dagegen unsortiert und zeigen keine Einregelung der Komponenten. Südwestlich von Rappoltenkirchen treten die Konglomerate in der Nähe von Pielacher Tegel auf. Sie sind hier deutlich feinkörniger (Feinkies), auch fehlt Melker Sand in der unmittelbaren Nachbarschaft.

Undifferenzierter Flysch (Kreide bis Eozän)

Da hier die Kartierung der Molassesedimente im Vordergrund steht, wird an dieser Stelle nicht zwischen den verschiedenen Gesteinen der Nordrandzone unterschieden. Diese umfassen im Arbeitsgebiet in erster Linie Kalksandsteine und Schiefer (Tonsteine und Mergel) der Unterkreide, aber auch rote und graue Tonsteine und Kalksteine (Neokomkalk nach GÖTZINGER et al., 1952) und zum Teil dickbankige Sandsteine, die möglicherweise anderen Deckeneinheiten (Greifensteiner Sandstein, Laaber Schichten) zugeordnet werden könnten. Eine Nannoplanktonassoziation aus einem hellen Tonmergel nahe des Elsbaches in direkter Nachbarschaft zum Buchberg-Konglomerat ergab ein mitteleozänes Alter (NP15/NP16, oberes Lutetium, unteres Bartonium, Bestimmungen durch ĆORIĆ). Bei tiefgründiger Verwitterung von dickbankigen Sandsteinen ist eine Unterscheidung vom Melker Sand nur durch das Vorhandensein kleiner Sandsteinplattenreste möglich. Für einige Proben werden zur Zeit Schwermineralanalysen durchgeführt (siehe oben).

Solifluidale Flysch-Überschotterung

Bedingt durch die steilen Hänge im Flysch (relativ zu den von Molassegesteinen aufgebauten Bergen) und die Mischung von Tonsteinen, Mergeln und kompetenten Sandsteinen kommt es im Grenzbereich Molasse-Flysch zu weiträumigen Überschotterungen. In einigen Bereichen treten auch großflächige Rutschungszonen mit buckeliger Morphologie auf. Hierdurch werden die häufig weniger kompetenten Molassegesteine (insb. Pielacher Tegel, Melker Sand) überdeckt und eine exakte Grenzziehung ist auch aufgrund fehlender morphologischer Kriterien nicht möglich. Hauptunterscheidungsmerkmal zum solifluidalen Lehm (siehe oben) ist der sehr hohe Anteil an kleinen Bruchstücken von Flyschsandstein. Für die Kartierung im Maßstab 1:10,000 wurden diese Flächen daher extra ausgewiesen.

Tektonik der einzelnen Arbeitsgebiete

Es handelt sich bei diesen Interpretationen um vorläufige Überlegungen, die bei fortschreitender Kartierung und Vorliegen weiterer biostratigraphischer Ergebnisse revidiert werden können, bzw. müssen.)

Siegersdorf (57/3)

Neben dem Robulus-Schlier kommen in diesem Teil von ÖK 57 nur Oberflächensedimente vor (Löss, solifluidaler Lehm, Schwemmfächer). Die kartierten Bereiche mit Robulus-Schlier sind Teil des nordwestlichen Muldenschenkels einer Muldenstruktur, die sich von Grabensee im Südwesten bis zum auf Blatt Tulln befindlichen Auberg im Nordosten erstreckt (siehe Kartierbericht 2005).

Kogl/Rappoltenkirchen (57/4, 57/9)

Östlich der Kleinen Tulln ist der tektonische Bau der Molassesedimente wesentlich komplizierter als westlich davon. Zwar streichen auch hier die Schichten WSW–ONO, durch die Einschuppung eines Flyschkörpers sind die einzelnen Gesteinseinheiten hier aber durch Störungen voneinander abgegrenzt. Auf der anderen Seite fehlen wichtige Einheiten. So grenzen von NW nach SE Buchberg-Konglomerat an Flysch, Flysch an Pielacher Tegel und Melker Sand, sowie dieser wiederum an Flysch. Östlich von Kogl befindet sich eine Blattverschiebung, die den östlichen Bereich um ca. 400 m nach Nordwesten hin verschoben hat. Südlich von Kogl scheint, im Gegensatz zu den östlich anschließenden Gebieten, keine Flyschschuppe aufzutreten. Im Luftbild lassen sich nördlich von Kreuth drei Lineamente erkennen, die auf Störungszonen im Untergrund (Buchberg-Konglomerat und Flysch) hinweisen. Verbreitung der lithologischen Einheiten, gerade Erstreckung und geographische Ausrichtung des Tals des durch Rappoltenkirchen fließenden Baches lassen auf das Vorhandensein einer weiteren größeren Störung entlang des Bachverlaufes schließen.

Elsbach (57/5)

Während sich der westliche Anteil um Gerersdorf aufgrund des Einfallens nach Nordwesten noch dem südöstlichen Muldenschenkel der Grabensee-Auberg-Mulde zuordnen lässt, ist der Bereich östlich und südlich der Hohen Warte bis zur Flyschgrenze durch zahlreich Bruchschollen und Schuppen gekennzeichnet. Deutlichstes Element ist eine Störung, die von Elsbach Richtung Klosterberg senkrecht zum Generalstreichen verläuft. Sie ist zudem morphologisch durch einen Taleinschnitt und entlang des Elsbaches durch eine Steilkante gekennzeichnet. Auch verläuft der Elsbach hier auf der ungewöhnlichen Gleithangseite, weshalb es sich warscheinlich um ein relativ junges oder in jüngerer Zeit aktives Strukturelement handelt. Der weitere Verlauf des Elsbaches bis zur Tiroler Siedlung grenzt den Flysch von den Molassesedimenten ab und stellt deshalb wahrscheinlich selbst eine Störungszone dar. Nordöstlich der Klosterberg/Elsbach-Störung (also südlich von Ried am Riederberg) sind Melker Sand mit Ollersbacher Konglomerat zwischen dem eigentlichen Flysch und einer Flyschschuppe im Westen eingeschuppt, bevor diese wiederum mit einer Störung (Überschiebung?) gegen Robulus-Schlier grenzt. Südwestlich anschließend befindet sich auf der rechten Elsbachseite eine Scholle mit Buchberg-Konglomerat, das entlang der oben erwähnten Störungen relativ nach Südosten versetzt wurde. Das Ausbissbild lässt auf ein Einfallen nach Nordwesten schließen. Der südöstlich der Hohen Warte anstehende Ältere Schlier erscheint ohne offensichtlichen stratigraphischen Zusammenhang mit den benachbarten Gesteinen und wird deshalb von Störungen begrenzt eingezeichnet. Der derzeitige Stand der Kartierung lässt die Gesteine südlich und östlich von Öpping in Ost-West-Richtung streichen. Nördlich der Flyschgrenze (Überschiebung) folgen hier Aufschlüsse mit Melker Sand, Pielacher Tegel und wieder Melker Sand, wiederum gefolgt von einer Flyschsandsteinschuppe und erneut Melker Sand und Pielacher Tegel.

Bericht 2006 über geologische Aufnahmen in der Flysch- und Klippenzone auf Blatt 57 Neulengbach

A. SLACZKA
(Auswärtiger Mitarbeiter)

The surveyed area is situated in the western part of the Flysch Zone of the Wienerwald in the area of the valley of the river Tulln (Laaben-Bach). It is bounded to the East by this valley, to the West by the edge of the topographic map ÖK57 Neulengbach, and reaches from the road Innerfürth – Oberkühberg – Hochgschaid (North) to the Gernbach valley (South). It embraces 19 km^2. The area is hilly, covered mainly by meadows and forests with thick quaternary deposits and poor outcrop situation. Exposures of older substratum are mainly situated along small creeks in the side valleys and the Laaben river.

The mapped area belongs to the Greifenstein nappe in the northern and central part and to Laab nappe in the southernmost part. Between these two nappes the narrow "Hauptklippen Zone" is located. Within the Greifenstein Nappe, the Altlengbach and Greifenstein Formations, and within the Laab Nappe the Hois Subformation and the Kaumberg Formation were hitherto distinguished.

During field work dozens of samples were collected to improve the stratigraphy. The ages of the rocks could be based on 44 samples for nannofossils, which were kindly determined by H. EGGER, 13 heavy mineral samples (det. W. SCHNABEL) and 25 samples for foraminifera (det. A GASINSKI, Kraków; Poland). Additional 27 thin-sections have been made for microfacial reasons.

The mapped area outlined above is built up by 3 main tectonic units. From North to South the Greifenstein Nappe, the Hauptklippen Zone and the Laab Nappe.

Greifenstein Nappe

Within the Greifenstein nappe several litostratigraphic units could be distinguished:

- Zementmergel Beds (Late Santonian – Campanian)
- ? Perneck Formation (Campanian – ?Maastrichtian)
- Altlengbach Formation (Late Campanian – Maastrichtian – Early Paleocene)
- Greifenstein Formation (Paleocene – Early Eocene)
- ? Irenental Formation (Early Eocene)

Zementmergel Beds

They are represented by light grey to grey or whitish hard marls and marly limestones in banks from few do tenth of centimetres. They are homogenous or laminated and display fucoids. Often they are sandy. The marls are intercalated by grey laminated, fine- to medium grained, thin to medium-bedded, sometimes thick-bedded sandstones. Some sandstones display convolutions. Thin intercalations of grey and green shales and marly shales occur. Sandstones increase to the top of the sequence. On its basis the nannoplankton points to Late Santonian and Campanian ages. Near the village of Hochgschaid the observed thickness can reach up to 250 meters.

Zementmergel are exposed only in a few places: south of Hochgschaid, south of Brand, and probably near Oberkühberg hamlet where on a field, WSW from this hamlet, there are several fragments of marls and strongly calacareous sandstones. The transition to the Altlengbach Formation is not clearly exposed. Observations from the Laabenbach river in Audorf imply, that the amount of shales increase and between these two formations the transitionional zone (?Perneck Formation) is developed. The age of the Zementmergel Beds is Santonian to Campanian.

Transitional Zone
("Perneck Formation" = "Oberste Bunte Schiefer")

To this formation were tentatively included successions exposed in axis of anticlines along Laabenbach near Audorf, which contain nannofosils of Campanian age. Although there are no red shales, they contain quite frequent intercalations of marly layers and are situated beneath thick-bedded sandstones of the Altlengbach Formation This succession is represented by grey and green shales and marly shales, medium- and thin bedded, fine- and middle grained, laminated, blue-grey calcareous sandstones, sporadic thick bedded, and locally by layers of white, pelitic, laminated limestones.

Due to refolding, the real thickness of this zone is difficult to establish, but it exceeds 20 meters.

Probably to the "Perneck Formation" or more probably to the uppermost part of the Zementmergel Beds a succession belongs in a core of an anticline between Wöllersdorf and Kottinggraben hamlet. It is composed of thin- and medium bedded, laminated, calcareous sandstones, grey, sporadic black shales and medium-bedded light grey sandy limestones and thick-bedded (up to 4 meters) grey marls of Campanian and Campanian–Maastrichtian ages.

Altlengbach Formation

This Formation builds up a great part of the mapped area and it alternately contains complexes of thick-bedded sandstones and complexes of medium-bedded sandstones with intercalations of marls and shales.In the eastern part, North of Laaben, the Altlengbach Formation can be divided into three parts:

- Lower part: Mainly thick-bedded sandstones (AS1 = Rossgraben Subformation).
- Middle part: Mainly medium-bedded sandstones and pelitic layers (AS2 = Ahornleiten Subformation), with thick sandstones at the top (AS3 = Kotgraben Subformation).
- Upper part: with frequent pelitic layers

These sequences may correspond with the subformations of the Altlengbach Formation established in Western Lower Austria and Upper Austria (e.g.: .EGGER, H., 1995: Die Litotratigraphie der Altlengbach-Formation und der Anthering-Formation im Rhenodanubischen Flysch (Ostalpen, Penninikum). – N. Jb. Geol. Paläont. Abh., **196**, 69–91).

Towards the west of the mapped area the amount of sandstones increases and a classification in individual lithological sequences is not possible.

The sedimentation of the Altlengbach Formation started, at least locally, during the Late Campanian. It is suggested by the occurrence of the Late Campanian nannofossil assemblages within lower part of the complex of thick bedded sandstones in the Laabenbach near Audorf. The main part of this formation belongs, however, to the Maastrichtian and the highermost part to the Early Paleocene.

Complex of thick bedded sandstones

It is represented by thick-bedded sandstones with subordinate intercalations of thin- to medium-bedded sandstones and locally thicker intercalations of shales.

Generally two types of thick bedded sandstones can be distinguished. The most frequent type is represented by strongly calcareous sandstone beds usually up to one meter thick, sporadically up to 3 m, which splits up into thick laminae up to dozen or so centimetres thick Locally there is plant detritus and shally clasts on the surface of the laminae. The sandstones are generaly medium-grained, although they can display gradation of grains in the lowermost part. In some places small erosional channels are visible. This graywackes contain besides sub-angular and angular, poorly sorted grains of quarz and feldspar (orthoclase and plagioclase), mica, glauconite, chlorite and mudstone clast. Typical is the content of garnet in the heavy mineral spectrum. Bottom current structures imply that clastic material was derived from NE and ENE. Locally trace fossils are visible.

The second type of the sandstones is generally thicker, more coarse-grained with better developed gradation Poorly sorted graywackes consist of angular to sub-rounded grains of quarz and in smaller amount of feldspar and rock particles. Locally they contain fragments of shells (?*Inoceramus, Lithotamnium*) and large foraminifera. Relatively often the bottom of the beds is uneven with erosional channels and sometimes beds are amalgamated. Pelitic intercalations are rare.

In places there are intercalations of single layers of medium-bedded, pelitic, rarely bioclastic, light-grey limestones, often with fucoides. Within the thick-bedded complex there are intercalations up to dozen and so metres of medium-and thin-bedded sandstones with grey shales and marly shales.

The complex of thick-bedded sandstones, which is coming directly on Zementmergel Beds or Perneck Formation corresponds to level AS1 (SCHNABEL, W., 1992:. Bericht 1989–1991 über geologische Aufnahmen in der Flyschzone auf Blatt 57 Neulengbach. – Jb. Geol. B.-A., **135**, 683–685.) and to the Rossgraben Subformation (EGGER, 1995). The thickness of this sandy level can reach 400 meters. In the Laabenbach profile between the villages Laaben and Audorf it is only around 200–250 m. This could be an effect of tectonic shortage.

Marls within the thick-bedded complex may probably contain reworked older nannoplankton. Within the succession of thick bedded sandstones in the creek north from Brand, a few meters of marls are exposed, with a bed of light grey limestone, containing an assemblage of nannofossils of mid-Coniacian–Campanian age. Unfortunately direct contact with surrounding rocks is not visible.

Complex of sandstones, marls and shales

The thickness of this complex is up to 200 meters and represented by medium- and thin-bedded, strongly calcareous, fine and medium grained calcareous sandstones, intercalated by light to dark grey shales, marly shales and marly mudstones. The thickness of the latter can reach three metres. Thick-bedded sandstones are subordinate, however in places they show complexes tens of metres thick. It seems, that the amount of thick-bedded sandstones increases towards West. Sandstones are usual laminated (B,C,D of Bouma cycle) in some cases convoluted. Thicker beds display gradation in the lower part and small erosional channels. Sporadically slump structures occur. Current structures and cross-bedding show that clastic material was supplied from ENE and NE. For this part of the Altlengbach Formation layers of medium- and thick-bedded (more than 1 m), white, pelitic limestones and marly limestones are characteristic.

The Maastrichtian age of the Middle Part is confirmed by nannoplankton data.When this succesion is distinct and lies directly on AS1 level, it can be correlated with level AS2 and generally with Ahornleiten SubFormation, the thick bedded complex on the top of it with the Kotgraben Subformation and level AS3.

Complex of marls, shales and sandstones

In this succession pelitic deposits increase; they are represented by light to dark grey, green shales (in smaller amount) and marly shales with intercalation of thin- and medium-bedded, laminated, fine-grained calcareous sandstones. Thicker sandstones beds are very sporadic. The amount of sandstones increases towards the top of the sequence. Locally medium-bedded, medium grained glauconitic sandstones occur. Besides glauconite they contain grains of quarz, feldspar (orthoclase and plagioclase), chlorites, mica and single small shells of foraminifera in fine grained calcareous matrix.

This complex is well developed only along the Laabenbach north from the village of Laaben, where it reaches a thickness of 150 m. Further to the West, e.g. in a creek North of Brand, the succession beneath the Greifenstein Formation contains numerous intercalations of medium- and thick-bedded, laminated, calcareous sandstones with garnet maxima in the heavy mineral spectra and the pelitic rocks diminish and the the succession becomes similar to the previous complex.

Greifenstein Formation

This formation is represented by complexes of thick- and very thick-bedded sandstones, often amalgamated with erosional boundaries. The sandstones are coarse- to medium grained with visible gradation (ABCD cycles of Bouma), frequently of fluxoturbidity type.

More fine grained sandstones consist mainly of moderately rounded quartz, in less amount of glauconite and small mica. Feldspar is rare. In some cases original outlines in quartz are difficult to see; the secondary quartz results in interlocking, sutured grain boundaries. Coarser sandstones are moderately to poorly sorted and consist of rounded to subangular grains of quartz, rock particles (fine-grained quartzite, mudstone), rare mica and feldspar. Generally they display a small amount of fine grained matrix. The matrix is sporadically calcareous, and becomes similar to sandstones of the Altlengbach Formation However they still contain plenty of zircon in the heavy mineral spectrum, typically for the Greifenstein sandstones. This is well visible in a transition zone between the two formations in the creek above Brand village. The shales and marly shales occur in sporadic and thin intercalations.

The Greifenstein Formation reaches a total thickness up to 500–600 m near Oberkühberg hamlet, but in a fold more to the South it does not exceed 200 m. In this fold, field data suggest that towards the west the typical Greifenstein sandstones pinch out facially. Probably the Greifenstein sandstones disappear further to the south, as they were not found near Eocene deposits South of Laaben. However, that could be an effect of tectonic reduction.

Data, based on foraminifera assemblages (samples from Laaben and Hochgscheid), confirm that the Greifenstein Formation represents the Paleocene.

"Irenental Formation"

Pelitic successions were included to this formation, which are exposed in the Laabenbach, south of Laaben, its westward prolongation, and in the area near Bacher hamlet to the West. These sediments contain nannoplankton of Early Eocene and Late Paleocene. It is represented by grey, green and black shales, marly shales and marly mudstones, often turbiditic, more than 1 m thick, intercalated by thin- and medium-bedded, laminated, grey sandstones. Visible thickness is about 60–70 m. The real one is difficult to establish due to tectonism. It cannot be excluded that these pelitic sediments replace the Greifenstein sandstones southwards.To this succession probably belongs a complex of thick-bedded sandstones, dozen or so meters thick, adjacent to the pelitic succession. The detritic material of these sandstones was transported from West to East, in contrast to the material in the Altlengbach-Formation, which came from the East.

Tentatively, to this formation similar sediments exposed locally along the southern boundary of the Greifenstein Formation south of Barbaraholz hamlet were included, despite the fact, that preliminary data based on a foraminifera and nannoplankton assemblage imply Paleocene age. They may also represent the higher, pelitic part of the Altlengbach Formation; additional checks are necessary.

Laab nappe

In the mapped area the Laab nappe appears only in its southernmost part South of the Hauptklippen Zone. It is represented by the Kaumberg Formation and the lower part of the Laab Formation (Hois Subformation). Between them marly pelitic-psammitic sequences are locally exposed.

Kaumberg Formation

The Kaumberg Formation is exposed along Gernbach and its southern tributaries. This Formation is represented by red, green, grey greenish shales intercalated by thin- to medium-, fine-grained, laminated calcareous, greenish sandstones. They are lithic, moderately sorted, contain sub- and poorly rounded quartz and fragments of calcareous mudstones, glauconite and rarely feldspar. Fine calcareous matrix exists. Some grains display thin calcareous envelope. In the lower part red shales disappear and green shales prevail. Locally the Kaumberg Formation is strongly folded and in one of these zones, in the middle part of the formation, a sequence of black shales and thin-bedded, dark, quarzitic, laminated sandstones appears, a few meters in thickness.

The shales of the Kaumberg Formation contain an assemblage with mainly arenaceous foraminifera of Maastrichtian age.

"Klamm Beds"

With this provisional term a succession has been designated, several meters thick with calcareous rocks, exposed in Laabenbach in Klamm (near house no 12), below Hois Subformation. It is represented by dark grey marls, whitish on the surface, up to 70 cm and thick, greenish, calcareous sandstones, in lower part quarzose which pass upwards into marls.

The age, based on calcareous nannoplankton and foraminifera, is Campanian–Maastrichtian.

Probably in the similar position i.e. below the Hois Formation, is an exposure of dark-grey to black shales and graded marly mudstones intercalated by thin-bedded, fine grained, laminated, calcareous sandstones. It is situated in a small creek farther to the West above Greger hamlet. Sporadically there are thin (1,5 cm) intercalations of greenish muddy shales. This marl contains poor assemblages of arenaceous foraminifera which can point to a Paleocene age.

The position of the calcareous sequences of Maastrichtian age is discutable. They can represent a succession between the Laab and Kaumberg Formations, which, as represented by more incompetent beds, were partially squeezed out below the competent complex of the Laab Formation. On the other hand it can, together with the Kaumberg Formation, represent a separate tectonic unit.

However, in a similar position, between Kaumberg and Svodnice Formations, within the Bile Karpaty nappe (West Carpathians), a calcareous sequence (Antoninek Formation) was locally observed, also Campanian–Maastrichtian in age (PICHA et al., 2006: AAPG Memoir, **84**, 49–175). Bile Karpaty Unit is regarded to be the eastern prolongation of the Laab nappe (ELIAS et al., 1990: Comparison of the Flysch Zone of the Eastern Alps and the Western Carpathians based on recent observations. – Thirty years of Geological cooperation between Austria and Czechoslovakia, Bratislava). This problem needs further researches in adjacent areas.

Hois Formation

This formation is represented on the mapped part by thick- to medium-bedded, coarse- to fine-grained, graded, quarzitic sandstones intercalated by grey to dark grey and green shales. In the exposures along the road to Klammhöhe, described in Guide-books (PREY, 1968; PREY in SCHNABEL (1993, Der Wienerwald. – Sammlung Geologischer Führer, **59**, Stuttgart), a Maastrichtian assemblage of foraminifera has been found. Redeposition of this material can not be excluded and the confirmation of the real age needs further investigation.

Hauptklippenzone

The Hauptklippenzone is a narrow, strongly tectonized zone between the Laab and Greifenstein nappes, built up generally by Jurassic and Cretaceous limestones and marls.

As was already noted, (GOTTSCHLING, P., 1966: Zur Geologie der Hauptklippenzone und der Laaber Teildecke im Bereich von Glashütte bis Bernreith, Niederösterreich. – Mitt. Geol. Ges, Wien, **58**, 23–86) the Hauptklippenzone crops out in three lenses in thesurveyed area: East of Stollberg, in Gern and in Glasshütte. Best known is the klippe partly exposed in an old quarry in Gern (PREY, 1968; PREY in SCHNABEL, 1963), however amore complete sequence is now exposed in a southern tributary of the Gernbach (Thomasberg). Blocks of the Late Jurassic limestones mentioned by PREY (1968) from Klamm are not visible any more.

The succession starts with greenish and red pelitic radiolaritic limestones, which pass over into light grey-greenish pelitic limestones with radiolarian, followed by red and greenish pelitic limestones, also with radiolaria. Up to now no age of this limestone is known, but in comparison to other klippen (GOTTSCHLING, 1966) they can represent a Kimeridgian–Tithonian age. Higher up with an erosional boundary there is a succession which starts with pebbly mudstones with *Aptychus* sp., passing into bioclastic limestones, thin pelitic limestones, sandy limestones and marls with redeposited blocks of whitish limestones, up to tens of centimeters in diameters. Higher up there are red and green marly limestones and eventually green spotted marls and marly limestones also with radiolaria. The age has not been determined yet, but from their position and development Tithonian–Neocomian age can be accepted. Few meters higher up, near a bridge, is an exposure of green marly limestones and green soft marls. Limestones display a biofacies, which can represent the higher part of the Early Cretaceous. The relation of the described sequence to the light limestones and spotted limestones of the Tithonian–Neocomian age exposed in the old quarry near Gern is uncertain, but probably they can be placed above spotted red and green marly limestones.

Late Creatceous age is represented by red shales and marly shales best exposed in a creek from Gföhl to Gern and in strongly tectonised exposures in the Laabenbach north from Glashütte and in the old quarry in Gern, where they are refolded with green and black shales. The red shales and shally marls contain nannofossils of Campanian age and foraminifera assemblages of Campanian–Maastrichtian age. In one sample from the "Gföhl to Gern" creek there are Paleocenian foraminifera. Red shales are refolded with green and black shales in several places. Green shales contain foraminifera assamblages of Maastrichtian and Paleocene age and black shales contain only piritized arenacous foraminifera and tiny radiolarians. Grey marls, which accompany red shales (Laabenbach, Glashütte, near house 38) contain foraminiferal assemblages of Maastrichtian age. Unfortunately, strong tectonization did not allow to reconstruct reliable relation between all these shales.

Red and green marls were found only in few places in higher part of the creek from Gföhl to Gern. They contain nannofossils of Campanian age and foraminifera assemblages of Late Cretaceous–Paleocene age.

Another lithofacies of the Late Cretaceous represented by grey marly shales and thin- to medium-bedded, grey sandy limestones is exposed in a southern tributary of Gernbach (Gern village, below house no 6). They contain moderately rounded quarz grains glauconite, mudstone particles and shells of foraminifera (eg. *Textularia* sp., *Globotruncana bulloides* and *Globotruncana lapparenti* among others). Similar deposits are exposed in Gernbach in Glashütte. The relation to the Late Cretaceous red pelitic lithofacies is not clear, probably it is a local lithofacies developed within red pelites. They can be also connected with the Late Cretacous marls and calcareous sandstones mentioned by H. KÜPPER (1962; Beobachtungen in der Hauptklippenzone bei Stollberg. – Verh. Geol. B.-A., 263–268.).

Further researches are need for a succession which contains medium- thin bedded calcareous sandstones found south from Hauptklippenzone near Gföhl and on the road between Stollberg castle and Gföhl .They represent graywackes with subrounded quartz and feldspar grains, mica, marl particles, calcareous grains and rare remnants of a fauna. This developement is different both from the Kaumberg Formation and the above mentioned sandy limestones.

Quaternary

Soil

The most abundant quaternary deposit is soil, which covers practically the whole mapped area except river beds. Usually it is the highest A-horizon that consists of mineral layers of maximum organic accumulation underlayed by B-horizon represented by weathered material and C-horizon represented by unconsolidated, weathered parent material. Unfortunately the last horizon is outcropping only in small areas usually on the top of hills and rarely along cart tracks or on slopes.

Terraces

They are developed along main river beds (Laabenbach, Gernbach Stössingbach), usually they are built up by fluviatile material (blocks, boulders and sand) underlined by parent rocks and covered by soil where broad terasses are developed. The height of the terraces is 2–4 m. Along tributaries of the main rivers terraces are narrow and lower.

Landslides

They occur mainly in the upper part of creeks near their sources areas, e.g. landslides south from Barbaraholz or NE from Stollberg. Smaller landslides exist along steep slopes. Usually landslides, especially bigger ones, embrace both soils and underlying rocks.

Springs

Several springs with aboundant contents of $CaCO_3$ were found. Usually they are connected with tectonized zones.

Tectonics

The rocks in the mapped area are strongly folded. Three main units could be distinguished from South to North: the Laab nappe and the "Hauptklippenzone" both overthrusting the Greifenstein nappe. The latter is internaly folded and several folds and thrust folds can be distinguished. All these stuctures are cutted by several cross faults of different range.

Laab Nappe

In the mapped area this nappe is represented only by its frontal part, monoclinally dipping towards the south and represented by the Kaumberg Formation, "Klamm Beds" and Hois Subformation, However, as it was mentioned above, there is a suggestion (SCHNABEL, 1992) that in reality two imbricated tectonit units exist: The Laab nappe sensu strictu, represented only by the Hois Subformation and a more northern unit built up by the Kaumberg Formation and what I tentatively called "Klamm Beds". More detailed studies are needed to clear up the contact between all these formations.

Hauptklippenzone

This zone is exposed in three areas:

1) Near Stollberg castle, which represent the eastern termination of a huge lens from Bernreith to Stollberg,
2) in Gern, where it forms a lens approximately 500 m long and 150 m wide and
3) in Glashütte.

Hitherto data indicate the existence of a cross-fault in Glashütte, the eastern part was displaced toward north. In the lenses, older rocks generally occupy a more northern position than the younger ones. Between these three lenses the HKZ was probably squeezed out completely and the Laab nappe is there directly overthrusted on the Greifenstein nappe.

Greifenstein Nappe

The Greifenstein Nappe is divided into several imbricated folds built up mainly of the Altlengbach Formation

In the southermost part, south from Wöllersdorf and Kottinggrab hamlet, an imbricated fold ("Stollberg-Kogelhof fold") can be recognized. This fold can be divided into generally narrow anticlinal and broader synclinal zones. The oldest (Campanian–Maastrichtian) rocks build a strongly refolded and tectonized core, which is exposed in the eastern part, along Laabenbach. Towards the west this core zone prolongs in the direction of Kottinggrab hamlet. That is proven by the existence of an exposure of grey marls with a light grey limestone layer in a creek south from Burhof hamlet. These marls contain nannoplankton of mid Coniacian–Campanian age. The inner part of the fold is generally built up by the lower part of the Altlengbach Formation (AS1), with a broad syncline which displays an overturned southern limb. The Hauptklippenzone is obliquely overthrusted on it.

The "Stollberg-Kogelhof fold" is overthrusted on the "Wöllersdorf slice", that is monoclinaly dipping towards the south with the synclinal part in SE, and is built up only of the Altlengbach Formation.

The next tectonic unit ("Malenthof fold") represents a fold with a strongly reduced northern limb of the anticline. The oldest sediments of Santonian–Campanian age are exposed in the core of anticline, near Brambach hamlet. The eastern prolongation of this core may be correlated with the refolded zone exposed in Laabenbach, on the southern outskirt of the Laaben village. In a narrow synclinal zone sediments of Eocene age are exposed, which are in direct contact with the Altlengbach Formation towards the North. Lack of Greifenstein Formation can be an effect of tectonic squeezing of the latter formation or it is absent primarily. The prolongation towards west is not clear. Towards the West, the northern boundary of the " Malenthof fold" probably runs along Brambach hamlet in the direction of Bonnleiten, up to a cross-fault. In Stössing creek its continuation is not visible. However it cannot be excluded that an overthrust plain is just not exposed in this creek or the whole fold, west from the cross-fault, is in reality a prolongation of "Malenthof fold". Is it also not clear if upper Paleocene grey and greenish marls and shales exposed near Bacher hamlet are the prolongation of the syncline with the Eocenian marls and shales, although it is probable.

"Malenthof fold" is thrusted on a slice ("Brand slice"), that dips monoclinally towards the south and is built up only of the Altlengbach Formation This scale becomes wider towards the west. It is not clear if the refolded anticlinal part, south from Sperhof hamlet is in reality the prolongation of this scale or of anticlinal part of the "Malenthof fold", as was mentioned above. It needs further works on the adjacent area situated westward. This anticlinal part, built up of Campanian–Maastrichtian pelitic sediments is good visible in the creek south from Sperrhof and in the river running to Stössing village (outside of the mapped area).

The next "Audorf fold" displays a broad refolded anticlinal zone in the eastern part, very good exposed along Laabenbach profile. This zone, where the "Perneck Formation" is exposed, probably disappears westward partly as an influence of cross-faults, and the whole fold built up of the Altlengbach Formation is monoclinally dipping southward. South from Hochgscheid once more older beds (Zementmergel Formation) appear in the frontal part. This fold can be internally imbricated if the marly complex exposed in the creek north from the Brand village really represents Campanian Zementmergel Beds.

The "Audorf fold" is overthrusted on a more northern unit, represented only by the Greifenstein Formation on the mapped area

Faults

The Greifenstein unit is cut by several cross faults of different sizes. However, some faults or their part can be discutable.

Most prominent is a fault from Hochgschaid extending southward, probably up to Kottinggrub. It is good documented in the northern part, where it terminates the eastward prolongation of the broad zone of the Zementmergel Beds. It probably continues through a breccia zone, visible in a creek from Sperrhof hamlet to SE, further to SE terminates relatively broad synclinal zone near Bacher hamlet and eventually it displaces the anticlinal part of "Wöllersdorf fold". It is also visible in the morphology. The next fault dislocates the northern boundary of "Audorf fold". Its length is unknow. Longer fault run from Waldhäuseln through Windbichl hamlet in direction of "Zur Luft". Probably this fault terminates "Brand scale" or "Malenthof fold from the West. The other more important fault extends from Buschhof in the direction of Hinterholz. Its existence is clear in the northern part where its longitudinal amplitude is around 500 meters. Probably the western termination of the anticlinal part of the "Audorf fold" is connected with the existence of a couple of cross-faults.

Another fault cuts the SE part of the Graifenstein nappe and the Hauptklippenzone near Glashütte. The size of this displacement is up to 100 metres.

Blatt 88 Achenkirch

Bericht 2005/2006 über geologische Aufnahmen im Quartär und in den Nördlichen Kalkalpen auf Blatt 88 Achenkirch

ALFRED GRUBER

Die Kartiertätigkeit im Jahr 2005 und teilweise 2006 umfasste eine Neuaufnahme der quartären Sedimente im Nordwestteil des Blattes, im Bächental und in den Tälern NE' des Demeljoches (1923 m) und des Juifen (1988 m). Von diesem Gebiet liegt bereits eine moderne Aufnahme der Festgesteine im Maßstab 1 : 10 000 von AXEL SPIELER (1994, 1998) vor. Weiters wurden in Teilbereichen strukturgeologische Untersuchungen durchgeführt. Das Bächental liegt in ca. gleich großen Anteilen auf vier ÖK-Blätter verteilt (ÖK 87 Walchensee, ÖK 88 Achenkirch, ÖK 118 Innsbruck und ÖK 119 Schwaz). Zum besseren Verständnis der geologischen Zusammenhänge wurde auch auf den, die ÖK 88 umgebenden Blättern kartiert.

Einzugsgebiet Bächental

Das Bächental liegt zwischen dem Rißtal im Westen und dem Achental im Osten und greift weit nach S in das Karwendelgebirge ein. Die Entwässerung erfolgt nach N zur Isar. Dieses stark verzweigte Almtal weist im äußersten Süden in der Mondscheinspitze (2105 m) den höchsten Punkt seiner Gebirgseinrahmung auf. Diese wird mehrmals von breiten und bis 1600 m hohen, sattelartigen Übergängen in die umliegenden Täler unterbrochen (Delpsjoch, Baumgarten Sattel, Grasbergsattel, Schleimssattel, Gröbner Hals und Rotwandsattel). Charakteristisch sind tief eingeschnittene Seitentäler, die teilweise dem E-W-verlaufenden Streichen der Karwendelsynklinale, teilweise ihrem Umbiegen in NE-SW-Richtung folgen.

Festgesteine

Die Festgesteinsabfolge reicht vom obertriassischen Hauptdolomit bis in die unterkretazischen Tiefwasserablagerungen der Schrambach-Formation. Die quartäre Lockergesteinsbedeckung zeigt eine große Vielfalt an glazialen, glazifluviatilen, fluviatilen und gravitativen Sedimenten.

Hauptdolomit

Der Hauptdolomit präsentiert sich als typisch hell- bis dunkelgraues, stets gut gebanktes, feinsparitisches und zuckerkörniges Gestein mit Stromatolithen, laminaren Fenstergefügen, birds eyes, Feinstlaminiten, slumping-Strukturen, intraformationellen Breccien. Dunklere und laminierte Dolomite sind meist bituminös. An verschiedenen Stellen (Hühnersbachtal, Rauchstubenalm, Pittenbach) treten stark bituminöse (Pyritwachstum) dunkelgrau-schwarze bis türkis-olivgrüne, dünnbankige bis papierdünne Dolomite und Dolomitmergel auf; Feinstlamination wechselt mit helleren, verschieden dick geschütteten Lagen (arenitisch bis siltitisch). Diese Lithotypen werden mit den Seefelder Schichten parallelisiert, einer lokalen, eingeschränkten Intraplattform-Beckenentwicklung an der Basis des Oberen Hauptdolomites.

Der Hauptdolomit tritt v.a. an den Rändern der Karwendelsynklinale auf, findet sich aber auch im Kern von sekundären, eng gefalteten, N-vergenten und teilweise durchgescherten Antiklinalstrukturen innerhalb der Großsynklinale (näheres dazu siehe Abschnitt „Strukturgeologie").

Plattenkalk

Es handelt sich um hell- bis dunkelgraue, bräunliche bis grünliche, meist dickbankige, sparitische bis mikritische Kalke (Packstones, Wackestones). Muschelschill, Megalodonten, Bioturbationserscheinungen und intraformationelle Breccien sind häufig. Dazwischen kommen dünnbankige, teilweise bituminöse Kalke und Dolomite (Dololaminite) und cm-dicke dunkle Mergellagen vor. Zum Hauptdolomit besteht ein breiter Übergang, bei Überwiegen der Kalke wurde von Plattenkalk gesprochen; die Grenze zur Kössen-Formation wurde mit dem Auftreten der ersten mächtigeren Mergel (dm-m-mächtig) gezogen. Im Bächental werden Mächtigkeiten von 150–200 m erreicht. Der Plattenkalk ist wegen seiner Verwitterungsresistenz für schroffe und derbe Geländeformen verantwortlich und neigt zu stärkerer Verkarstung (z.B. Brettersbergalm, Lochalm Mitterleger).

Kössen-Formation

Dm-gebankte, graue bis bräunliche, bioklastische Kalke mit Muscheln (*Rhaetavicula contorta, Rhaetina gregaria*), Brachiopoden und Ammoniten sowie hellgraue dickbankige