ser interdisziplinären Zusammenarbeit zu gewinnen. Nur so können neue gemeinsame Fragestellungen entwickelt werden, die die Kompetenzen der jeweiligen Disziplinen essentiell erweitern und zu neuen Erkenntnissen führen.

Dinoflagellate bioevents at the Cretaceous/Paleogene boundary in the Gosau basin of Gams, Northern Calcareous Alps, Austria

Omar, M.[1, 2] & Piller, W.E.[1]

[1] University of Graz, Institute of Earth Sciences (Geology and Palaeontology), Heinrichstrasse 26, 8010 Graz, Austria;
omaraosman@yahoo.com; werner.piller@uni-graz.at;
[2] El-Minia University, Faculty of Science,
Geology Department, El-Minia, Egypt

For the first time, an integrated palynological investigation was carried out across the Cretaceous/Paleogene (K/Pg) boundary in two sections (Knappengraben and Gamsbach sections) from the Gosau Basin of Gams in the Northern Calcareous Alps, Austria.

More than 180 dinoflagellate species and subspecies were identified from 89 rock samples concentrated around the K/Pg boundary. In most samples the dinocysts are moderately to well preserved but associated with reworked material. In both sections *Manumiella druggii, Trabeculidium quinquetrum, Cyclonephelium compactum* and *Dinogymnium acuminatum* are restricted to the Upper Maastrichtian. *Cordosphaeridium fibrospinosum, Palynodinium grallator, Membranilarnacia*? *tenella, Spongodinium delitiense* and *Lejeunecysta izerzenensis* reach from the Upper Maastrichtian to the Lower Danian. *Carpatella cornuta, Damassadinium californicum, Senoniasphaera inornata, Trithyrodinium evittii, Batiacasphaera rifensis* and *Impagidinium maghribensis* are only Danian taxa. The first and last occurrences of these taxa are correlated with the nannoplankton biozones (Egger et al. 2004, 2009) and with other dinocyst bioevents around the K/Pg boundary in the Northern and Southern hemispheres (Williams et al. 2004, Brinkhuis et al. 1998). The *Spongodinium delitensis* acme Zone is recorded in both studied sections (from 90-180 cm in Gamsbach section and from 100-220 cm in Knappengraben section above the K/Pg-boundary).

Brinkhuis, H., Bujak, J.P., Versteegh, G.J.M. & Visscher, H. (1998): Dinoflagellate-based sea surface temperature reconstructions across the Cretaceous-Tertiary boundary. - Palaeogeography, Palaeoclimatology, Palaeoecology, **141**: 67-83.

Egger, H., Koeberl, C., Wagreich, M. & Stradner, H. (2009): The Cretaceous-Paleogene (K/Pg) boundary at Gams, Austria: Nannoplankton stratigraphy and geochemistry of a bathyal northwestern Tethyan setting. - Stratigraphy, **6**(4): 333-347.

Egger, H., Rögl, F. & Wagreich, M. (2004): Biostratigraphy and facies of Paleogene deep-water deposits at Gams (Gosau Group, Austria). - Annalen des Naturhistorischen Museums Wien, **106**A: 281-307.

Williams, G.L., Brinkhuis, H., Pearce, M.A., Fensome, R.A. & Weegink, J.W. (2004): Southern Ocean and global dinoflagellate cyst events compared: index events for the late Cretaceouse-Neogene. - Proceedings of the Ocean Drilling Program, Scientific Results, **189**: 1-98.

Cretaceous/Paleogene dinoflagellate bioevents in the K/Pg-boundary section of Waidach (Helvetikum), Salzburg, Austria

Omar, M.[1, 2], Piller, W.E.[1] & Egger, H.[3]

[1] University of Graz, Institute of Earth Sciences (Geology and Palaeontology), Heinrichstrasse 26, 8010 Graz, Austria;
omaraosman@yahoo.com; werner.piller@uni-graz.at;
[2] El-Minia University, Faculty of Science,
Geology Department, El-Minia, Egypt;
[3] Geological Survey of Austria, Neulinggasse 38,
1030 Vienna, Austria; hans.egger@geologie.ac.at

Very high abundance dinocyst samples have been studied from the Cretaceous/Paleogene (K/Pg) boundary interval of the Helvetic Zone north of Salzburg, Austria. A total of 163 dinocyst species and subspecies out of 62 genera have been identified. Biostratigraphically, the K/Pg transition in Waidach section comprises the upper part of the Cretaceous *Nephrolithus frequens* Zone (CC26) and the lower part of the Paleocene *Markalius inversus* Zone (NP1). However, a change in the dinoflagellate assemblages has been observed at the K/Pg boundary, suggesting a disconformity between the Maastrichtian and Danian.

Dinogymnium acuminatum, Eisenackia circumtabulata and *Lejeunecysta izerzenensis* are restricted to the Upper Maastrichtian. *Manumiella druggii, Manumiella seelandica, Trithyrodinium evittii, Disphaerogena carposphaeropsis, Cordosphaeridium fibrospinosum, Palynodinium grallator, Spongodinium delitiense, Batiacasphaera rifensis* and *Kenleyia leptocerata* extend from the Upper Maastrichtian to Lower Danian. *Carpatella cornuta, Damassadinium californicum* and *Senoniasphaera inornata* are exclusively Danian taxa. *Trithyrodinium evittii* is recorded with high frequency in most Maastrichtian and Danian samples. Two *Manumiella* spikes have been recorded in the Upper Maastrichtian (~1 m and 10 m below the K/Pg boundary). An acme of *Spongodinium delitiense* is recorded in the Lower Danian (1 m above the K/Pg boundary).

Tectonic correction of secondary magnetizations (SM): record of incremental strain in a fold

Ortner, H.[1], Thöny, W.[2], Gruber, A.[3] & Scholger, R.[4]

[1] Institut für Geologie und Paläntologie, Universität Innsbruck,
Innrain 52, A-6020 Innsbruck;
[2] OMV Exploration & Produktion GmbH,
Trabrennstrasse 6-8, A-1020 Wien;
[3] Geologische Bundesanstalt, Neulinggasse 38, A-1030 Wien;
[4] Paläomagnetiklabor Gams, Lehrstuhl für Geophysik,
MU Leoben, Gams 45, A-8130 Frohnleiten

In polydeformed thrust belts such as the Northern Calcareous Alps, pervasive remagnetization erased most

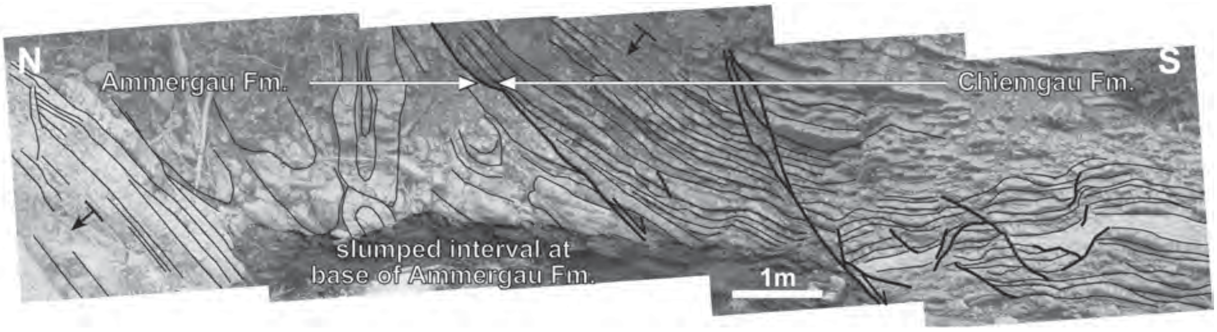

Fig. 1: Photograph and line drawing of the transition between Chiemgau Fm. and Ammergau Fm. in the Ampelsbach section. The Ruhpolding Fm. is cut out by local faulting. Note fault drag and upright roll-over geometry caused by faults running into bedding in the overturned succession.

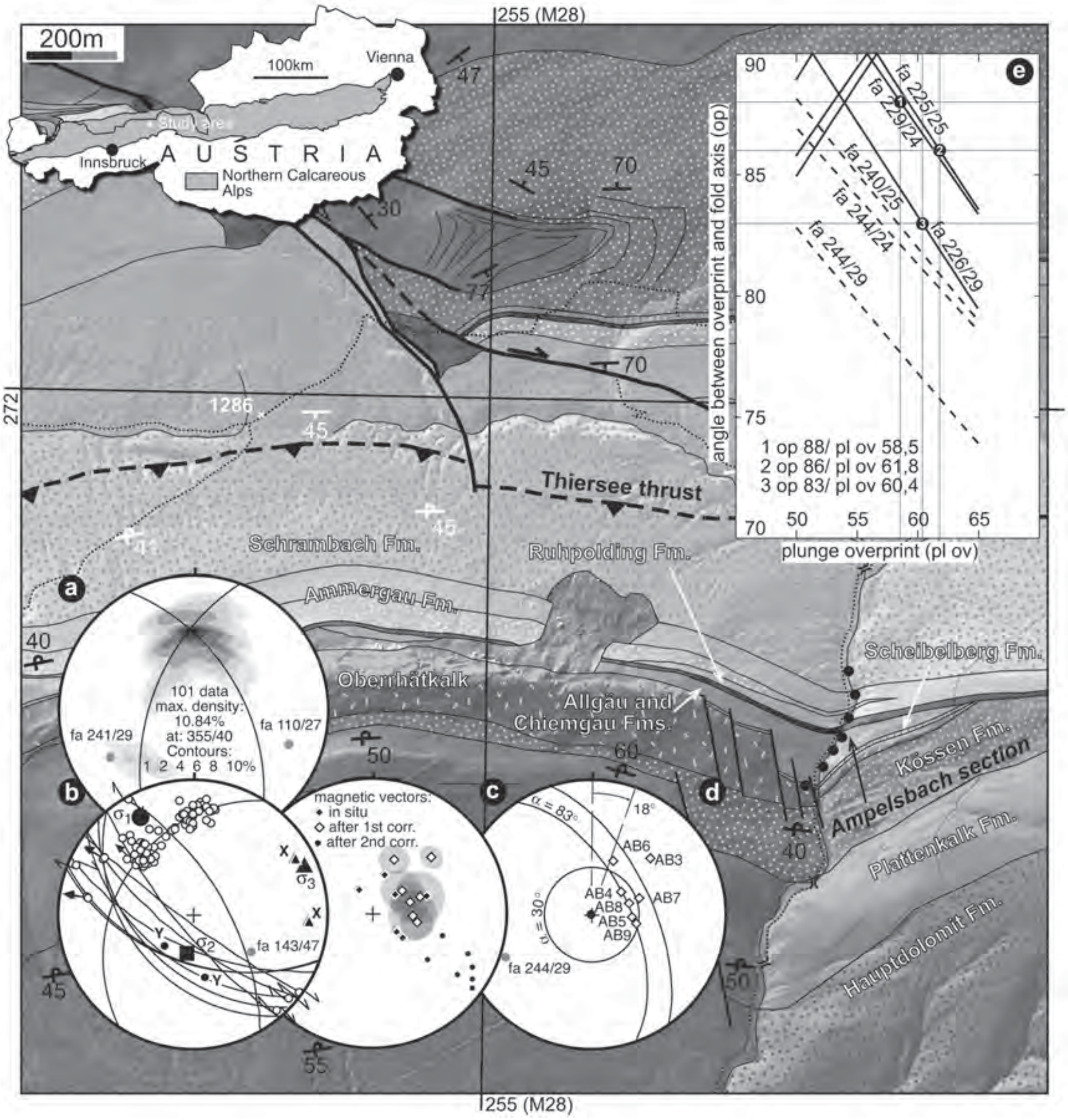

Fig. 2: Geologic sketch of Ampelsbach section. a) Contoured poles to bedding in the wider vicinity shows two fold axes (fa). b) Poles to bedding and brittle faults measured in the Ampelsbach section. Orientation of the calculated paleostress tensor (σ_1, σ_2, σ_3). The principal axes of the strain ellipsoids (X, Y) from deformed ammonites are coaxial and therefore probably cogenetic. c) Two steps of tectonic correction of magnetic vectors. d) Small circle calculated from OM in limestone samples after 1st correction with cone axis near the regional fold axis (a). Intersection with small circle about center of the net representing possible OM gives amount of vertical axis rotation. e) Relation of angular distance between OM and fold axis versus plunge of OM.

primary magnetic information, but SM carries important kinematic information. This information can usually not be extracted using traditional techniques of tectonic correction such as simple untilting. Secondary magnetizations may: 1) predate, 2) be synchronous to, or 3) postdate tectonic deformation. In case 1 magnetic vectors record finite strain, in case 2 incremental strain. Folding and faulting as seen in the field contributed to tilting of magnetic vectors, but also deformation in deeper structural levels, e.g., upramping of a deeper thrust sheet that would cause hinterland-directed followed by foreland directed tilting.

Tectonic correction of SM from Triassic-Cretaceous rocks of the Achensee region (Ampelsbach section) involves initial correction for local fault drag (Fig. 1, Fig. 2b). This shifts the paleomagnetic vectors onto a small circle (Fig. 2c, d) along which the vectors move during folding. Marl samples were affected by homogeneous strain measured at deformed ammonites (R = 1,4-1,6) whereas limestones were not affected (R ~1-1,1; Fig. 2b). Magnetic directions from marl samples do therefore not lie exactly on the small circle. An unknown amount of vertical axis rotation postdating folding and the unknown inclination of the SM hinders straightforward reconstruction. This problem is solved by plotting the relationship of possible angles between SM and fold axis to possible plunge of the SM (Fig. 2e). Using the cone opening angle of 83° calculated from the magnetic vectors (Fig. 2c), a plunge of 60° of the OM and a clockwise vertical axis rotation of 18° results (solution 3 of Fig. 2e). Bedding has been tilted 35° to the north and was vertical before remagnetization. The age of remagnetization can be estimated to be post-Oligocene due to the steep inclination.

Different approaches to age-date catastrophic rockslide events: Radiocarbon, Surface Exposure, and U/Th

Ostermann, M. & Sanders, D.

Inst. of Geology, University of Innsbruck, Austria;
marc.ostermann@uibk.ac.at

Age-dating of catastrophic rockslides/rock avalanches is prerequisite to unravel a potential relation between the frequency of mass-wasting events relative to climatic change or earthquakes. In the Alps, some 500 slope failures exceeding 10^6 m^3 in volume are known, but the age as yet is determined only for about 7 % of events.

Rockslides are hitherto dated with the radiocarbon method and/or surface exposure dating (e.g., Lang et al. 1999). In addition, in a pilot study on the carbonate-lithic rockslide of Fern Pass (Tyrol, Austria), it was demonstrated that U/Th dating of diagenetic cement formed within a rockslide deposit can provide a good proxy age of the mass-wasting event (Ostermann et al. 2007, Prager et al. 2009).

We compare three different radiometric methods and their applicability to age-date rockslides/rock avalanches. Based on examples from Northern and Southern Tyrol we discuss the relation of sampling procedure to numerical age determination of mass-wasting events, with a focus on requirements and limitations of each method.

Lang, A., Moya, J., Corominas, J., Schrott, L. & Dikau, R. (1999): Classic and new dating methods for assessing the temporal occurrence of mass movements. - Geomorphology, **30**/1: 33-52.

Ostermann, M., Sanders, D., Prager, C. & Kramers, J. (2007): Aragonite and calcite cementation in 'boulder-controlled' meteoric environments on the Fern Pass rockslide (Austria): implications for radiometric age-dating of catastrophic mass movements. - Facies, **53**: 189-208.

Prager, C., Ivy-Ochs, S., Ostermann, M., Synal, H.-A. & Patzelt, G. (2009): Geology and radiometric ^{14}C-, ^{36}Cl- and Th-/U-dating of the Fernpass rockslide (Tyrol, Austria). - Geomorphology, **103**/1: 93-103.

Aussterben oder Überleben - ein multidisziplinärer Forschungsansatz zu jungpleistozänen Höhlenbären und Braunbären in Europa

Pacher, M.

Austrian Academy of Sciences, Station Lunz am See,
Institute of Palaeontology, Vienna;
martina.pacher@univie.ac.at

Spektakuläre, jungpleistozäne Großsäuger Europas, wie Mammut, Wollnashorn, Riesenhirsch und Höhlenbär sind heute ausgestorben. Diese Arten verschwanden in Stufen während oder am Ende der letzten Eiszeit, andere erst im Holozän. Der Höhlenbär als Teil der ausgestorbenen europäischen Megafauna ist in zahlreichen Höhlen in Europa und möglicherweise Asien (Knapp et al. 2009) nachgewiesen. Gleichzeitig kam in Europa der Braunbär vor, doch wenig ist über die Interaktion der beiden Bärenarten bekannt. Gab es Konkurrenz um Ressourcen oder bevorzugten sie unterschiedliche ökologische Nischen? Wesentlich ist dabei die Frage: „Warum überlebten Braunbären bis heute während Höhlenbären ausstarben?“

Mögliche Ursachen sind physische Unterschiede, Nahrungs- und Habitatsansprüche, und der fragliche Einfluss des Menschen. Ökologische, geographische und chronologische Überlappungen von Höhlenbär und Braunbär, sowie ihre mögliche Konkurrenz müssen in die Überlegungen einbezogen werden. Die Bedeutung der einzelnen Faktoren auf beide Arten wird in einem multi-disziplinären Ansatz erarbeitet, wobei der derzeitige Forschungsstand und offene Fragen vorgestellt werden. Vor allem der unklare Status der Bären im Osten (Ural, Kaukasus, Altai, Krim), und damit die Verbreitungsgrenze der Höhlenbären verlangt Klärung, ebenso wie die paläoökologischen Ansprüche der Bärenarten.

Die zeitlichen Verbreitungsmuster und Chronologien beider Arten werden mit Hilfe direkter Datierungen von Höhlenbär- und Braunbärfunden rekonstruiert. Nach derzeitigem Forschungsstand (Pacher & Stuart 2008) scheint der Höhlenbär bereits vor letztem Vereisungshöhepunkt ausgestorben zu sein und damit viel früher als ursprünglich angenommen. Die letzten Höhlenbären werden im