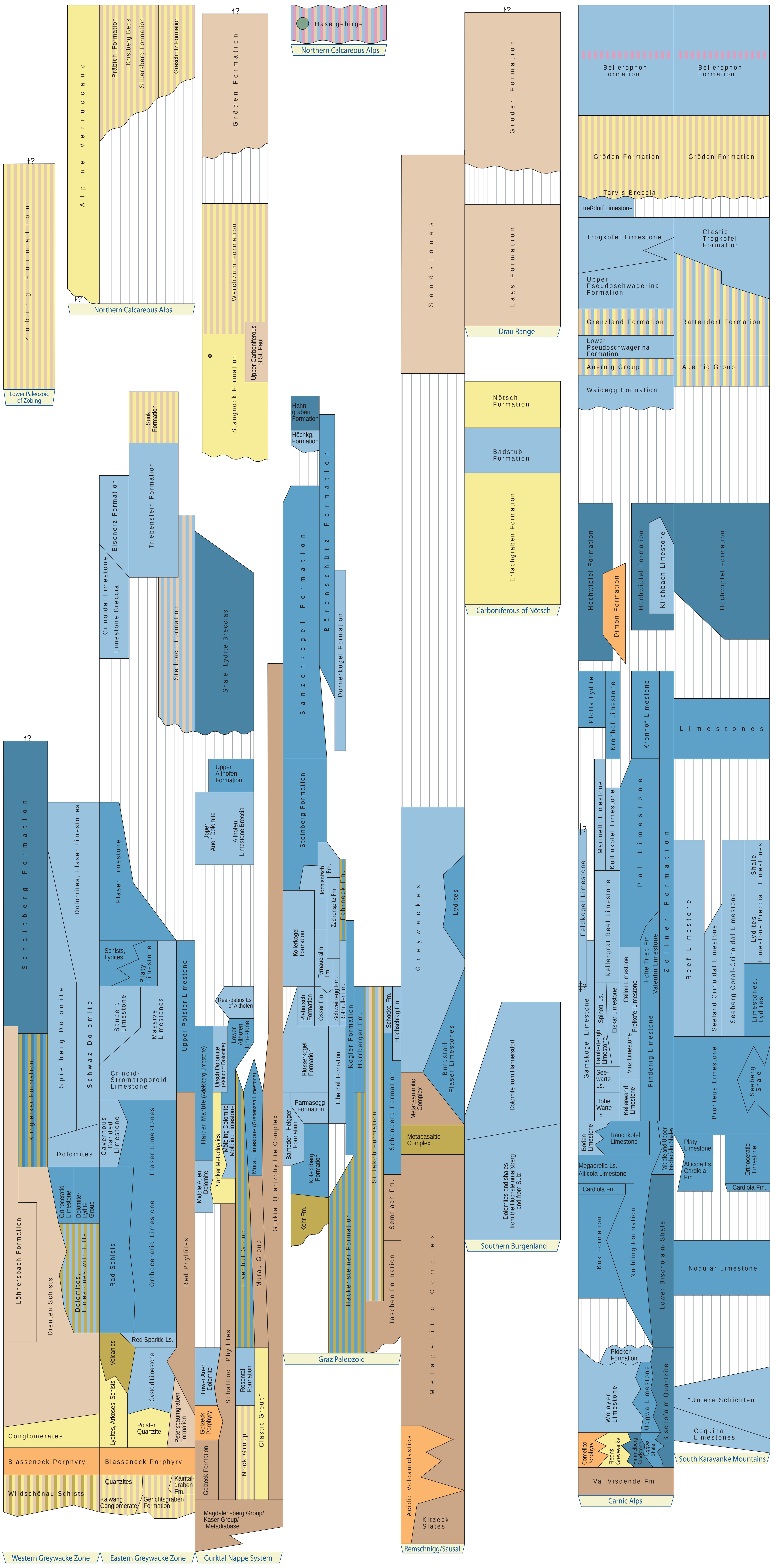
Validity: Invalid; comprehensive description by SCHLAMBERGER (1987: p. 4; "Saurer Vulkanitkomplex").

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

Austrian Stratigraphic Chart 2004 - Paleozoic

(sedimentary successions)

Austrian Stratigraphic Commission



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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