

mente wie Zr (>200 ppm), Ce (>100 ppm), Y (30–60 ppm), wie sie für Magmen typisch sind, die sich in Riftzonen bilden (A-Typ-Magmatite). Neben drei Vulkaniten (Alkalifeldspatryholite sowie ein Quarztrachit) wird die Gruppe weiters von zwei Granitgeröllen mit ähnlichem Spurenelementmuster repräsentiert, wahrscheinlich plutonische Anteile derselben Suite. Bei einer dieser Proben konnten Monazite mit permotriassischen Th(U)/Pb-Verhältnissen festgestellt werden. Bei den granitischen Proben ist eine leichte metamorphe Überprägung ersichtlich (Chloritisierung der Biotite, z.T. Schachbrettabitbildung). Als charakteristisches primäres Mineral ist insbesondere der stark entmischte (Hypersolvus)-Alkalifeldspat zu nennen.

Zur Gruppe 3

Jenes Geröll, welches am eindeutigsten der Gruppe der Cetischen Granitoide (FRASL & FINGER, 1988) zugeordnet werden konnte, ist ein feinkörniger Trondhjemit mit schwacher epizonaler Überprägung. Obwohl das Gestein makroskopisch nicht den Leitgesteinen des cetischen Massivs (Schaittner Diorit, Buchdenkmal-Granit) entspricht, kann eine Zuordnung vor allem nach geochemischen Kriterien erfolgen. Wie FRASL & FINGER (1988) zeigen konnten, besitzt die cetische Granitfamilie einige ganz charakteristische Spurenelementmuster wie sehr hohes Ba und Sr bei gleichzeitig sehr niedrigem Rb. Dazu kommt ein zumeist sehr hohes Natrium/Kalium-Verhältnis. Die erwähnte

trondhjemitische Geröllprobe besitzt genau diese Eigenschaften (z.B. Na₂O: 5,09 %, K₂O: 1,56 %, Ba: 944 ppm, Sr: 700 ppm, Rb: 23 ppm). Sie ist vermutlich vergleichbar mit anderen grauen Metatondhjemiten und Trondhjemitgneisen des helvetischen Untergrundes, wie sie z.B. im Haunsberg Wildflysch (FRASL, 1987), aber auch in der Umgebung des Buchdenkmals (FAUPL, 1975) gefunden wurden.

Zur Gruppe 4

Zwei Gerölle stark zerscherter, epimetamorpher Granodioritgneise wurden geochemisch genauer untersucht. Beide weisen markant niedrige Yttrium- (13 bzw. 5 ppm), Niob- (8 und 10 ppm) und Zn-Gehalte (<10 ppm) auf. Die nur schwach peralumische Geochemie spricht für saure I-Typ-Granite als Ausgangsgesteine. Chemische Altersdatierungen an Monaziten ergaben für eine der Proben ein oberkarbones Alter von ca. 310 Ma, welches wegen der idiomorphen Formen und Zonarbaue der gemessenen Monazite am ehesten als Bildungsalter des granitischen Ausgangsgesteins zu deuten ist. Granittypologische Vergleichbarkeit ist gegeben mit einigen (allerdings weniger deformierten) sauren Granitgeröllen im Flysch der Karpathen (HANZL et al., 1999). Generell wäre hier festzuhalten, dass saure I-Typ-Granite und Granodiorite mit oberkarbonischen Altern im Basement der Alpen und Karpathen einige Verbreitung besitzen (z.B. FINGER et al., 1993, 2003).

Blatt 57 Neulengbach

Siehe Bericht zu Blatt 40 Stockerau von B. HUMER & F. FINGER.

Blatt 66 Gmunden

Bericht 2001–2003 über paläontologische Untersuchungen der triassischen und jurassischen Brachiopodenfauna auf den Blättern 66 Gmunden, 94 Hallein, 95 St. Wolfgang, 96 Bad Ischl 102 Aflenz und 118 Innsbruck

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(Auswärtiger Mitarbeiter)

The brachiopod studies in 2001–2003 were made in the framework of the projects no. 205/00/0944 and no. 205/03/1123 of the Grant Agency of the Czech Republic (Research Program of the Institute of Geology ASCR CEZ: Z3 013 912). Field works in 2001 and 2002 were partially supported by the financial help of the Austrian Academy of Sciences. The field works with H. LOBITZER in the UNESCO World Heritage area Hallstatt-Dachstein/Salzkammergut were made thanks to the field support of the Czech-Austrian projects KONTAKT no. 2001-4 and no. 2003-2.

The brachiopod study of 2001 was focused on the famous Liassic locality Kratzalpe NW of the Kratzspitz (elev. p. 1759 m) in the northern part of the Hagengebirge near Golling, and on the vicinity of Hallstatt. Kratzalpe was studied and described by KRAFFT in 1897 and has been

known since due to a rich Lower and especially Middle Liassic ammonite and brachiopod fauna.

Grey crinoidal Hierlatz-type limestones were collected on the Tannhausberg in an altitude of ca. 1060 m, near the touristic path leading to Kratzalpe. They yielded the Sinemurian assemblage consisting mostly of zeilleriid brachiopods. The most common brachiopod species were there *Zeilleria stapia* (OPPEL), *Zeilleria mutabilis* (OPP.), *Bakonythyris ewaldi* (OPP.), *Lobothyris punctata* (SOW.), *Liospiriferina obtusa* (OPP.), *Liospiriferina alpina* (OPP.), *Liospiriferina angulata* (OPP.), *Calcirhynchia plicatissima* (QUENST.), *Prionorhynchia greggini* (OPP.) and *Prionorhynchia fraasi* (OPP.).

The specific diversification of local brachiopod assemblage seems relatively poor compared to that of the classical locality of Hierlatz Limestone on Hierlatz near Hallstatt. The near-by locality Hieflalpe from where KRAFFT mentioned Hierlatz Limestone with similar rich brachiopod fauna was visited also in 2001 but the fossiliferous limestones were not traced. Red Pliensbachian micritic limestones of Kratzalpe area are famous thanks to their ammonite fauna, monographed by ROSENBERG in 1909. Their best occurrences are to be found just on the Kratzalpe and on the northern bottom of the Tannhausberg (near the highway) and are characterized except ammonites by smooth brachiopods as *Apringia paolii* (CANAV.), *Orthotoma apenninica* (CAN.), *Liospiriferina* aff. *alpina*

(OPP.), *Bakonyithyris* cf. *pedemontana* (PARONA) and by big specimens of a leading terebratulid *Securithyris adnethensis* (SUESS).

Also sampling in the Dachstein Limestone of the Hochschwab was completed in 2001. The brachiopod list from the SE slopes of the Karlhochkogel (elev. p. 2096 m) was enlarged and contains now the following species, incl. some Koessen forms: *Rhaetina pyriformis* (SUESS), *Sinuocosta emmrichi* (SUESS) ssp. n., *Fissirhynchia fissicostata* (SUESS), "*Rhynchonella*" aff. *misella* BITTN., *Sinuocosta* cf. *bittneri* (DAGYS), *Zugmayerella koessenensis* (ZUGM.), *Laballa suessi* (ZUGM.), very common *Oxycolpella eurycolpos* (BITTN.), *Neoretzia superba* (SUESS), *Hungarispira lorezti* (BITTN.), *Schwagerispira fastosa* (BITTN.) and *Zeilleria austriaca* (ZUGM.). In a large debris field below the Fölzalm except common but fragmentary *Halorella amphitoma* (BRONN) only *Halorelloidea rectifrons* (BITTN.) was found. Both localities are of Norian age.

The aim of the field works made in cooperation with H. LOBITZER (Geological Survey, Vienna) in the Hallstatt vicinity was to check the present situation of the old well-known localities of Mesozoic brachiopods in the area between Hallstatt and Gosau. The classical localities of the Anisian Schreyeralm Limestone on Schreyeralm and Schiechlinghöhe NW of Hallstatt are still well accessible and yield a not very numerous but characteristic well-preserved brachiopod fauna such as *Mentzelia ptychitiphyla* (BITTN.), *Norella refractifrons* (BITTN.) and the most common *Pexidella marmorea* (BITTN.). Several new Liassic localities were ascertained in 2001 and 2002 SW of Hallstatt in the environs of Mitterwand and Klauskögerl. The Hierlatz Limestone yielded there prevalingly terebratulids (*Lobothyris andleri* (OPP.)) and zeilleriids. Among the rhynchonellid and spiriferinid species *Prionorhynchia polyptycha* (OPP.), *Calcirhynchia plicatissima* (QUENST.), *Cuneirhynchia retusifrons* (OPP.), *Liospiriferina obtusa* (OPP.) and *Liospiriferina alpina* (OPP.) were quite common. The assemblage is of Upper Sinemurian age and differs from that of Hierlatz above all in the relative minority of coarse-ribbed rhynchonellids. Our later samplings in the area of Mitterwand (Dürrenalpe) did not yield any Liassic brachiopod species that could point to a level younger than Upper Sinemurian. One of the classical Middle Jurassic sites of the „Klausschichten“ SW of Hallstatt in the vicinity of the Klausalpe could not be found in 2001. According to old reports, the locality was already originally very small and not easy to be traced. The position of the second locality Mitterwand (Dürrenalpe) was not precisely described in the older literature. It is possible, however, to find there several isolated occurrences of grey and red biosparites with manganese spots or micrites with crinoid particles containing neither numerous nor extremely well-preserved terebratulids and rhynchonellids, well-determinable ammonites are practically absent. Among new finds of Middle Jurassic brachiopods on the Mitterwand, the following characteristic species should be mentioned: *Septocurella* (?) *defluxa* (OPP.), *Apringia atla* (OPP.), *Striirhynchia subechinata* (OPP.), *Striirhynchia berchta* (OPP.), *Capillirhynchia bretoniaca* (OPP.), *Karadagithyris gerda* (OPP.) and "*Terebratula*" *fyglia* OPP. They all give evidence of the Bajocian–Bathonian age of the sampling sites.

The classical locality of the Hierlatz Limestone on SE slopes of the Feuerkogel (elev. p. 1964 m) on the Dachstein Plateau showed biosparitic white and red crinoid limestones containing a brachiopod fauna with the most frequent species *Cirpa latifrons* (STUR in GEYER), *Prionorhynchia polyptycha* (OPP.), *Prionorhynchia fraasi* (OPP.), *Prionorhynchia greppini* (OPP.), *Calcirhynchia* (?) *plicatissima* (QUENST.), *Liospiriferina alpina* (OPP.), *Liospiriferina obtusa* (OPP.), *Zeilleria mutabilis* (OPP.), *Zeilleria alpina* (OPP.), *Bakonyithyris ewaldi* (OPP.) and *Lobothyris* ex gr. *punctata* (SOW.). This assemblage is characteristic of the Upper Sinemurian age. The red micritic fissure fillings in the section represent a most probably high-

er stratigraphical level and contain a different brachiopod assemblage showing on average smaller specimens. Such taxa were neither figured nor described in GEYER's classical monography on Hierlatz brachiopods (1889). Even if we found no stratigraphically important ammonite fauna in these micrites, some brachiopod species could indicate already the Pliensbachian (?) level: rhynchonellids *Prionorhynchia* (?) *flabellum* (MENEH.), *Pisirhynchia pisoides* (ZITT.), *Gibbirhynchia* sp. and a terebratulid *Phymatothyris cerasulum* (ZITT.), which was ascertained for the first time on Hierlatz by A. VÖRÖS already in 1994. The Liassic brachiopods from some other localities on the Dachstein Plateau (Wildkarkogel, N. Ochsenkogel) and those from Mitterwand are very similar to each other, the rhynchonellid and terebratulid species prevail, spiriferinid species are scarce (ca. 15%). The most common among the rhynchonellids are: *Prionorhynchia fraasi* (OPP.), *Prionorhynchia polyptycha* (OPP.), and *Calcirhynchia* (?) *plicatissima* (QUENST.), among the terebratulids *Lobothyris* ex gr. *punctata* (SOW.), *Zeilleria mutabilis* (OPP.), *Zeilleria stapia* (OPP.) and *Zeilleria alpina* (GEYER). Smooth species like *Liospiriferina alpina* (OPP.) and *Liospiriferina obtusa* (OPP.) occur commonly among spiriferinids. Ribbed spiriferinids are rare (*Dispiriferina*). The assemblages are of Sinemurian age and are very similar to those at the classical locality Hierlatz or to the lower assemblage at Erlakogel near Ebensee.

The locality at the top of Erlakogel (elev. p. 1575 m) NE of Ebensee was shortly visited in 2002. It yielded a rich brachiopod fauna in 2 different horizons. White, fine biotrital limestones and red micrites with white crinoid fragments near the mountain top contain the following species as the most frequent ones: *Calcirhynchia* (?) *plicatissima* (QUENST.), *Cuneirhynchia cartieri* (OPP.), *Prionorhynchia fraasi* (OPP.), *Liospiriferina alpina* (OPP.), *Liospiriferina* cf. *semicircularis* (BÖSE), *Dispiriferina* aff. *segregata* (DI STEF.), *Lobothyris andleri* (OPP.), *Zeilleria mutabilis*, *Zeilleria stapia* (OPP.) and *Zeilleria* aff. *sarthacensis* (D'ORB.). The character of this assemblage supports Upper Sinemurian age. Topographically lower occurring white and pink biosparitic crinoid limestones yielded "*Terebratula*" *schlosseri* BÖSE, "*Terebratula*" *gracilicostata* BÖSE, *Zeilleria thurwieseri* (BÖSE), *Cirpa* aff. *subcostellata* (GEM.), *Calcirhynchia fascicostata* (UHLIG), "*Spiriferina*" cf. *oxygona* EUD.-DESL. and *Bakonyithyris* cf. *ovimontana* (BÖSE). Especially the first 3 species are characteristic of the horizon and prove its Pliensbachian age. They were all established by BÖSE (1897) and originate from Kramsach in Tirol, where the Pliensbachian age was well documented by the accompanying ammonites.

The main point of the field works in 2003 was sampling of brachiopods near the Triassic/Jurassic boundary, where the global reduction of marine assemblages took place. Terebratulids known from the Kössen facies inside the Dachstein Limestone in the old quarry near Knerzenalm (N 47 40 38 / E 13 43 37) not far from Blaa Alm were based on internal structures proven as *Rhaetina gregaria* (SUESS). I collected the brachiopod material at some well-known Triassic/Jurassic boundary sections and also at new localities. The classical locality of the Kössen Beds in the Kendlbachgraben in the Osterhorn Group in Salzburg had suffered a large landslide some years ago, which covered the fossiliferous uppermost parts of the section (N 47 40 56 / E 13 21 53), where *Fissirhynchia fissicostata* (SUESS), *Zeilleria norica* (SUESS) and *Oxycolpella oxycolpos* (SUESS) occur. In Kendlbachgraben and in the near-by Tiefengraben I found also *Rhaetina pyriformis* (SUESS) and *Zugmayerella* sp. Several new boundary localities in the vicinity of Hinterriss in Tyrol (Vorderskopf, Altjoch, Schlossgraben etc.) were recently discovered by KMENT (Bad Tölz) who published his study of the local Hettangian and Lower Sinemurian ammonites in 2000. I collected brachiopods mostly in the Rhaetian part of his sections, the Hettangian *Lobothyris delta* (NEUM.) was ascertained only in the Hettangian grey marls of the Kendl-

bach Formation SE of the Vorderskopf top (elev. p. 1858 m) NW of Hinterriss („Vorderskopf 2“ in Kment, 2000). The Kössen Beds near the Altjochalm ENE of Hinterriss (N 47 28 59/E 11 30 17) yielded the rich brachiopod fauna, accompanied with pelecypods and rare ammonites: *Fissirhynchia fissicostata* (Suess), "*Rhynchonella*" *subrimosa* (SCHAFFH.) sensu SUESS (common), *Rhaetina pyriformis* (SUESS), *Rhaetina* sp., *Sinucostra emmrichi* (SUESS), *Zugmayerella koessenensis* (ZUGM.), *Zeilleria norica* (SUESS), *Zeilleria austriaca* (ZUGM.) and *Oxycolpella oxycolpos* (SUESS). The characteristic Rhaetian species *Austrirhynchia cornigera* (SCHAFFH.) was not found. The Kössen marls near the forest road in the Schlossgraben E of Hinterriss (N 47 28 32/E 11 28 55) yielded poorly preserved *Choristoceras* sp. and a good collection of *Fissirhynchia fissicostata* (SUESS), "*Rhynchonella*" *subrimosa* (SCHAFFH.) and *Sinucostra emmrichi* (SCHAFFH.). Nice spec-

imens of "*Rhynchonella*" *subrimosa* (SCHAFFH.) were found also in the dark-grey micritic limestones of the Kössen Formation between Tölzer Hütte and Schönberg, NE of Hinterriss. The local section was described already in 1960 by ULRICH.

Dark-grey micritic limestones and marls of the Kössen Formation are well developed in the Ampelsbach valley NE of Achenkirch. They contain the characteristic Kössen terebratulid species *Rhaetina gregaria* (SUESS), which is relatively rare in the Karwendel basin. Just in the river ca. 100 m from the eastern end of Leiten the passage into the Lowermost Liassic greyish sandy limestones and marls is to be followed. These sandy marls yielded partially damaged *Callospiriferina haueri* (SUESS) and terebratulids (*Lobothyris delta* (NEUM.) and *Lobothyris* sp.

Blatt 94 Hallein

Siehe Bericht zu Blatt 66 Gmunden von M. SIBLÍK..

Blatt 95 St. Wolfgang

Siehe Bericht zu Blatt 66 Gmunden von M. SIBLÍK..

Blatt 96 Bad Ischl

Siehe Bericht zu Blatt 66 Gmunden von M. SIBLÍK..

Blatt 102 Aflenz

Siehe Bericht zu Blatt 66 Gmunden von M. SIBLÍK..

Blatt 118 Innsbruck

Siehe Bericht zu Blatt 66 Gmunden von M. SIBLÍK..

Blatt 178 Hopfgarten in Deferegggen

Bericht 1999 über geologische Aufnahmen auf Blatt 178 Hopfgarten in Deferegggen

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Die Grenze des Kartiergebietes verläuft im Norden entlang des Kamelisenbachs zum Roten Kinkele (Rotes Gingele), weiter bis zur Graterhebung bei 2827 m ü.NN im Osten und über den Grumauerberg hinunter zum Villgra-

tenbach, der die Grenze im Süden bildet. Im Westen stellt der Kartenrand die Grenze dar.

Paragneis ist das dominierende Gestein, das Granat, Staurolit und Kyanit enthalten kann. Dazwischen treten Bänder von Glimmerschiefer, Kalksilikatfels, Quarziten und vereinzelt auch Marmor auf, der oft in Verbindung mit einem Grafitschiefer steht. Weniger verbreitet ist Orthogneis (Augengneis). Weiters treten auch Quarzknödel auf, bei denen es sich um eingescherte Quarzklüfte handelt.