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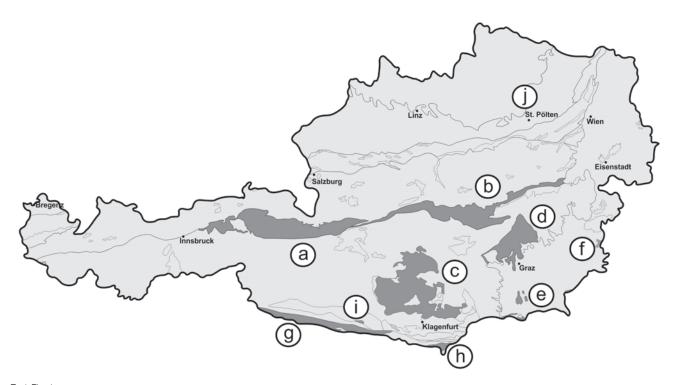
The lithostratigraphic units of the Austrian Stratigraphic Chart 2004 (sedimentary successions) – Vol. I – The Paleozoic Era(them)

## Introduction

Profound studies of Paleozoic successions within Austria's territory go back to an amazingly long period of more than 150 years of research history. To the end of the first half of the 19th century all systems of the Paleozoic erathem (with the exception of the Ordovician) had been established thus enabling a systematic recognition and correlation of time-equivalent strata over different countries. As early as in 1843 Franz UNGER, paleobotanist at the Joanneum in Graz, recognized Devonian rocks (only four years after establishment of the system!) in Austria. A few years later, particularly during comprehensive geological mapping by the Austrian Geological Survey ("Geologische Reichsanstalt"; after the breakdown of the Austrian-Hungarian Monarchy the "Geologische Bundesanstalt"), Silurian successions were recognized by Franz HAUER in 1847. Permian rocks containing fusulinids were identified by Guido STACHE in 1872 and Ordovician strata, also by STACHE, in 1884. The Carboniferous ("age of carbonaceous limestone") was for a long time well-known in Alpine geology, however, for several decades this system remained a vast bin for unidentified Paleozoic rocks.

Since lithostratigraphic units are the basic entities of geological maps specific names were assigned to distinct lithological sequences already during early periods of geologic surveying. Initially naming was very general and frequently used in a dual sense to combine lithological features with (relative) age implications (e.g., "Uibergangskalk" or transitional rocks, placed between the "uranfängliche Gebirge" [= basement rocks containing no fossils] and the "Flötz-Gebirge" [= stratified and low-dipping rocks often holding fossils] in the sense of Abraham Gottlob WERNER'S stratigraphy). Following the fundamental ideas of Hollis Dow HEDBERG during the mid-1970s lithostratigraphic units more and more were based on their observable physical features only and not on their inferred age. Since 1999 a "Recommendation (quideline) to the handling of the stratigraphic nomenclature" (STEININGER & PILLER, 1999) exists which (at least) should regulate (new) designations. However, a synoptical compilation of lithostratigraphical units ("formations") as given herein, uncovers still a large number of the lithostratigraphical terms to be invalid.

Areas within Austria's borderlines exhibiting anchizonal to lower greenschist metamorphosed Paleozoic successions are remnants which were dismembered during Variscan and Alpine orogeneses and incorporated into the complicated Alpine nappe system. Today these Paleozoic areas are irregularly distributed (Text-Fig. 1). Within the Alpine mountain belt sequences belong to the "Upper Austroalpine Nappe System" (i.e., the Western Greywacke Zone (Tyrol, Salzburg), Eastern Greywacke Zone (Styria and Lower Austria), the Carboniferous of Nötsch, the Gurktal



Regions of anchizonal to lower greenschist metamorphosed Paleozoic strata in Austria. (a) Western Greywacke Zone; (b) Eastern Greywacke Zone; (c) Gurktal Nappe System; (d) Graz Paleozoic; (e) Remschnigg and Sausal areas; (f) Southern Burgenland; (g) Carnic Alps; (h) Karavanke Mountains; (i) Carboniferous of Nötsch; (j) Lower Paleozoic of Zöbing.

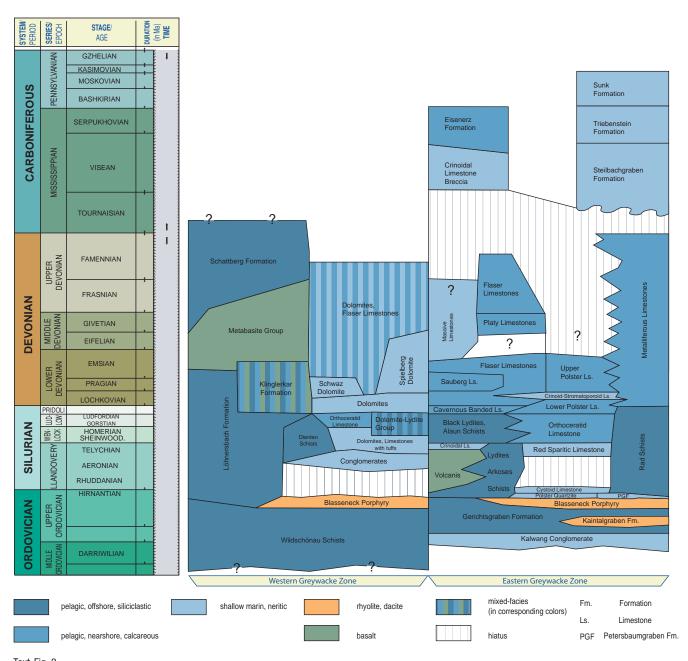
Nappe System, the Graz Paleozoic and some isolated outcrops in southern Styria (Remschnigg/Sausal) and Burgenland as well as the Southern Alpine System (Carnic Alps and the Karavanke Mountains; Southern Carinthia). Outside the Alpine region an isolated upper Paleozoic (Carboniferous, Permian) occurrence is known resting on crystalline units of the Bohemian Massif.

All Paleozoic occurrences together constitute a surface ratio of less than 10 % of the Austrian territory. More than 40 % of the Paleozoic area is covered by the Greywacke Zone, one-third by the Gurktal Nappe System; the Graz Paleozoic takes little more than 10 % and the Carnic Alps less than 10 % of the Paleozoic area.

Geologic units do not stop at national borders. Therefore a number of Italian colleagues kindly co-operated describing lithostratigraphic units of the Carnic Alps which are outcropping on both sides of the Austrian-Italian border.

In the following 191 lithostratigraphic units are briefly described. Some typological errors of lithostratigraphic names and graphic mistakes concerning stratigraphic ranges of formations as illustrated in the ASC 2004 had to be corrected. The Greywacke Zone featured too many inconsistencies and made a revision necessary which resulted in a differing conceptual base for the lithostratigraphic arrangement (Text-Fig. 2). The reader interested in the Greywacke Zone therefore is kindly requested to use the new graphic chart. Note also that explanatory remarks of the Greywacke Zone are only provided on lithostratigraphic units which are illustrated in the new concept (Text-Fig. 2).

Bernhard Hubmann



Revised lithostratigraphic chart of the Western and Eastern Greywacke Zone.

## Austrian Stratigraphic Chart 2004 - Paleozoic

(sedimentary successions) **Global Classification Austrian Stratigraphic Commission DURATION Ma** SYSTEM / PERIOD SERIES / EPOCH Ma STAGE / TIME AGE 251 CHANGHSINGIAN
Dorashamian

WUCHIAPINGIAN
Dzhulfian Kristberg Beds Haselgebirge 255 Northern Calcareous Alps 260 Bellerophon Bellerophon Formation CAPITANIAN 265 ⊐ WORDIAN ROADIAN 270 Gröden Formation Gröden Formation KUNGURIAN Σ Z 275 ⋖ ۵ Tarvis Breccia 280 Treßdorf Limestone ARTINSKIAN 2 Clastic Trogkofel Formation Trogkofel Limestone 285 M D SAKMARIAN 290 Upper Pseudoschwagerina Formation 0 Northern Calcareous Alps 295 **Grenzland Formation** Rattendorf Formation **ASSELIAN** Drau Range 299 Upper Carbonifer of St. Paul Lower Pseudoschwagerina Formation SZ GZHELIAN Auernig Group Auernig Group  $\simeq$  Z **□** < KASIMOVIAN 305 ш. Waidegg Formation O > MOSKOVIAN 310 SB  $\simeq$ Höchkg. Formation SZ 6.4 315 Badstub Formation BASHKIRIAN  $\supset$   $\square$ S 320 SERPUKHOV-325 335 Carboniferous of Nötsch 340 345 2 350 TOURNAISIAN 13.9 60.2 355 359.2 UPPER EVONIAN FAMENNIAN 0 370 = 375 Seeberg Coral-Crinoidal Limestone 10.8 380 FRASNIAN N 385 GIVETIAN 390 **EIFELIAN** 395 0 400 D NER NOWER EMSIAN Crinoid-Stromatoporoid Limestone PRAGIAN LOCHKOVIAN 4.8 Dolomites O egaerella Ls. ticola Limestone LUDFORDIAN
GORSTIAN
HOMERIAN
SHEINWOOD.  $\supset$ Southern Burgenland LLANDOVERY ΓELYCHIAN Nodular Limestone Dolomites, Limestones Dienten Schists 435 AERONIAN 15.5 4 S 27.7 440 RHUDDANIAN Red Sparitic Ls. 443.7 **HIRNANTIAN** 445 Graz Paleozoic UPPER RDOVICIAN **D** 12.1 450 "Untere Schichten" Polster Quartzite 455 Conglomerates 0 South Karavanke Mountains, Blasseneck Porphyry 460 Blasseneck Porphyry MIDDLE ORDOVICIAN O Val Visdende Fm. **DARRIWILIAN** 465 Carnic Alps 3.7 470 0 Remschnigg/Sausal Western Greywacke Zone Eastern Greywacke Zone 475 480 0 RDO' TREMA-Legend DOCIAN 485 pelagic, offshore, siliciclastic coal (may include several seams) 488.3 490 UPPER SAMBRIAN pelagic, nearshore, calcareous position/age doubtful/controversial shallow marin, neritic 12.7 495 terrestrial-continental, coarse clastic older unit left \ younger unit right Geologische Bundesanstalt terrestrial-continental, fine clastic hiatus **PAIBIAN** 500 evaporite (chloride, sulphate) unconformity MIDDLE AMBRIAN rhyolite, dacite **GSSP** 505 (basaltic) andesite, trachyandesite 12.0 Formation 510 Limestone 515  $\alpha$ mixed-facies (in corresponding colors) CAMBRIAN  $\mathbf{m}$ 520 © Commission for the Palaeontological and Stratigraphical Research of Austria (CPSA) of the Austrian Academy of Sciences ≥ and Austrian Stratigraphic Commission **Universität** 525 Cutout and English adaptation of the "Die Stratigraphische Tabelle von Österreich 2004": Geological Survey of Austria 530 OWER The Austrian Stratigraphic Chart 2004 - Paleozoic is a supplement of: Hubmann, B., Ebner, F., Ferretti, A., Kido, E., Krainer, K., Neubauer, F., Schönlaub, H.-P. & Suttner, T.J. (2014): The Paleozoic Era(them), 2<sup>nd</sup> edition. – In: Piller, W.E. [Ed.]: The lithostratigraphic units of the Austrian Stratigraphic Chart 2004 (sedimentary successions) – Vol. I – 535 Abhandlungen der Geologischen Bundesanstalt, 66, 9–133, Wien. 540 Printing: Grasl Druck & Neue Medien GmbH, Bad Vöslau **Naturhistorisches Museum Wien** 

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