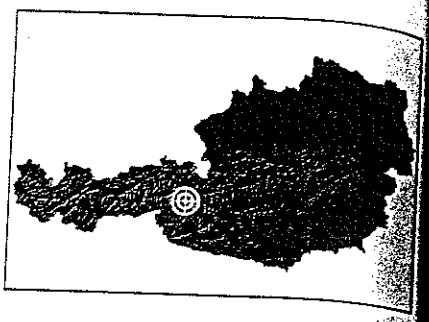
Kammerhöhle (2573/8) – Hohe Tauern 2002 Expedition (Kitzsteinhorn, Kaprun, Salzburg)



ZUSAMMENFASSUNG

Das Kitzsteinhornmassiv birgt im Umfeld des Schmiedingerkees ein hochalpines Karstgebiet in einer Höhenlage zwischen 2200 m und 2700 m. Ein ausgedehntes Schigebiet um das "Alpincenter Kaprun" erstreckt seine Einrichtungen nahezu über die gesamte verkarstete Fläche. Mehrere große Höhlen sind hier bekannt, insbesondere der bis in eine Tiefe von 1049 m erforschte Feichtnerschacht (2573/3) und die 560 m tiefe Kitzsteinhornhöhle (auch: Zeferethöhle (2573/2). Die Höhlenerkundung steht in diesem Gebiet noch am Anfang, und das Potential für Höhlenzusammenschlüsse und neue Fortsetzungen ist vorhanden. Mit dem in 1050 m Seehöhe gelegenen Quellaustritt des Kesselfalls überschreitet das Tiefenpotential 1500 m. Das Ziel der hier beschriebenen Expedition war die Fortsetzung der Forschung in der 2001 entdeckten Ponorhöhle KA5 und die Weiterführung der Höhlenforschung im Umfeld des Feichtnerschachtes. Da das Objekt KA5 mit Schnee verschlossen war, konzentrierte sich die Forschung auf die benachbarte gewaltige Kammerhöhle (KA3; 2573/8), in der eine Tiefe von 226 m erreicht werden konnte. Im Umfeld des Alpincenters konnten weitere 20 Höhlen vermessen werden.

ABSTRACT

The Kitzsteinhorn massif harbours a high-altitude karst area in the vicinity of Schmiedingerkees, between 2200 and 2700 m altitude. The large ski resort around the "Alpincenter Kaprun" developed over much of the karst area. Several large caves are known, including Feichtnerschacht (2573/3), discovered by Richard Feichtner, who explored it altogether with Polish cavers down to –1049 m. A second large system is Kitzsteinhornhöhle (Zeferethöhle, 2573/2), -560 m deep. Cave investigation is only starting in this area. The potential of connecting existing systems as well as finding new extensions in these systems is high. The depth potential of the Kesselfall spring, located at about 1050 m above sea level, surpasses 1500 m. The aim of this expedition was to continue the exploration of swallow hole KA 5, which was discovered in 2001, and to continue the cave investigation near Feichtnerschacht. Unfortunately, KA 5 was plugged by snow this year. A continuation found in KA 3, however, also discovered in 2001, resulted in the Kammerhöhle (2573/8), a tremendous cave where we reached a depth of –226 m. In the area around the Alpincenter, about 20 small caves were surveyed, some of them new and some already explored by previous cavers.

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THE KITZSTEINHORN MASSIF

The Kitzsteinhorn (3208 m) is located in the Hohe Tauern massif at the southern termination of the Kaprun valley (Fig. 1). The Schmiedinger Kees covers the highest parts of the plateau. The Kammer area is a steep, tilted plateau, located east of the Schmiedinger glacier. A narrow crest, stretching from the Hohe Kammer (2636 m) to the Kitzsteinhorn summit, divides this karst area. The walk from the Alpincenter (trail no. 726) takes about 1 hr. The trail first descends to the glacier foot, and then climbs up to the Nördliche Kammerscharte (2636 m). From there one has to

leave the trail and to descend 400 m down to 2500 m altitude. The Kammer plateau extends up to 2850 m, i.e. to the foot of the Kammerkees. Mountain slopes drop steeply down to the valley of the Kapruner Ache in the north and east. Karst developed in micaceous calcschists (Kalkglimmerschiefer, Bündner Schiefer; Audra, 2001a). These rocks have been intensively metamorphosed during the alpine orogeny (Höck & Pestal, 1994; Höck et al., 1994; Tichy, 1992). Calcschists consist of calcite crystals and interspersed white mica flakes (muscovite), giving rise to a typically light grey colour in unweathered hand specimens. Bed thickness ranges from centimetres to decimetres. Mica flakes are always oriented parallel to the schistosity. Increase in the proportion of mica in these marbles results in grey-brown or dark-brown colours on weathered rock surfaces. This repeated change in rock colour causes the characteristic zebra-skin pattern of the calcschists. The mica-rich beds are responsible for collapse of large rock slabs in the caves. In the Kammer area impervious schists outcrop almost everywhere. A distinct 30 m-thick, impure calcschist bed crosses the area diagonally, from the Nördliche Kammerscharte down to the foot of the plateau. Some gullies intersect this calcschist bed giving rise to swallow holes. Strata dip 40°N that allow cavers to climb or slide along very steep slopes without a rope. In contrast, steeper dip (50-65°) in caves near the Alpincenter gives rise to subvertical shafts.

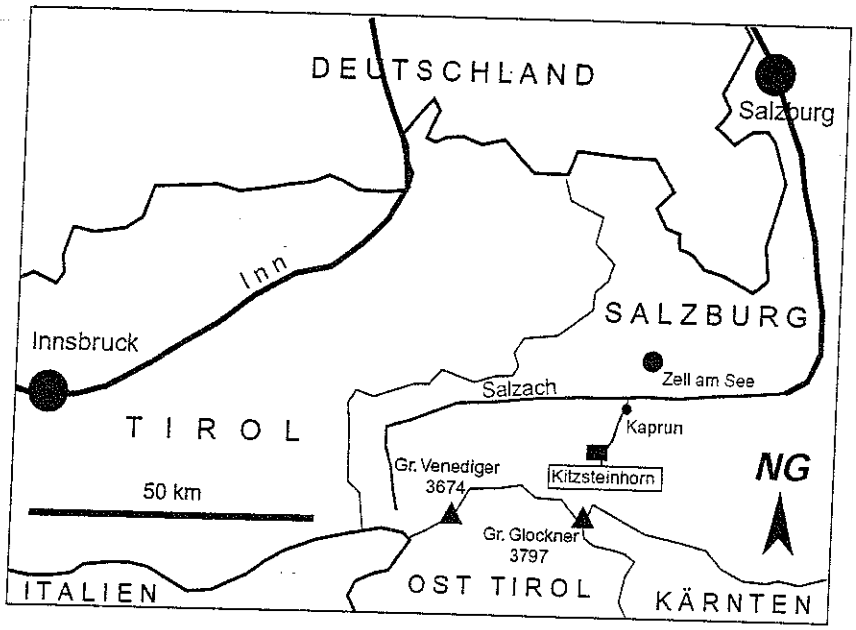

Fig. 1. Location of the Kitzsteinhorn massif in the Hohen Tauern of Salzburg.

Abb. 1. Lage des Kitzsteinhorn-Massivs in den Hohen Tauern.

KAMMERHÖHLE (KA 3)

Length: 650 m surveyed (+ 100 m not surveyed),
Depth: – 226 m, E = 325 861, N = 5 230 080,
Sh = 2.505 m (GPS, UTM WGS 84 - 33 T).

One entrance to the Kammer Höhle (KA 3a) opens in the Kammer gully at the foot of a small scarp as a small rectangular opening facing uphill (Fig. 2, 3). The whole system developed in a rather thin calcschist bed at the contact to impervious schists. Several parallel steep galleries developed along the 40° N dip. The schists are prone to collapse resulting in unstable and dangerous boulder chokes (Fig. 4, 5). A detailed description of the cave system is impossible, because of its complexity and monotony due to widespread boulder chokes. The best way through can be found following the most evident passages, footprints and surveying marks (Fig. 6, 7).

The Entrance Series

The entrance gallery widens immediately due to the confluence of two galleries: a tributary originating from the secondary entrance (KA 3b) on the right bank and a small active tributary on the left bank originating from the firn in the neighbouring KA 7 entrance. The passage continues straight

Fig. 2: Swallow holes near Kammerhöhle. KA 4 opens below a white quartz dyke.

Abb. 2: Schwinden nahe der Kammerhöhle. KA 4 öffnet sich unter einem weißen Quarzgang. Foto: S. Zibrowius

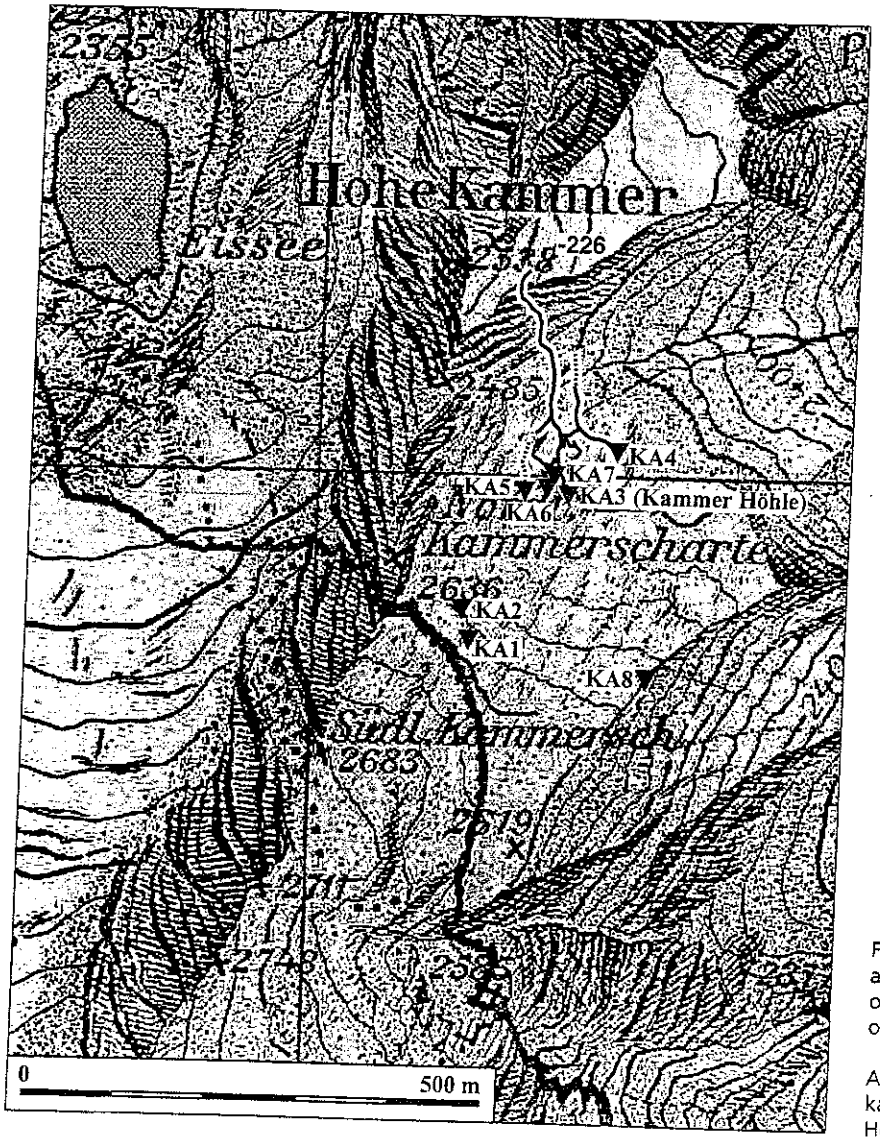

Fig. 3: Map of the Kammer area showing the location of caves including the outline of Kammerhöhle.

Abb. 3: Höhlenverbreitungskarte der Umgebung der Hohen Kammer.

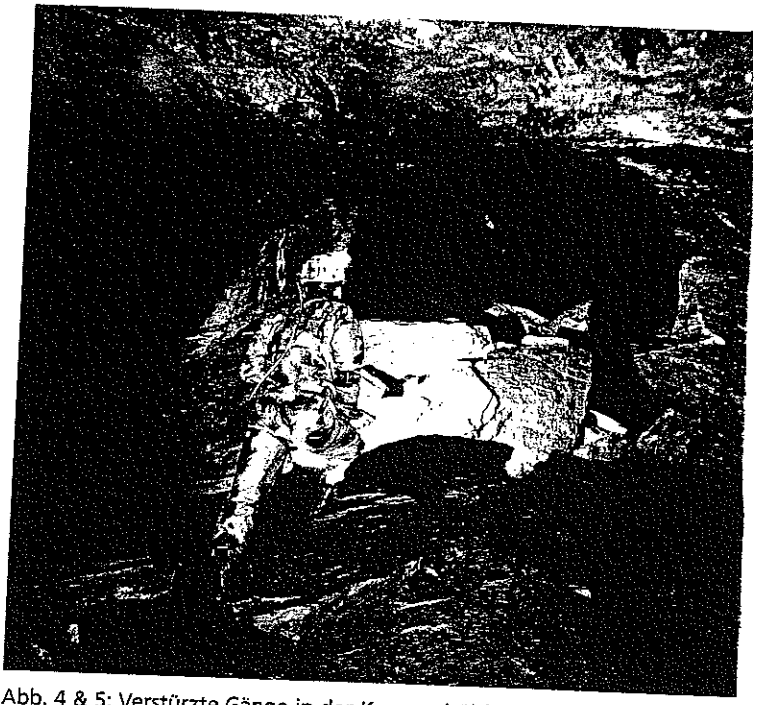

Fig. 4 & 5: Collapsed passages in Kammerhöhle, controlled by the dip of the calcschists. Photo. S. Zibrowius

Abb. 4 & 5: Verstürzte Gänge in der Kammerhöhle, die an das Einfallen der Kalkschiefer gebunden sind.

down between huge blocks (digging at –14 m) including climbing along an unstable choke that opens on a steep gallery.

The tributary of the E 13 chimney

This gallery opens in the Steinmann Chamber. On the right bank, a climb across unstable blocks gives access to a rather wide tributary. A 13 m high chimney was climbed (E 13), but we stopped at the base of another 4 m climb. A strong ascending wind clearly shows a connection with an impassable swallow hole located a few meters downstream of the secondary entrance.

The Fossil Series

Downstream of the Steinmann Chamber, a lead on the right gives access to a gallery leading downward. Crossing a pothole (at -50 m) and a chamber to the right of the passage leads downward again and then opens to a large fossil gallery with upstream and downstream continuations:

- Upstream, after two short climbs, the cross-section becomes smaller. About 100 m further up and subsequent to digging, the passage terminates in a boulder choke with no airflow (-23 m). The survey has shown that the end of KA 4 cave is very close.
- Downstream, the wide gallery closes after some dozens of meters (-95 m). A continuation was found across a very narrow fracture, where strenuous digging was necessary. After climbing into a small chamber and passing the top of a keyhole–shaped canyon, we stopped at the rim of a 7 m deep shaft. This downstream passage may correspond to the main active trunk and connect to the chimney located at –74 m.

The main active trunk

Following the main axis down the cave one reaches the Waterfall Chamber (-78 m), whose name originates from a stream falling from the ceiling. After climbing the waterfall, this 50 m long narrow and wet tributary was explored up to a final squèéze (-60 m), showing a rather strong airflow. The water originates from the KA 5 swallow hole. Downward, the passage is 2 x 2 m wide with steep and slippery slides especially between -100 m and –140 m, and some local squeezes due to accumulations of rock fragments. A chimney is closed at the top by blocks at about –174 m, but a continuation can be seen between the blocks.

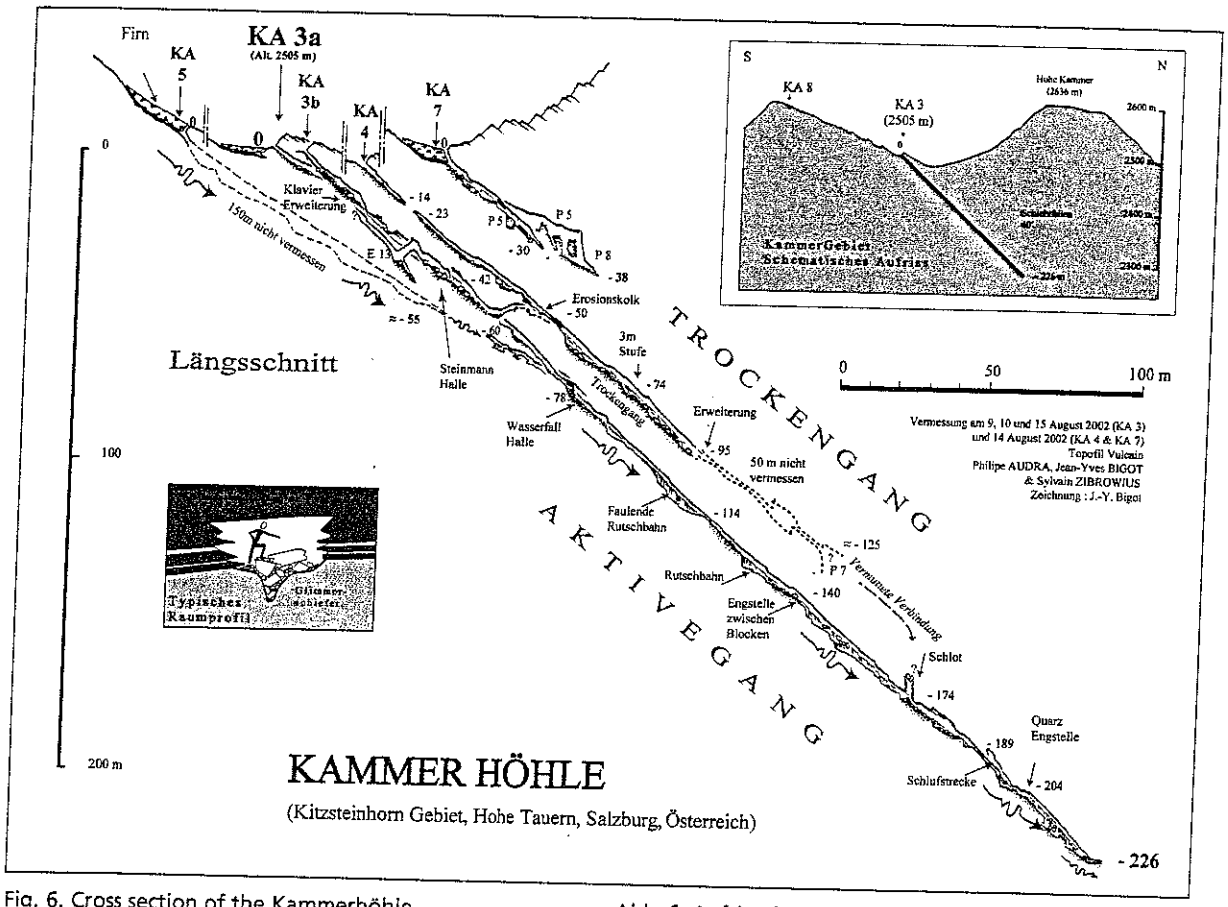

Fig. 6. Cross section of the Kammerhöhle.

Abb. 6. Aufriss der Kammerhöhle.

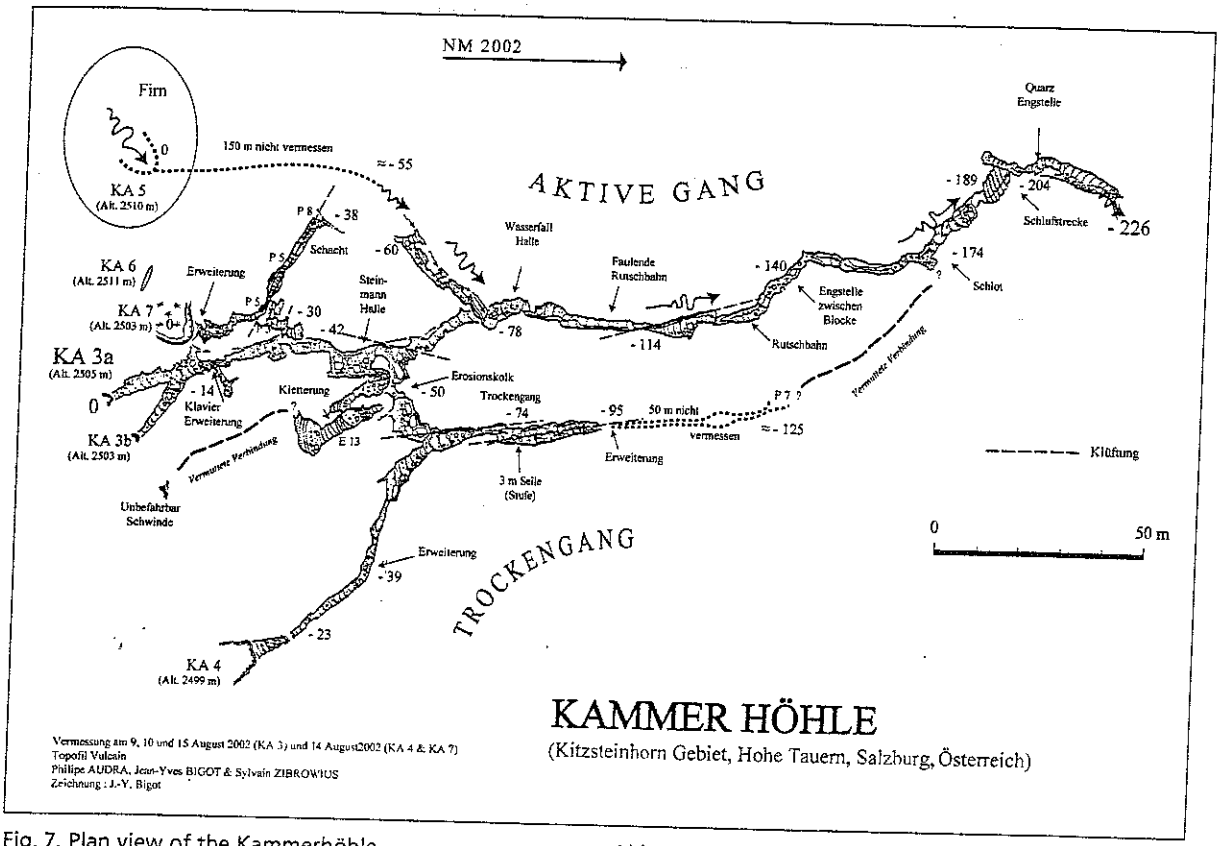

Fig. 7. Plan view of the Kammerhöhle.

Abb. 7. Grundriss der Kammerhöhle.

This tributary probably originates in the Fossil Series. Downward, at about -189 m, the gallery changes into a 20 m long steep, low-roof passage, where one has to share the space with the brook. At its issue, a small climb gives access to a rather wide gallery, which becomes immediately narrow.

At –204 m, a wet squeeze (the Quartz squeeze) gives access to a wider passage which also closes soon. Digging allowed going ahead about 8 m along a narrow fissure, but we stopped at a new squeeze at –226 m. The passage continues, and a weak airflow was felt.

REMARKS

- The whole active trunk, from –80 to the bottom, is particularly dangerous due to its relatively small size and several squeezes where water is flowing. We diverted the Kammer brook that flows into the KA 5 swallow hole in order to explore under relatively safe conditions. Good weather conditions are required and a flood in this cave would be extremely dangerous.
- The cave corresponds to the uppermost part of an underground system with a branchwork pattern due to the confluence of passages originating from different swallow holes (Fig. 3). It is conceivable that with time some swallow holes will become extinct features due to changes in the hydrographic network, e.g., the impassable swallow hole, KA 4, KA 6, KA 7 and KA 3 (Kammerhöhle). Currently, most of the gully discharge sinks into KA 5 and reappears 78 m deeper in the Waterfall chamber of the Kammerhöhle.
- The system developed in a northerly direction, controlled by the dip of the rock. We assume that this cave system contributes to the Kesselfall spring, located 1500 m below, whose catchment is mainly located around Schmiedingerkees, where Feichtnerschacht and Kitzsteinhornhöhle (Zeferethöhle) open (Knapczyk, 1983; Klappacher, 1992).
- No calcite deposition occurs in the entire cave system, except for the first part of the Fossil Series where we found some remnants of a fossil white calcite flowstone, currently perched and dismembered. A sample of this speleothem yielded a U/Th age of 191.500 yr, i.e., suggesting formation during the penultimate interglacial (Tab. 1).
- No gear is required to visit this cave other than a 3 m long rope which is useful to climb down a step at -74 m giving access to the downstream part of the fossil trunk.

Table 1: Geochemical data and radiometric age of a flowstone sample from Kammerhöhle (analyst: Y. Quinif, CERAK, Mons, Belgium).

Sample	U (ppm)	^{234}U / ^{238}U	^{230}Th / ^{234}U	^{230}Th / ^{232}Th	^{234}U / $^{238}U_{t=0}$	Age (yr)
KAM 7019	0,032 (±0,001)	1,110 (±0,026)	0,847 (±0,023)	7,3 (±0,5)	1,188	191.500 (+17.200 / -14.500)

EXPLORATIONS

- August 2001: discovery of the entrance (KA 3a), and exploration down to –14 m (Philippe Audra, Philippe Hache. The secondary entrance (KA 3b) was connected by Richard Feichtner (Audra, 2001b).
- August 2002: after digging at the bottom of this cave, we explored the cave during 6 trips (Philippe Audra, Jean-Yves Bigot, Richard Feichtner, Bernhard Köppen and Sylvain Zibrowius). Possibilities of further exploration remain, particularly in the bottom part, but we stopped our exploration due to flooding and collapse hazard.

Participants: Philippe Audra, Jean-Yves Bigot, Richard Feichtner, Katarina Gladis, Bernhard Köppen and Sylvain Zibrowius.

CONCLUSIONS

We consider the speleological exploration of the Kammer area as almost complete. Some possibilities for future cave research, however, remain:

- Digging at the bottom of KA 1 (Audra, 2001b),
- Exploring the 10 m deep KA 2 shaft (Audra, 2001b),
- The downstream part of the Fossil Series in the Kammerhöhle should be connected to the main active trunk at –174 m at the chimney. The bottom at –226 m should be cleared while digging. The upstream part of the 13 m-climb could be extended in the direction of the impassable swallow hole. Even though the Kammerhöhle is a particularly dangerous cave due to collapse and flooding hazards, a 1500 m depth potential may still exist.

Winter exploration continues in Feichtnerschacht led by Polish cavers who reached –1049 m and discovered new passages leading from the –500 m fossil gallery (<http://www.kktj.pl/index-en.html>; Nowak, 2002; Audra, 2000; Audra et al., 2002a, b; Ciszewski, 1998; Ciszewski & Recielski, 2001; Gajewska, 2000; Sounier, 2001).

ACKNOWLEDGEMENTS

This expedition was successful thanks to several people and institutions:

- The French caving federation (FFS) and especially the International Relationships Commission (CREI) who sponsored the trip.
- Richard Feichtner, Gletscherbahnen Kaprun (GBK), who helped us to obtain the access to the lifts and organized the comfortable accommodation in the Alpincenter.
- The Landesverein für Höhlenkunde Salzburg (LVHK) and particularly Walter Klappacher, who helped us getting caving permissions.
- E. Herrmann and Ch. Spötl for their thorough reviews.

REFERENCES

Audra, Ph. (2000): Weitere Entdeckungen in der Feichtner-Schachthöhle (Hohe Tauern, Salzburg). - Die Höhle, 51(2): 72.

Audra, Ph. (2001a): Un nouveau „-1000" dans un karst englacé : le gouffre Feichtner (Kitzsteinhorn, Salzburg, Autriche). Genèse de la plus profonde cavité karstique du monde en roche non calcaire . - XI[e] Congrès national suisse de spéléologie, Genève. La Chaux-de-Fonds (Société suisse de spéléologie), 19-24.

Audra, Ph. (2001b): Hohe Tauern 2001. Expédition spéléo en Autriche. 25 p. - Lyon (CREI, Fédération française de spéléologie).

Audra, Ph., Bigot, J.-Y. & Zibrowius, S. (2002a): Hohe Tauern 2002, rapport d'expédition. - Lyon (CREI, Fédération française de spéléologie).

Audra, Ph., Bigot, J.-Y. & Zibrowius, S. (2002b): Expédition Hohe Tauern 2002 (Autriche, Salzbourg). Spelunca, 88: 39-44 .

Ciszewski, A. (1998): If not in Lampo, then... – Jaskinie, 10: 13-15.

Ciszewski, A. & Recielski, Kr. (2001): Caves of the Kitzsteinhorn. - Polish Caving 1997-2001. Published at the occasion of the 13th International Speleological Congress, 22-24.

Gajewska, A. (2000): Three years with Feichtnerschacht and its discoverer or a reward after years. - Jaskinie, 19: 6-11.

Höck, V. & Pestal, G. (1994): Geologische Karte Grossglockner 153. 1:50.000. Wien (Geologische Bundesanstalt).

Höck, V., Koller, Fr. & Seeman, R. (1994): Geologischer Werdegang der Hohen Tauern vom Ozean zum Hochgebirge. Hohe Tauern. Mineral und Erz: 28-48. Naturhistorisches Museum, Wien.

Klappacher, W. (1992): Salzburger Höhlenbuch, Vol. 5, 626 p. Salzburg (Landesverein für Höhlenkunde).

Knapczyk, H. (1983): Kitzsteinhorn, das Höhlenparadies der Tauern. - Atlantis, 4: 10-12.

Nowak, J. (2002): Kitzsteinhorn 2002. - Jaskinie, 26(1): 4.

Sounier, J.-P. (2001): Autriche: –1000 au Feichtnerschacht. – Spéléo, 39: 6-8.

Tichy, G. (1992): Zur Geologie der Hohen Tauern. Salzburger Höhlenbuch, Vol. 5: 358-366. Salzburg (Landesverein für Höhlenkunde).