INQUA–SEQS 2017

QUATERNARY STRATIGRAPHY AND HOMINIDS AROUND EUROPE:
Tautavel (Eastern Pyrenees)

Tautavel – Ufa
2017

INTERNATIONAL UNION FOR QUATERNARY RESEARCH (INQUA)
Commission on Stratigraphy and Chronology (INQUA – SACCOM)
Section on European Quaternary Stratigraphy (INQUA – SEQS)
Université de Perpignan Via Domitia, France (UPVD)
Centre Européen de Recherches Préhistoriques de Tautavel, France (EPCC CERP)
UMR 7194 «HNHP» du CNRS, MNHN-UPVD-CERP Tautavel, Paris, France
Institute of Geology, Ufimian Scientific Centre, Russian Academy of Sciences

INQUA–SEQS 2017
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QUATERNARY STRATIGRAPHY AND HOMINIDS AROUND EUROPE: Tautavel (Eastern Pyrenees)

Tautavel - Ufa
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The book presents proceedings of the International Conference INQUA-SEQS 2017 held in Tautavel, France. Reports concern a wide spectrum of issues connected to the study of the Quaternary Epoch (2.6 Ma) in Europe and Asia. Based on the results of local and regional Quaternary studies the authors focus on Quaternary stratigraphy and correlations across the Europe and discuss the integration of panEuropean and pan-Eurasian stratigraphical frameworks. The special attention is given to palaeontological, palaeoclimatological and palaeoenvironmental issues from the Quaternary of Europe and Asia.

Materials are published with the maximal preservation of the authors' text.

Volume of abstracts is produced
by Guzel Danukalova.

In memory of
Willem Edward Westerhoff
Past president of INQUA-SEQS

Organisers:

International Union for Quaternary Research (INQUA) (http://inqua.org/)
Commission on Stratigraphy and Chronology (INQUA – SACCOM) (http://www.inqua-saccom.org/)
Section on European Quaternary Stratigraphy (INQUA – SEQS) (http://www.inqua-seqs.org/)
Database of Quaternary Stratigraphy of Europe, grant IFG 1612F SEQS – DATESTRA (http://datestra-seqs.strikingly.com/#the-project)
Université de Perpignan Via Domitia, France (UPVD)
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UMR 7194 «HNHP» du CNRS, MNHN-UPVD-CERP Tautavel, Paris, France

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Conference Program

Conference Program

Saturday, September 9th 2017

09.00-21.00	Arrival.
14.00-18.00	Cultural excursion to Tautavel.

Sunday, September 10th 2017

CERPT Centre Européen de Recherches Préhistoriques de Tautavel, Meeting Room.

05.00-21.00	Arrival.
11.00-12.30	Workshop of IFG INQUA-SACCOM-SEQS PROJECT DATESTRA.
12.30-14.30	Lunch.
14.30-17.30	Workshop of IFG INQUA-SACCOM-SEQS PROJECT DATESTRA.
17.30-19.30	Cultural excursion to Tautavel.
20.00	Dinner at Relai Soleil – Tor del Far Restaurant.

Monday, September 11th 2017

Congress Hall, Tautavel.

7.30-8.00 Breakfast.
8.00-8.30 Registration of the participants.

8.30-8.45 **Formal opening of the Conference**
Greetings from:
Major of Tautavel (Mr. ***Ilary Guy***).
Director of Centre Européen de Recherches Préhistoriques de Tautavel (SERPT) (Dr. ***Gregoire Sophie***).

8.45-9.10 ***Van Kolfschoten Thijs,*** INQUA Vice-President.
IN MEMORIAM OF WIM WESTERHOFF: OUR PAST SEQS PRESIDENT AND FRIEND.

Scientific Sessions.

1 session — Quaternary Stratigraphy and its Relationships With Tectonics and Climate.

(Chair Dr. Danukalova Guzel)

9.10-9.30 ***Strautnieks Ivars**, Kalnina Laimdota, Kiziks Kristaps, Paparde Liga, Deksne Elina*.
SIGNIFICANCE OF THE GEOLOGICAL PROCESSES AND CLIMATE CHANGE ON THE VISKUZHI ISLAND GEOMORPHOLOGY AND DEVELOPMENT.

9.30-9.50 ***Fiebig Markus*, Maurer Olivia, Payer Thomas, Grupe Sabine.**
CORRELATION OF EROSIONAL AND ACCUMULATIVE LANDFORMS IN THE VIENNA BASIN (AUSTRIA).

9.50-10.10 ***Mihevc Andrej*, Zupan Hajna Nadja, Pruner Petr, Bosak Pavel, Horáček Ivan, Fiebig Markus, Häuselmann Philipp.**
QUATERNARY CAVE SEDIMENTS IN ALPINE AND DINARIC KARST OF SLOVENIA AND THEIR RELEVANCE FOR KARST GEOMORPHOLOGY.

10.10-10.30 ***Seiriene Vaida.***
THE PROBLEM OF CHRONOSTRATIGRAPHY OF THE MIDDLE PLEISTOCENE SNAIGUPĖLĖ INTERGLACIAL SEDIMENTS OF LITHUANIA.

10.30-11.00 **Tea / coffee break.**

2 session Assessing chronology of Quaternary stratigraphy: certainties, problems, limits and new perspectives.

(Chair Dr. Schokker Jeroen)

11.00-11.20 ***Talamo Sahra, Coltorti Mauro, Di Rita Federico, Godefroid Fabienne, Kindler Pascal, Frechen Manfred, Lasberg Katrin, Montagna Paolo, Sanna Laura, Sechi Daniele, Andreucci Stefano, Pascucci Vincenzo*.**
A MIS 5A ATTRIBUTION TO THE DEPOSITS OF THE TYPE-SECTION OF THE TYRRHENIAN STAGE AT CALA MOSCA – IS MESAS (SOUTH EAST SARDINIA, ITALY)?

11.20-11.40 ***Trifonov Vladimir*, Ozherelyev Dmitry, Tesakov Alexey, Simakova Alexandra.**
ENVIRONMENTAL AND GEODYNAMIC SETTINGS OF MIGRATION OF THE EARLIEST HOMININE TO THE ARABIAN-CAUCASUS REGION.

11.40-12.00 ***Marks Leszek*.**
NEW INSIGHT INTO THE LATE MIDDLE PLEISTOCENE STRATIGRAPHY IN POLAND.

12.00-12.20 ***Busschers F.S.*, Cohen K.M., Peeters J., Sier M.J.**
THE DIACHRONIC NATURE OF THE SAALIAN-EEMIAN BOUNDARY IN EUROPE.

3 session Archaeological deposits and Quaternary stratigraphy.

(Chair Dr. Pieruccini Pierluigi)

12.20-12.40 ***Lefort J.-P.*, Danukalova G.A., Eynaud F., Monnier J.-L.**
ONSHORE AND OFFSHORE EVIDENCES FOR FOUR ABRUPT WARMING EPISODES DURING MIS 6 AT THE WESTERNMOST TIP OF CONTINENTAL EUROPE: HOW THEY CONTROLLED THE MIGRATIONS OF NEANDERTHALS.

12.40-13.00 ***Ackermann Oren***
THE ANCIENT ANTHROPOGENIC LAYERS ON TOP OF THE BEDROCK – THE THIN CRUST OF THE QUATERNARY?

13.00-14.30 **Lunch.**

14.30-14.50 ***Schokker J., Van de Ven T.J.M.***
THE STRATIGRAPHICAL CONTEXT OF A DEEPLY BURIED MIDDLE PALAEOLITHIC SITE IN THE SOUTHERN NETHERLANDS AND ITS IMPORTANCE FOR ARCHAEOLOGICAL PROSPECTING.

14.50-15.10 ***Kalnina Laimdota, Paparde Līga, Cerina Aija, Loze Ilze, Strautnieks Ivars, Kiziks Kristaps, Macāne Aija.***
PALAEOGEOGRAPHICAL CONDITIONS AND SETTLEMENT CHARACTER DURING THE STONE AGE IN LUBANS PLAIN, EASTERN LATVIA.

15.10-15.30 ***Ratajczak Urszula, Shpansky Andrey V., Malikov Dmitriy G., Stefaniak Krzysztof, Nadachowski Adam, Ridush Bogdan, Mackiewicz Paweł.***
QUATERNARY POST-CRANIAL REMAINS OF *SAIGA* SP. FROM EURASIA.

15.30-15.50 ***Kotowski Adam, Badura Janusz, Borówka Ryszard K., Stachowicz-Rybka Renata, Hrynowiecka Anna, Tomkowiak Julita, Bieniek Bartosz, Przybylski Bogusław, Ciszek Dariusz, Ratajczak Urszula, Schpansky Andrey V., Urbański Krzysztof, Stefaniak Krzysztof.***
STEPHANORHINUS KIRCHBERGENSIS FROM GORZÓW WIELKOPOLSKI (POLAND) – PRELIMINARY DATA AND PERSPECTIVES.

15.50-16.10 ***Moigne Anne-Marie.***
BIOCHRONOLOGY OF THE LOWER MIDDLE PLEISTOCENE SEQUENCE OF THE ARAGO CAVE AT TAUTAVEL AND THE DISPERSAL OF FAUNA DURING THE GLACIAL MIS 14.

16.10-16.30 ***Frolov P.D., Kurshakov S.V.***
THE EARLY PLEISTOCENE FRESHWATER FAUNA FROM THE LOWER DON RIVER AREA AND TAMAN PENINSULA

16.30-17.00 **Tea / coffee break.**

4 session Biostratigraphy across Europe: new data and perspectives for Quaternary stratigraphy.

(Chair Prof. Van Kolfschoten Thijs)

17.00-17.20 ***Krokhmal Alexey, Rekovets Leonid, Nadachowski Adam.***
BIOSTRATIGRAPHY OF THE PLEISTOCENE OF UKRAINE ON THE BASIS OF ARVICOLIDAE.

17.20-17.40 ***Nadachowski Adam, Lemanik Anna, Klimowicz Małgorzata, Socha Paweł.***
BIOCHRONOLOGY OF THE PLEISTOCENE AND PALAEOENVIRONMENTAL CONDITIONS IN THE NORTH CENTRAL EUROPE (POLAND) INFERRED FROM SMALL MAMMAL ASSEMBLAGES.

17.40-18.00 ***Danukalova Guzel, Osipova Eugenija, Yakovlev Anatoly, Kurmanov Ravil.***
BIOSTRATIGRAPHY OF THE EARLY PLEISTOCENE (PALEOPLEISTOCENE) OF THE SOUTHERN URALS REGION, RUSSIA.

18.00-18.30 Discussion.

18.30-19.00 Welcome Drink offered by the Tautavel City Hall.

20.00 Social Dinner at Relai Soleil – Tor del Far Restaurant.

Tuesday, September 12th 2017
Congress Hall, Tautavel

7.30-8.00 Breakfast.

Scientific Sessions

5 session DATESTRA, a Database of Terrestrial Quaternary Stratigraphy of Europe.
(Chair Dr. Fiebig Markus)

8.40-9.00 ***Pieruccini P., Danukalova G., Fiebig M.***
DATESTRA: A DATABASE OF TERRESTRIAL EUROPEAN STRATIGRAPHY (INQUA FUNDED FOCUS GROUP SACCOM: 1612F).

9.00-9.20 ***Pieruccini P., Bertini A., Coltorti M., Magri D., Palombo M.R., Ravazzi C., Sala B.***
THE ITALIAN CONTRIBUTION TO THE DATESTRA PROJECT (INQUA FUNDED FOCUS GROUP SACCOM: 1612F): A FIRST COMPILATION OF THE MAIN ITALIAN QUATERNARY SITES.

9.20-9.40 ***Danukalova Guzel, Osipova Eugenija, Yakovlev Anatoly, Kurmanov Ravil***
MIDDLE, UPPER PLEISTOCENE (NEO PLEISTOCENE) AND HOLOCENE KEY-SITES OF THE SOUTHERN URALIAN REGION (RUSSIA): SUMMARY FOR THE DATABASE.

9.40-10.00 ***Mencin Gale Eva*, Jamšek Rupnik Petra, Bavec Miloš, Anselmetti Flavio S., Šmuc Andrej.**
MINERALOGICAL AND PETROLOGICAL FINGERPRINTING OF PLIO-QUATERNARY INTRAMOUNTAIN BASINS IN NORTHEASTERN SLOVENIA.

10.00-10.20 ***Talamo Sahra, Coltorti Mauro, Andreucci Stefano, Di Rita Federico, Godefroid Fabienne, Kindler Pascal, Frechen Manfred, Lasberg Katrin, Sanna Laura, Sechi Daniele, Pascucci Vincenzo.***
COASTAL VERSUS INLAND AEOLIAN DEPOSITION ALONG THE NORTH-WESTERN COAST OF SARDINIA.

10.20-10.40 ***Marks Leszek*.**
PROPOSAL OF POLISH KEY SITES TO THE DATA BASE OF THE QUATERNARY STRATIGRAPHY OF EUROPE.

10.40-11.00 **Tea / coffee break.**

11.00-11.20 ***Trikhunkov Yaroslav I., Trifonov Vladimir G., Latyshev Anton A., Shalaeva Evgenia A., Bachmanov Dmitry M., Kozhurin Andrey I.***
USING OF PALEOMAGNETIC DATA FOR CORRELATION OF THE PLIOCENE-QUATERNARY SEQUENCES OF ARABIAN-CAUCASUS REGION.

11.20-11.40 ***Shalaeva* E.A.*, Trifonov V.G., Avagyan A.V., Sahakyan L.H., Simakova A.N., Trikhunkov Y.I., Frolov P.D., Sokolov S.A., Tesakov A.S., Lebedev V.A., Titov V.V., Belyaeva E.V.***
COMPARISON OF QUATERNARY SEDIMENTARY SEQUENCES OF THE WEST SEVAN BASIN AND BASINS OF NW ARMENIA.

11.40-12.10

Poster Session

Gasteviciene Neringa.
LATE GLACIAL AND HOLOCENE ENVIRONMENTAL AND CLIMATE CHANGES IN NORTH LITHUANIA ACCORDING TO CHIRONOMID STUDIES.

Angelucci Diego E., Susini Davide.
STRATIGRAPHY AND FORMATION PROCESSES OF UPPER PLEISTOCENE SITES IN THE RIVER MULA BASIN (MURCIA, SPAIN).

Kotowski Adam, Nowakowski Dariusz, Kuropka Piotr, Kołaczyk Karolina, Badura Janusz, Borówka Ryszard K., Stachowicz-Rybka Renata, Ratajczak Urszula, Schpansky Andrey V., Urbański Krzysztof, Stefaniak Krzysztof.
HISTOLOGICAL ANALYSIS AND COMPARISON BETWEEN BONES OF *STEPHANORHINUS KIRCHBERGENSIS* FROM GORZÓW WIELKOPOLSKI (POLAND), WOOLLY RHINOCEROS *COELODONTA ANTIQUTITATIS*, INDIAN RHINOCEROS *RHINOCEROS UNICORNIS*, BLACK RHINOCEROS *DICEROS BICORNIS* AND WHITE RHINOCEROS *CERATOTHERIUM SIMUM* – PRELIMINARY DATA AND PERSPECTIVES.

	***Marciszak Adrian**, Schouwenbourg Charles, Lipecki Grzegorz, Pawłowska Kamilla, Gornig Wiktoria, Káňa Vlastislaw, Roblíčková Martina.* STEPPE BROWN BEAR *URSUS ARCTOS PRISCUS* GOLDFUSS, 1818 - HUGE SCAVENGER OF LATE PLEISTOCENE GRASSLANDS PALEOCOMMUNITIES
	***Fadeeva Tatyana**, Gimranov Dmitriy, Kosintsev Pavel.* NEW DATA ON LATE PLEISTOCENE MAMMALIAN FAUNA FROM IGNATIEVSKAYA CAVE, SOUTHERN URALS.
	***Korsakova Olga**, Kolka Vasiliy.* PLEISTOCENE STRATIGRAPHY AND KEY-SECTIONS IN KOLA PENINSULA, NORTH WEST RUSSIA. AVAILABLE DATA.
	Serdyuk Natalia. LOGOVO HYENY (HYENA'S DEN) CAVE AS A PALEOLITHIC PALEONTOLOGICAL OBJECT.
12.10-12.30	***333.*** PRESENTATION OF THE EXCURSION PROGRAMM.
12.30-14.30	**Lunch.**
14.30-15.00	***Danukalova Guzel.*** INQUA - SEQS ACTIVITIES (1996-2017).
15.00-16.00	General Discussion.
16.00-16.30	**Tea / coffee break.**
16.30-18.00	***Fiebig Markus.*** SUMMARIZING DISCUSSION AND SEQS BUSINESS MEETING.
20.00	Social Dinner at Relai Soleil – Tor del Far Restaurant.

Wednesday, September 13th 2017

7.30-8.00	Breakfast.
	Scientific excursions.
8.30	Departure. The excursion to the Caune de l'Arago, Middle Pleistocene sequence.
13.00-14.00	Packed lunch.
14.00	Departure. The excursion to the Prehistory Museum and European Research Centre of

	Tautavel. Visit to the palaeontological, archeological and palaeoanthropological collections (*Homo heidelbergensis*, Arago XXI).
20.00-21.00	Social Dinner at Relai Soleil – Tor del Far Restaurant. Stay overnight in Tautavel city.

Thursday, September 14th 2017

7.00-8.00	Breakfast.

Scientific excursions.

8.30	Departure. Excursion to the alluvial terraces and alluvial sequences along the coastal rivers (Tet, Tech and others).
13.00-14.00	Packed lunch.
14.00	Departure. Excursion to the alluvial terraces and alluvial sequences along the coastal rivers (Tet, Tech and others).
20.00-21.00	Social Dinner at Relai Soleil – Tor del Far Restaurant. Stay overnight in Tautavel city.

Friday, September 15th 2017

7.00-8.00	Breakfast.

Scientific excursions

8.30	Departure. Coastal and continental sequences: Ramandils Cave (Port La Nouvelle).
14.00-14.30	Packed lunch at La Franqui cliff.
14.30-16.00	Travel to the Grotto Canalettes crossing the Eastern Perynees. The excursion to the Grotto Canalettes.
20.00-21.00	Social Dinner at Relai Soleil – Tor del Far Restaurant. Stay overnight in Tautavel city.

Saturday, September 16th 2017

7.30-8.00	Breakfast.
5.00-21.00	Departure.

Scientific Sessions

IN MEMORIAM OF WIM WESTERHOFF: PAST PRESIDENT OF SEQS AND FRIEND

Van Kolfschoten Thijs

Faculty of Archaeology, Leiden University, Leiden, The Netherlands.

With the death of Wim Westerhoff on May 13, 2017, at an age of 64 years, the Quaternary Community lost an inspiring and remarkable colleague. Wim finished his Quaternary Geology study at the Free University of Amsterdam in 1980 and with his master degree he started his career at the Geological Survey of The Netherlands. Initially, he investigated the Holocene development in the western part of The Netherlands and later he concentrated his research on the southern part of The Netherlands investigating the Cenozoic development of the North Sea Basin. Based at the Geological Survey office in Nuenen he investigated hundreds of boreholes and recorded many sections exposed in quarries located at both sides of the Dutch/German border such as the quarries near Tegelen. The results of these detailed investigations formed the base of Wim's PhD thesis entitled: *Stratigraphy and sedimentary evolution – The lower Rhine-Meuse system during the Late Pliocene and Early Pleistocene (southern North Sea Basin)*. A thesis that he successfully defended at the Free University of Amsterdam on February 19, 2009.

Wim loved to be in the field and to share his excitement for Quaternary geology with colleagues and students. He organised and participated in many field trips, showing the exposures he studied. He was a talented speaker and teacher. Wim was also active in national and international Quaternary Research Associations such as the International Union for Quaternary Science (INQUA) and the INQUA Section on European Quaternary Stratigraphy (SEQS). He served the SEQS as Secretary in the period 2004-2012 and as President in the period 2012-2015. In addition he played an active role as member as well as chair of INQUA – The Netherlands.

During the excursion to *The Lower-Middle Pleistocene of the Upper Don basin*, in 1994 organised by The Committee of the Russian Federation on Geology and Subsurface Usage "Geosynthes", Wim's involvement in the SEQS community actually started. During that excursion, with participants from Great Britain, The Netherlands and Russia, he realised and acknowledged the importance of an international community such as INQUA-SEQS and more and more he enjoyed the cooperation with colleagues from Eastern Europe. On the train from Voronezh back to Moscow the idea was launched to organise an INQUA-SEQS meeting in The Netherlands. The result was a very successful INQUA-SEQS meeting *The Dawn of the Quaternary* in Kerkrade (The Netherlands), June 1996. Wim was also involved in the organisation of a second INQUA-SEQS devoted to the Eemian.

In the succeeding decades Wim played a prominent and a very active role in INQUA and SEQS; he became one of the biggest ambassadors of the Quaternary Community and Quaternary Science. Wim's death is first of all a big loss for his family, for Laurieke and their children. But also a big loss for our common Quaternary community.

Wim, thank you for all you did for us…

We miss you…..

SIGNIFICANCE OF THE GEOLOGICAL PROCESSES AND CLIMATE CHANGE ON THE VISKUZHI ISLAND GEOMORPHOLOGY AND DEVELOPMENT

Strautnieks Ivars, Kalnina Laimdota, Kiziks Kristaps, Paparde Līga, Deksne Elina

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The Island Viskuzhi in the Lake Usma is the largest lake island in Latvia. The bottom of the Lake Usma is located in glaciodepression created by the Venta tongue of the Vistulian Glaciation. Depression was occupied by the ice-dammed lakes, and later also by the bay of the Baltic Ice Lake. The geological and geomorphological studies of the Island Viskuzhi, as well as the studies of the lake bottom topography, provide important information on the accumulation of sediments and changes in paleogeographic conditions at the end of the Late Glacial and in the Holocene. The island of up to 3.1 km long and 1.2-1.75 km wide is the natural boundary between the north of Lake Usma and its deepest southern part. The Island Viskuzhi forms a transverse elevation in the mid of Lake Usma, between the elongated, N-S parts of the lake bottom and form two parallel depressions. Island Viskuzhi from east coast of Lake Usma is separated by 300 m wide strait whose depth reaches 6.5 m.

A 160-200 m wide, 1.3 km long, Strait Amjudzupe, which has 7-10 m high and steep slopes, which continues underwater, has a depth of 12-14 m and reaches in total 24 m, from the west coast of the lake. On the bottom of the Strait Amjūdzupe, opposite the mouth of small River Viskuzhi, there is an amphitheater-shaped hollow typical for waterfalls. The glaciolimic sediments, characterized by clay and silt layers, as well as fine-grained, silty sand, found in the corings indicate their accumulation in the bed of the ice melting water basin. The Island Viskuzhi has complicated by the S-shaped, valley-shaped lowering of about 2.5 km long and 150-200 m wide, which crosses the island SW-NE. The lower part of the lowering is occupied by the Viskuzhi boggy zone, where different types of peatlands changes from the fen, transitional mire and rised bogs.

Layer of sapropel was found below the 6 m thick peat layer. Total thickness of organic sediment reaches 11 m, thus the fixed valley-lowering depth reaches 17-19 m. Under the sapropel, just above the medium-grained sand at 10.93 cm depth, a 5 cm thick medium decomposed peat layer, which accumulates before 9080 + 50 14C years BP, has been found. In the peat layer, just above the contact with the sand, pine seeds and pitcher fragments have been found, indicating that the island has been covered with pine forest at this time. However, the seeds of bogbean (*Menyanthes trifoliata*) found in peat show that the forest near the lake is often overflowed because puppies can form dense, monodominant stands on shores of overgrown lakes or flooding meadows and deforestation.

The sapropel under the peat on the Island Viskuzhi indicates the lake conditions, when the lowering was a strait of Lake Usma between the two parts of the current island. When the water level of the Lake Usma dropped, the connection of the Viskuzhi palaeolake with Lake Usma was interrupted, and for quite some time, there was a rather unusual situation: the Lake of Viskuzhi in Lake Usma.

CORRELATION OF EROSIONAL AND ACCUMULATIVE LANDFORMS IN THE VIENNA BASIN (AUSTRIA)

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The town of Vienna was built on a terrace stair case with 6 different levels. In average the base levels are at 237 m (Laaerberg Terrace), 222 m Wienerberg Terrace), 195 m (Arsenal Terrace), 185 m (Theresianum Terrace), 164 m (Simmeringer Terrace), 155 m (Stadt Terrace and Prater Terrace) above sea level (asl) and the Quaternary base level below the recent river Danube between 143 and 154 m asl. Above the Laeerberg Terrace no further terrace levels have been found in the Vienna basin. Only some small gravel accumulations and erosional terrace levels are found above, along the slopes of the Vienna forest. The terrace stair case is assumed to be of Quaternary age. Erosional features along the slopes of the basin are considered to be of Tertiary age.

The Danube enters the Vienna Basin via the Klosterneuburger gate which is a break through valley through the Vienna Forest. It is unknown when the Danube started to erode the break through valley. During Miocene times the Danube was flowing north of the modern valley and accumulated the so called Hollabrunner gravel.

In the break through valley a prominent terrace with a base level around 170 m asl. is preserved in the area of the town Klosterneuburg. The terrace is situated about 12 km upstream of Vienna. Assuming the recent fluvial gradient of 0.04 % also during the Pleistocene, the equivalent base level of the Klosterneuburger Terrace is in Vienna about 4.8 m lower which means at about 165 m asl. That would fit to the Simmeringer Terrace. This gives a first minimum age for the break through valley.

The southern shoulder of the break through valley is the so called Leopoldsberg with a summit at 425 m asl., the northern shoulder the Bisamberg with a top at 360 asl. From the flanks of Leopoldsberg a small creek flows nowadays into the break through valley. Before it was catched by the break through valley, the creek was heading directly into the Vienna basin.

The altitude of the former, nowadays abandoned creek valley is at Nussdorf (about 7 km down the river of Klosterneuburg) about 260 m asl. This is a level well above the Laeerberg terrace and means that the break through valley, which catched the small creek valley at a level of about 260 m asl., should be quite old, probably much older than the Quaternary.

QUATERNARY CAVE SEDIMENTS IN ALPINE AND DINARIC KARST OF SLOVENIA AND THEIR RELEVANCE FOR KARST GEOMORPHOLOGY

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Karst is a type of landscape with special surface and underground and features. It is main characteristic is dissolution and removal of the rock in the form of solution and prevalent underground drainage that forms caves. Karst is in general poor of sediments, but caves act as sediment traps and can preserve sediments for a very long time. In this paper we present some results from studies of cave sediments in Southern Calcareous Alps and Dinaric mountains which significantly help to better understanding of geomorphic and tectonic evolution of the karst areas.

In the Alps we studied relict cave Snežna jama and caves in Tisnik hill. All caves were formed by a sinking river that brought into the cave allogenic sediments. This enable reconstruction of paleorelief. Datation of the sediments with paleomagnetic methods, palaeontology and by cosmic nuclides show that the mountains together with the Snežna jama were uplifted for about 1000 m in past 2 Ma while the uplift of caves of Tisnik hill are much smaller.

In Dinaric Mountains on the Kras Plateau we studied several profiles of cave sediments that were exposed in quarries, caves and unroofed caves. Sediments in Račiška pečina cave and in Črnotiče quarry revealed several sedimentary profiles with fossil remains of small mammals about 1.8 – 2 Ma old. The whole sediment sequences, analysed with paleomagnetic methods were up to 5 Ma old.

The age of the sediments define the sedimentation phases in caves and later denudation of karst surface, tectonic uplifted for at least about 400 m deepening of the blind valleys and other closed depressions.

THE PROBLEM OF CHRONOSTRATIGRAPHY OF THE MIDDLE PLEISTOCENE SNAIGUPĖLĖ INTERGLACIAL SEDIMENTS OF LITHUANIA

Šeirienė Vaida, Stančikaitė Miglė, Šinkūnas Petras, Kisielienė Dalia, Gedminienė Laura

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Series climatic fluctuations with pronounced warm and cool events are characteristic to the Middle Pleistocene however their intensity, duration and correlation throughout the Europe are still questionable. Terrestrial interglacial Middle Pleistocene sites of Saalian complex (younger than Holsteinian) are very rare in northern part of the Central Europe. Due to the lack of long sequences covering multiple warm and cold stages and absents of absolute age dates, correlation of these sediments is problematic. Further interglacial sediments of this age are nearly absent in eastern Baltic region and no traces were observed northwards in Latvia or Estonia and nor going to the eastwards in Belarus. However, in Poland sediments of two Middle Pleistocene interglacials – Zbójnian and Lublinian – were studied and correlated with Reinsdorf and Schöningen in Western Europe respectively (Lindner et al., 2013).

Simultaneously, sediments of Snaigupėlė Interglacial corresponding to Saalian complex were discovered in the several sections situated in the eastern part of Lithuania though their exact stratigraphic position and correlation are still complicated (Kondratienė, 1996).

Stratigraphy of the Snaigupėlė Interglacial sections was mainly based on palaeobotanical data and geological conditions of occurrence. Most investigations points on correlation of Snaigupėlė Interglacial sediments with marine isotope stage 7, but only in one section (Mardasavas) this age was proved by 230Th / U isochron method (Gaigalas et al., 2007). Some researches disclaim the existence of Snaigupėlė Interglacial and interpret these sediments as redeposited or dislocated. Thus, the new investigations for ascertaining the chronostratigraphy and sedimentation palaeoenvironment of Snaigupėlė Interglacial sediments are in significance for East Europe region.

Recent investigations of Snaigupėlė interglacial sediments outcropping in Pundžonys section were performed to clear up the stratigraphy of the sediments and sedimentation palaeoenvironmet and included complex proxies. Reconstruction of the vegetation changes confirms deposition of the investigated bed during the different climatic stages of the interglacial and is in positive correlation with the pollen records representing Snaigupėlė Interglacial. However, the optical stimulated luminescence dates are controversial.

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A MIS 5A ATTRIBUTION TO THE DEPOSITS OF THE TYPE-SECTION OF THE TYRRHENIAN STAGE AT CALA MOSCA – IS MESAS (SOUTH EAST SARDINIA, ITALY)?

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The Tyrrhenian Stage was created by Issel (1914) to designate a time interval postdating the Sicilian and predating the Holocene. The type section mostly comprises beach deposits and is located at Cala Mosca – Is Mesas on the Sant'Elia headland near Cagliari (South East Sardinia).

The attribution to the Last Interglacial was made because of the occurrence of a warm-water mollusk assemblage that, among others, contains *Strombus bubonius*, a gastropod nowadays thriving along the Senegalese coast. This species is considered as an index fossil of the Last Interglacial along the Mediterranean shorelines.

Early chronological data, including amino-acid racemization and U/Th dating of mollusks and corals found in the beach sediments, confirmed this attribution. However, ages obtained from the latest U/Th dating, despite a good correlation with the Last Interglacial, showed inconsistent isotopic ratios.

Recent investigation at the type-locality revealed the occurrence of a small cave carved in Miocene limestone, the Is Cocciulas cave, which was largely colluvium-covered in the past years, but has been re-opened by modern erosion processes. The cave, many tens of meters long, shows a pristine tidal notch at ca. 6 m asl, as well as lithophaga borings up to ca. 9.0 m asl. The elevation of the tidal notch is lower than the tidal notch exposed in coastal cliffs along the Orosei Gulf to the north and in the past assigned to the highest MIS 5e highstand. The lower elevation of the notch has to be associated with the occurrence of negative tectonic movements in the Campidano area. The intermediate marine sequence and terrace in the central part of Cala Mosca – Is Mesas at ca. 5 m asl could possibly represent a MIS 5c highstand. Therefore, the sediments containing the Senegalese fauna and capping a marine abrasion platform at +1.5 m asl in the southern part of the area, that were previously attributed to MIS 5e, could actually represent a later highstand, possibly MIS 5a.

Nonetheless, all these indicators could also reflect millennial sea-level fluctuations during MIS 5e. New U/Th dating of corals found in the inner part of the Is Cocciulas cave are in progress, and should hopefully shed light on these questions.

ENVIRONMENTAL AND GEODYNAMIC SETTINGS OF MIGRATION OF THE EARLIEST HOMININE TO THE ARABIAN-CAUCASUS REGION

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The Lower Pleistocene fluvial sections with the earliest Palaeolithic finds in Syria, Eastern Turkey, Armenia, Georgia, and Dagestan (the eastern Greater Caucasus) are analyzed in the report. Some of these stone industries are qualified as Oldowan or its analogs (Orontes River and Halabiyeh–Zalabiyeh area in the Euphrates Valley in Syria, and Dmanisi in southern Georgia). Others are qualified as Oldowan with elements of early Acheulian or proto-Acheulian (the Euphrates tributaries in Eastern Turkey, north-western Armenia, Dagestan). Perhaps, all of them belong to the same culture and local differences depend on stone materials used and functional specialization of the tools. Time interval of these industries is nearly between 2.0 and 1.7 Ma.

Topography of the area during that time was a combination of intermountain and foredeep depressions and uplands that were not higher than middle-mountain (up to 1000–1500 m).

Palynological studies reveal savanna landscapes with features of slight aridization and transition to forest-steppe landscapes in the early Calabrian. Nevertheless, general characteristics of faunal complexes including big mammals were similar in the region during the Gelasian and the earliest Calabrian. Two landscape features characterize both the African native land of early hominine and the discussed areas of Syria, Turkey, Armenia, and Georgia. The first one is the presence of valley-like tectonic depressions with lakes, rivers, and other water sources, and the second one is manifestations of young volcanic activity which were synchronous with or preceded the hominine settling. The availability of water and soils enriched in volcanic derivatives resulted in abundant vegetation attractive to herbivorous mammals. Beasts of prey, including hominine, migrated after herbivorous. They quickly reached wide basins between the Lesser and Greater Caucasus and foothills of the latter, including Dagestan.

NEW INSIGHT INTO THE LATE MIDDLE PLEISTOCENE STRATIGRAPHY IN POLAND

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In the stratigraphical charts of the late Middle Pleistocene in Poland there is a full sequence of 3 interglacials and 3 glaciations. They all have their own names and are correlated with the marine isotope stages (MIS 11-6) in deep-sea sediments. In the adjacent countries, both in the west and in the east, there are similar stratigraphical subdivisions, although in several countries some glaciations and interglacials are not represented by glacial deposits but by loess-palaeosoil complexes. However, if looking more critically upon these stratigraphical subdivisions based on key sites all over Europe, we find an extremely poor time-control and in fact, most stratigraphical terminology seems to represent conceptual models only that are not based on reliable geological data. In Poland, the glaciations Liwiecian and Krznanian (MIS 10 and 8) and the interglacials Zbójnian and Lublinian (MIS 9 and 7) are among such poorly defined stratigraphical units.

A deep-sea climatostratigraphy based on cores from middle and low latitudes indicates that the stages 11 and 9 represent considerable warmings, and the stages 10 and 6 are the greatest coolings in the presented part of the Middle Pleistocene. The most mysterious is the stage 6 which seems to have been less warm but composed of several warmer and cooler substages. Such ambiguous climatostratigraphy of the late Middle Pleistocene may result in a non-unequivocal reference to definite setting in a stratigraphical chart.

The Mazovian (Holsteinian) Interglacial in Poland is documented in numerous sites, some of which represent long continuous sequences that represent not only MIS 11 but also a considerable part of MIS 10, the latter with several warmer and cooler episodes. A terminal part of the late Middle Pleistocene that is the Odranian (Saalian) Glaciation is represented by glacial deposits but also by periglacial features that preceded and followed the Scandinavian ice sheet advance as indicated by OSL ages.

In the non-glaciated part of Europe there is quite a complete representation of the late Middle Pleistocene marine isotope stages (MIS 11-6) and their setting seems to have been supported by geological data (e.g. Central Massif in France). Therefore, it seems probable that in the glaciated part of Europe the late Middle Pleistocene sequences have unfortunately and insufficient time control. We can assume alternatively at present that either a reliable dating will fill the gaps in the stratigraphical charts (especially for MIS 9-7) or there are several Holsteinian-like pollen sequences corresponding to MIS 11, 9 and 7 respectively but their stratigraphical setting has not been properly determined yet.

THE DIACHRONIC NATURE OF THE SAALIAN-EEMIAN BOUNDARY IN EUROPE

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The Eemian is the term for the terrestrial and coastal marine Last Interglacial in Europe. The Eemian has been extensively studied from paleolandscape, sedimentary, archaeological, molluscan and botanical perspectives and it's lower boundary is currently also under evaluation in light of ICS' SQS base Upper Pleistocene Subseries/Stage stratotype definition (Head, 2016). Although the duration of the Eemian in north western Europe is well know from lake sediments (Müller, 1974), the absolute age of onset and ending are a matter of correlation and discussion. A critical part is the debate on to what extent the Eemian pollenzone biostratigraphical correlation can be diachronic between subregions of Europe. A second matter is the correlation with the MIS 6-5e transition.

On basis of detection of the Blake paleomagnetic excursion at a site close to the original Eemian type locality in the Netherlands (Sier et al., 2015) concluded that the Saalian – Eemian boundary was positioned at ~121 kyr, confirming earlier findings from a site in Germany (Sier et al., 2011). Comparison with a marine core offshore Portugal, for which marine isotope stratigraphy, pollen biostratigraphy and paleomagnetic excursion data exists (Sanchez-Goñi et al., 1999; Shackleton et al., 2002; Thouveny et al., 2004), shows that the onset of Eemian interglacial environmental conditions in north western Europe was delayed by ~6 kyr with respect to southern Europe (~127 kyr). The onset of the Eemian in NW Europe is thus placed well after the MIS 5e benthic $\delta^{18}O$ plateau was entered.

The striking diachroneity in the onset of interglacial conditions between southern and northern parts of Atlantic Europe, implies that regional climatic conditions over Europe and the North Atlantic in the first part of MIS 5e were very much different from those in equivalent parts of MIS 2 and 1, a feature that is related to known differences between the melting history of the Greenland ice cap following Termination II and Termination I (Bauch et al., 2000; Lowe et al., 2000; NEEM.., 2013). It also has implications for reading global fingerprints in the sea-level history of the period (Long et al., 2015).

In this presentation we give an overview of the current state of insights in the age of the Saalian - Eemian boundary throughout north western Europe. We perform a cross-correlation including the above and new records, strengthening our earlier findings of diachronic registration of Saalian-Eemian boundaries throughout Europe.

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ONSHORE AND OFFSHORE EVIDENCES FOR FOUR ABRUPT WARMING EPISODES DURING MIS 6 AT THE WESTERNMOST TIP OF CONTINENTAL EUROPE: HOW THEY CONTROLLED THE MIGRATIONS OF HOMINIDS

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Study of the total shell production typical of the *Pupilla* association in two loess formations of westernmost Europe (Nantois in Brittany and Villiers-Adam in the Paris Basin) evidenced for the first time four abrupt "warming" and humid episodes during the cold Upper Saalian episode.

Comparison with oak charcoal and rodents teeth of the same age sampled in La Cotte de Saint Brolade (Jersey Island) confirms the existence of these short events.

Correlations with detritic layers, resulting from short and repetitive phases of iceberg melting, imaged in the deep marine sediments of the Celtic Sea (MD03-2692 core) and dated between 130 and 190 Ka confirm the offshore extension of the abrupt warming phenomena.

The simultaneity of the onshore and offshore warmings, which were also contemporaneous with four positive variations of the sea level, shows that these events extended at the global scale. Simultaneous astronomical insolation and precession maxima demonstrate their astronomical origin.

Compilation of the ESR/RU ages of the artefact-rich layers shows a discontinuous dwelling of the Hominid populations and evidences that their migrations were controlled by the climatic improvements associated with the astronomical cycles.

Study of the oxygen isotopes recorded during the different warming phases shows that they were not all characterized by the same temperature. There is a clear relationship between the sea surface temperature (SST) around Brittany and Hominids dwellings when the temperature of the sea was reaching 10° in summer. On the contrary when SST was as low as 5° during summer Hominids were staying more to the south.

It is thus possible, to establish the existence of a marine-based climatic threshold that controlled the migration of Hominids toward Brittany. We are actually calculating the evolution of the delta ^{18}O of loess gastropods collected in Brittany in order to check if the continental-based threshold was of the same amplitude as the marine-based threshold. It is interesting to remember that the threshold actually available is identical to the lowest death rate already calculated for Hominids.

THE ANCIENT ANTHROPOGENIC LAYERS ON TOP OF THE BEDROCK – THE THIN CRUST OF THE QUATERNARY?

Ackermann Oren

The Martin (Szusz) Department of Land of Israel Studies and Archaeology, Bar Ilan University, Ramat-Gan, Israel.

Human activity is an agent that designs the environmental and landscape systems, and may even be considered equivalent to the force of nature.

Its impact on those systems was significant even in ancient times, perhaps from the Neolithic revolution onwards.

One surprising phenomena is the long-time effect of past human activities which still affect current landscape components. These effects are evidenced in the development of anthropogenic soils and rocks, fields and agricultural terraces, archaeological mounds known as tells, and surface alterations by moving and quarrying of rocks.

The current presentation shows representative examples that demonstrate the vast extent of this phenomena. Therefore, the anthropogenic layer, the thin crust on top of the Quaternary sequence, might be considered a distinct geological / sedimentological strata?

THE STRATIGRAPHICAL CONTEXT OF A DEEPLY BURIED MIDDLE PALAEOLITHIC SITE IN THE SOUTHERN NETHERLANDS AND ITS IMPORTANCE FOR ARCHAEOLOGICAL PROSPECTING

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In 2013, workers discovered bones and lithic artefacts during the construction of an underground parking garage in the city of ‘s Hertogenbosch, the Netherlands. Subsequent monitoring of wet dredging of the building plot led to the collection of hundreds of well-preserved Pleistocene mammal bones and Middle Palaeolithic artefacts from c. 7 to 10 m below surface. Here we report on the sedimentary and chronostratigraphic context of the finds. We aim to 1) demonstrate the potential of the deep subsoil for preservation of archaeological remains, and 2) contribute new knowledge as to where and in which sedimentary contexts such remains may have been preserved. Ultimately, this should result in prospecting strategies that take the geological complexity of the deeper subsurface into consideration.

The site is located in the northern part of the Roer Valley Graben, an active tectonic subsidence area that is part of the Cenozoic rift system of north-western Europe. It was filled with marine, coastal and fluvial deposits till the early Middle Quaternary. When tectonic movements forced the Rhine-Meuse river system to a more north-eastern course in the Middle Pleistocene, the accommodation space of the subsiding graben was filled with an up to 35 m thick sequence of fine-grained, small-scale fluvial, aeolian and lacustrine sediments, as well as with organic deposits. These investigations concern the upper part of this sequence. Based on samples from undisturbed cores and correlation with cone penetration tests that were acquired during the building process, five sedimentary units can be distinguished. Information on the age of the sediments has been obtained by optical dating of samples from the three cores.

Results show that the artefacts can most likely be correlated to the lowermost part of fine-grained fluvial channel sediments deposited by the river Dommel. OSL dating indicates that this unit was formed in several phases between c. 11 and 45 ka. The fluvioaeolian-palaeosol sequence below however, dates between 200 and 300 ka, indicating a hiatus of more than 150 ka at the transition between the two units. Regional geological mapping reveals the link between the local sedimentary sequence and the geological development of the Rhine-Meuse river system further north. Repeated climatic shifts and glacio-isostatic movements related to the waxing and waning of the Fennoscandian ice sheet have resulted in a cyclic alternation of aggradation and incision phases by the Rhine and Meuse. A widespread incision phase took place around the transition from Early to Middle Pleniglacial (MIS 4-MIS 3, c. 60 ka). We postulate that this incision caused the backward erosion of tributary rivers such as the Dommel. From its confluence with the Rhine-Meuse several km north of the archaeological site, the Dommel eroded a broad valley in the fine-grained fluvioaeolian-palaeosol sequence, which was later filled by sandy fluvial deposits. In the Late Glacial period coversand was deposited along the southern edge of the river area obliterating the underlying patchwork of palaeo-landscapes.

PALAEOGEOGRAPHICAL CONDITIONS AND SETTLEMENT CHARACTER DURING THE STONE AGE IN LUBANS PLAIN, EASTERN LATVIA

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The Lake Lubans and the adjoining area occupy the deepest depression of the Lubans Plain, characterized by a complicated geological structure, hydrographic network, and evidence of the extensive human inhabitation during the Stone Age. Geological corings were carried out on the territory of the ancient Lake Lubans, which at the end of the Late Glacial was at least three times larger than area covered by the current lake. This is in the areas of the Stone Age settlements, which were most often on the shores of the ancient lake. In order to find out the conditions during the lake development and changes in the environment, the multidisciplinary research including palaeobiological analyses have been carried out with special attention to that have existed during the Stone Age. The objective of the research was to establish the development of the lake and palaeoenvironment in the immediate vicinity of ancient settlements.

The depression of Lake Lubans is one of the largest archaeological Stone Age area of this type, not only in the Baltic States, but also in Europe, reaching a total area of 100,000 hectares, which houses 24 protected archaeological monuments of national significance, dating from the Late to the Younger Stone Age. Archaeological excavations contain a very rich material that allows us to reconstruct the lifestyle and activities of the Stone Age Men, evidence that people were engaged in fishing, hunting, and later also in livestock farming and agriculture. However, there is still insufficient information about the natural conditions and how they affected ancient people by the climate change.

The two particular Stone Age settlement areas - the Lagaza and Icha – were selected for the study, since they have the most insufficient data available, as well as for their locations that are distinctive in the paleo-geographic aspect.

The territory of the Lagaza settlement was set up in a triangle whose peak was formed by two rivers fusing together (Posms and Lagaza), which after a couple of hundred meters flow into River Aiviekste. Thus, from the West and East, the settlement area was surrounded by still, deep rivers, while a special segragation was built on the Northern side.

On the contrary, the Icha settlement is located in the lower reaches of the River Icha at Lake Skurstenezers. On the left bank of the River Icha, in the last bend of this river, about 300-350 meters above the mouth of the Vejupite Icha. During the middle Neolithic age River Icha was one of the largest tributaries of Aiviekste, but in the early Neolithic, when the Lake Lubans' level was lower, the settlement could be located on the island. That is why the settlement area has remained incomplete – due to the risen water level and the meandering of the river, part of the settlements have not survived.

QUATERNARY POST-CRANIAL REMAINS OF *SAIGA* SP. FROM EURASIA

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At present the saiga *Saiga tatarica* (Linnaeus, 1766) occurs only in Kazakhstan, Kalmykia and Mongolia, and its distribution range its shrinking. The reasons for the situation are varied: on the one hand the species is sensitive to climate and environmental changes, on the other human activities reduce its abundance (Kholodova et al., 2006). In the recent geological past, especially at the end of the Late Pleistocene (MIS 2), the saiga was very widespread in all of the Palaearctic and northern Nearctic and formed a constant component of the mammoth steppe community (Kahlke, 1999, 2014).

The morphological and statistical analyses of skulls of *Saiga* sp. showed significant differences between the extant and Pleistocene forms. This can be interpreted as a result of the great morphological variation of the Pleistocene populations from various geographical areas, and to the adaptation to local conditions (Ratajczak et al., 2016).

The preliminary analyses of post-cranial skeleton showed that the recent specimens from Kazakhstan had smaller tibial distal epiphysis than those from the Pleistocene. The specimens from Crimea showed higher values, but their size was similar to that of the saiga from Siberia. It is seen from the analysis of the variation of saiga metacarpal bones that the animals from the Upper Palaeolithic of France were larger than the recent specimens from Azerbaijan.

The morphological and statistical analyses of the skulls and post-cranial skeleton will serve to verify the taxonomic status of the Pleistocene saiga, most often described as *Saiga borealis* and / or *Saiga tataria*.

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STEPHANORHINUS KIRCHBERGENSIS FROM GORZÓW WIELKOPOLSKI (POLAND) – PRELIMINARY DATA AND PERSPECTIVES

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In april 2016 during construction of express way S3 in the environs of Gorzów Wielkopolski a 17 metres thick profile was uncovered. A deep denudational valley separates the lake in two parts, suggesting that one of them is from the coastal part, while the other is from the part afar from the cost. The lake lays on the fluvioglacial sands and gravel, probably MIS 6. The sequence of lake sediments is covered by glacial deposits from MIS 2. In the part of lake afar from coast the lower sequence of organic limnic deposits can be ascribed to the Eemian Interglacial, the upper probably reflects a sediment complex of the early Vistulian Glaciation. In the lacustrine deposits skeleton of rhinoceros of the genus *Stephanorhinus* and a metacarpal bone of the fallow deer *Dama dama* were found.

In the coastal part of a lake lacustrine sediments are covered by river delta cons which are in turn covered by till of Vistulian Ice Sheets. The preliminary geochemical analyses concerned gyttja and limnic chalks in this profile.

In the first phase of lake's development oxidative conditions were present. In the next, middle geochemical horizon a higher content of organic matter inclines that depth of the lake rose, and anaerobic conditions appeared. In the uppermost parts of the profile the amount of organic composits gradually declines, which suggests that climatic conditions were becoming less favourable for high biological productivity.

Rhino skeleton found on the site is almost complete. Besides left hind leg, almost all bones are present, which is at least 85% of the skeleton. State of preservation is uncommonly good – all the anatomical features are recognisable, enabling most of standard measurements used in paleonotology. Full histological analysis is possible, and samples from metapodials and ribs are being used to determine specific microscopic bone structure. It is possible that even remnants of tendons are still present too.

In case of rhinoceroses, the most distinctive features used in systematic diagnostics are taken from teeth. The analysis of morphological features showed that the skeleton belongs to *Stephanorhinus.* Further investigations showed that the rhino from Gorzów Wielkopolski is a specimen of species *Stephanorhinus kirchbergensis*. Diaphysis of limb bones and relatively small teeth show that given specimen was an adult female.

A sample of vegetation remains was taken from the upper right second premolar. The presence of *Ceratophyllum demersum* is characteristic for basins up to 10m deep. Another taxa *Najas marina* is known for their preference for meso- and eutrophic water and also characteristic for shallow coves with rapidly heated waters. Occurrence of diaspores of *Carex elata* indicates that peat bogs have developed on the shores of the lake. Taxa composition indicates that settlements, in which rhinoceros skeleton was found, were deposited in warm climate conditions.

THE EARLY PLEISTOCENE FRESHWATER FAUNA FROM THE LOWER DON RIVER AREA AND TAMAN PENINSULA

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On the south of European part of Russia, Late Early Pleistocene freshwater fauna has been studied from 8 sections (Iskra, MalyiKut (Taman Peninsula), Nesmeyanovka, Sarkel, Semibalki 1, Margaritovo 1, 2, Port Katon 3 (North-east Azov sea region and Don River basin)).

Late Early Pleistocene (late “Levantine”) is known from Iskra, MalyiKut and Nesmeyanovka location. The assemblage includes *Bogatschevia scutum*, *Pseudosturia caudata*, *P. brusinaiformis*, *Potamoscapha tanaica* and different species of the genus *Unio* and *Crassunio*. The fauna of small mammals correlates to the upper part of the regional zones MQR9.

This assemblage reflects climatic conditions from the subtropical to more temperate (Mediterranean) climate and is characterized by the gradual loss of subtropical elements and increasing role of boreal ones, and the appearance of the new genus of Unionidae (*Pseudosturia*). The closest related forms to the genus *Pseudosturia*– representatives of the genus *Eolymnium* now inhabit the subtropical zone of the Middle East (Chepalyga, 1967). The climate was still warm and, apparently, close to the subtropical.

More young freshwater complex was collected from sites of Sarkel, Semibalki 1, Port-Katon 3 and Margaritovo 1. In all these localities large mammals belong to the Taman faunal complex and the association of small mammals are correlated to the regional zone MQR8 (Tesakov et al., 2007).

The following molluscsare determinated in this complex: *Viviparus pseudoturritus*, *V.* spp., *Lithoglyphus* cf *naticoides*, *L. pyramidatus*, *Fagotia esperi*, *Bithynia tentaculata*, *Bithynia* sp. (opercula), *Parafossarulus* sp. (opercula), *Valvata piscinalis*, *Lymnaea* spp., Planorbidae spp. *Unio* sp., *Pisidium sulcatum*, *P.* sp. and others. This association is characterized by a large number of extinct species. Next fishes were determined in this complex: *Acipenser* sp., *Carassius carassius*, *Abramis* sp., *A.* cf. *ballerus*, *A. bjoerkna*, *Aspius aspius*, *Rutilus* cf. *rutilus*, *Scardinius erythrophthalmus*, *Tinca tinca*, *Silurus glanis*, *Esox lucius*, *Sander lucioperca*, *Sander* sp., *Perca* sp.

These freshwater associations are characterized by boreal limnophilic and stagnopilic forms. The malacofauna indicates a lacustrine water body with an oozy bottom and thickets of riparian vegetation. Southern boreal mollusks *Fagotia* and *Lithoglyphus* are thermophiles for this region. The presence of fragments of thick-walled shells of Unionidae and Viviparidae provide an indication of a warm climate.

The fauna of the terminal Early Pleistocene was studied in the Margaritovo 2 locality. The stage of evolution of the *Stenocranius* voles from this site correlates to the first half of the MQR7 regional zone. According to the paleomagnetic data, these deposits are reversely magnetized, and corresponds to the inverse polarity interval between the Jaramillo Subchron and the Brunhes-Matuyama reversal.

Bithynia leachi, *Bithynia* sp. (opercula), *Parafossarulus* sp. (opercula), *Valvata pulchella*, *Valvata piscinalis*, *Borysthenia naticina*, *Lymnaea* sp., Planorbidae spp., Succineidae indet, *Limax* sp., Euglesidae spp., Pisidiidae spp., *Dreissena* sp and others were determinated in this section. Fishes complex is represented by *Abramis* sp., cf. *Rutilus* sp., *Scardinius erythrophthalmus*, *Silurus glanis*, *Esox lucius*. Most of this freshwater association is represented by modern boreal species inhabiting water bodies with a weak current. Many of the recorded mollusks and fishes prefer sandy-clay bottom habitats. The climate has become colder: southern boreal genera are missing in this complex. Fish assemblage also characteristic of the boreal water bodies.

The freshwater fauna of the end of late Early Pleistocene reflects the gradual cooling of the climate and the restructuring of the fauna from the subtropical through the southern boreal to the modern boreal type.

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BIOSTRATIGRAPHY OF THE PLEISTOCENE OF UKRAINE ON THE BASIS OF ARVICOLIDAE

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Pleistocene biostratigraphy of the Ukraine on the basis of small mammals was established at the end of 20th century. The main biostratigraphic criteria used at that time were based on changes of faunal composition in time and percentage differences of tooth morphotypes in Arvicolidae.

These criteria were at present supplemented by several indices e.g. SDQ, A/L, B/W and C/W, and sometimes SDQH, HH and M/L as well as details of enamel structure. The obtained numerical indices allowed to establish evolutionary changes for particular taxa of Arvicolidae in the Pleistocene.

Directions and trends of morphological changes in time of particular phyletic lineages (*Mimomys-Arvicola*, *Allophaiomys-Microtus* with division to subgenera, *Pliomys-Clethrionomys*, *Prolagurus-Lagurus*, *Dicrostonyx*, and partly *Chionomys* and *Lemmus*) were analyzed.

On the basis of old and new criteria and also taking into account cyclic climatic changes the chronological succession of almost 200 Pleistocene sites of Ukraine was described. Moreover, boundaries of different stratigraphic ranks were established, e.g. boundaries between faunistic complexes and correlation of particular assemblages.

The correlation of continental and marine sediments of Pleistocene were also possible because some marine sediments in the Ukraine contain remains of Arvicolidae.

BIOCHRONOLOGY OF THE PLEISTOCENE AND PALAEOENVIRONMENTAL CONDITIONS IN THE NORTH CENTRAL EUROPE (POLAND) INFERRED FROM SMALL MAMMAL ASSEMBLAGES

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The effects of large-scale climate fluctuations in Pleistocene on dispersal of land mammal species are better visible in the North European Plain than in the Mediterranean area.

The lack of important geographical barriers favored periodic east-west migrations of mammal species and in consequence turnover of the whole communities along with changing climate and environment. This phenomenon is relatively well documented by abundant records of small mammal communities in the area north of the Carpathians and Sudetes Mountains. Altogether ca.

20 key sites were analyzed. The Early Pleistocene assemblages (e.g. Kadzielnia, Kamyk, Kielniki, Zabia, Zalesiaki) were compared with Middle Pleistocene (e.g. Kozi Grzbiet, Bisnik, Deszczowa) and early Late Pleistocene (MIS 5 – MIS 3) (e.g. Bisnik, Raj, Oblazowa, Stajnia, Komarowa) small mammal communities.

The reconstruction of climate conditions in the environs of the studied sites was based on models of bioclimatic analyses applied to the small mammal assemblages. Most of the important climatic and environmental changes in north Central Europe resulted in the appearance of “waves” of newcomers from the east. Successive faunas consisted either of the new species assemblage or species composition was the same but representatives of particular phyletic lineages differed morphologically from both previous and later forms. This regularity is well documented e.g. by Arvicolinae rodents for instance in *Allophaiomys – Microtus* and *Mimomys – Arvicola* lineages.

Morphological, and thus measurable, differences crate a basis of biochronological and biostratigraphic correlations.

BIOSTRATIGRAPHY OF THE EARLY PLEISTOCENE (PALEOPLEISTOCENE) OF THE SOUTHERN URALS REGION, RUSSIA

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A summary of published and unpublished data on the stratigraphy of the Early Pleistocene (Paleopleistocene) of the Southern Urals region is presented in this paper. It follows previous reviews about the characteristics of the Pleistocene deposits of the easternmost part of Europe. Deposits of different origin, which constitute the regional stratigraphic units, are characterized. Malacological and mammalian data form the base for the (bio)stratigraphical subdivision. Fossil mollusca, ostracoda, mammals and pollen are used for the reconstruction of the palaeoenvironmental conditions and the stratigraphical position of the main localities is discussed.

Three horizons are distinguished in the Early Pleistocene (Paleopleistocene) – Zilim-Vasilievo, Akkulaevo, and Voevodskoe which were investigated in the boreholes and outcrops (Fig.).

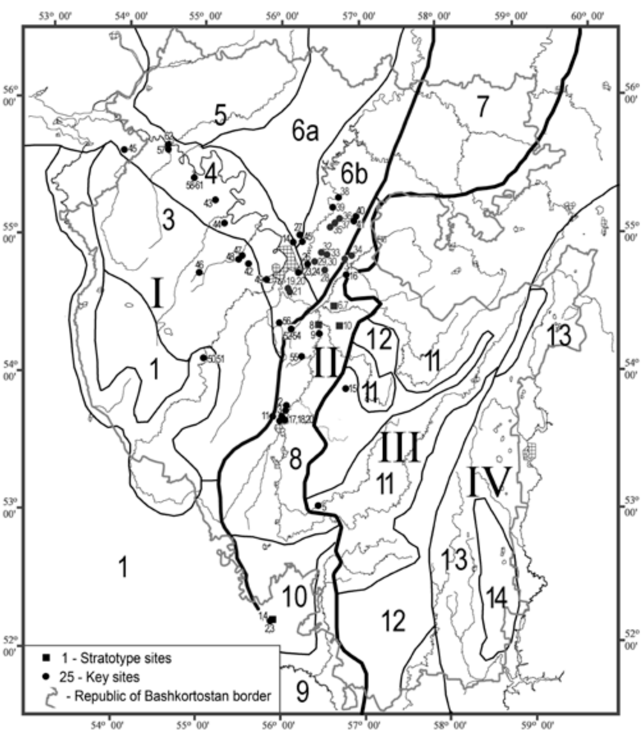

Fig. General map and location of the studied area showing the key Eopleistocene sites.
Legend: I-IV-s: I – South-East of the Russian platform; II – Fore-Uralian; III – Uralian; IV – Trans-Uraltau; 1-11 – regions: 1 – Bugulma-Belebei Highland, Obzhyi Syrt Highland (eastern part); 2 – Ik and Dema (upstreams) Rivers Basin; 3 – High left bank of the Belaya River (Syun' and Baza Rivers); 4 – Belaya River Basin between Ufa town and the river mouth; 5 – High right bank of the Belaya River (Bui and Bystryi Tanyp Rivers); 6a – Ufa River Bassin (between Krasnoufimsk city and the river mouth); 6b – western slope of the Ufimian Plateau; 7 – Yuryuzan and Ai Rivers Basin (56°-55° N); 8 – Belaya River Basin (including high right and left banks of the river) (55°-53° N); 9 – Sakmara and Ural Rivers Basin (53°-52°30′ N); 10 – Interfluves; 11 – Belaya River Basin with tributaries (between the upstream of the Belaya River and the Nizhnebikkuzino village); 12 – Interfluves; 13 – Ui, Sakmara, Ural Rivers Basin (from the upstream of these rivers to Kuvandyk town); 14 – Interfluves. Key Paleopleistocene sites (small Arabic numbers): Palaeo-Sakmara basin: 4 – borehole 375; Palaeo-Belaya basin: 6 – Kumurly, borehole 4; 7 – Lipovka, borehole 5; 8 – Karlaman, borehole 9; 9 – Karan-Kiishki, borehole 10; 10 – Vasylievka, borehole 6; 11 – Muravei, borehole 22; 12 – Ishparsovo, borehole 1; 13 – Aleksandrovka, borehole 2; 14 – Sharypovsky, borehole 33; 21 – Nagaevo, borehole 8; 23 – Bazilevka, borehole 105; 24 – Bazilevka, borehole 102; 25 – Sredny Izyak. borehole 22; 26 – Karaganka, borehole 448; 27 – Uspenskaya, borehole 23; 28 – Baltika, borehole 30; 30 – Iglino, borehole 82; 31 – Pyatiletka, borehole 35; 32 – Sart-Lobovo, borehole 25; 33 – Chuvashkubovo, borehole 40; 34 – Urman, borehole 53; 35 – Novokulevo, borehole 12; 37 – Staroisaevo, borehole 8; 38 – Nyzhny Chandar, borehole 2; 39 – Novobedeevo, borehole 4; 42 – Nurlino, borehole 2; 43 – Shelkanovo, borehole 1; 44 – Sychevo, borehole 4; 45 – Starosultangulovo, borehole 36; 46 – Symbugino; 47 – Yulushevo; 48 – Sultanaevo; 49 – Voevodskoe; 50 – Akkulaevo, section 4; 51 – Akkulaevo, sections 5u-5z, 6, 7, 8, 9, 11, 15, 16, 18, 21; 52 – Karmaskaly, section in a ravine; 53 – Karmaskaly, section in a quarry; 54 – Karmaskaly, borehole 18; 55 – Uteimullino III; 56 – Ilenka I, II, III; 58-61 – Novosultanbekovo, sections I-V; 62 – Chui-Atasevo I

Zilim-Vasilievo horizon (average 25 m) is represented by sediments formed during the river system flooding by the prograding Akchagyl Sea. An assemblage of molluscs, ostracods, spore-pollen spectra characterizes it. According to palaeomagnetic data, the horizon corresponds to the bottom r-Matuyama orthozone; n-Reunion subzone base is often observed in its roof.

At the beginning of the early Quaternary, a new ingression of the Akchagyl Sea began in the Zilim-Vasilievo time, which developed as much as possible in Akkulaevo time, and then briefly re-emerged after regression into the territory of the Southern Fore-Urals during Voevodskoe time. The characteristics of the events of the Gelazian age are shown on the basis of the materials of V.L. Yakhemovich and her colleagues (1970; 1965a, b) and G.A. Danukalova (1996).

In the Zilim-Vasilievo time the flooding of the hydrosystem began in connection with the approach of the second maximum phase of the Akchagylian ingression. At this time flooding of small wetlands, the formation of a freshwater lake system, their merging with the formation of a vast liman (which was freshwater at the beginning and brackish water at the end of time) occurred.

Flora of this time was different from the Pliocene and was actually an Akchagyl taiga type, close in composition to the modern one. In the north of the region and on the slopes of the mountains *Picea-Abies-Pinus* taiga dominated, in the south – *Pinus* taiga with *Tsuga* and pines grew. On the slopes of the Obshyi Syrt, Pine forests grew with sparse fir, *Tsuga*, broad-leaved trees and poor grass cover. At the beginning of this time, there was a warming with the appearance of pine and deciduous forests and a rich grass cover. At the end of the time was a cooling that resulted in a reduction in the species diversity of trees and a predominance of *Artemisia* and Chenopodiaceae among grasses, as well as in the development of mountain tundra with *Betula nana* and *Lycopodium pungens*.

On ostracods from the bottom up the salinization of the reservoir was traced with the appearance of euryhaline, and then typical Akchagyl brackish and marine forms. Mollusc complex contain freshwater and brakishwater species which indicate salinization of the basins.

Akkulaevo horizon corresponds to the Akchagyl ingression maximum: its bottom is composed of marine sediments (25 m), and top, of deltaic (to 4.5 m). The deposits contain freshwater and marine molluscs, ostracods, remains of Khaprovsky assemblage mammals.

At the beginning of Akkulaevo time there were two wide brackish water Akchagyl Sea gulfs in the Southern Fore-Urals.

One gulf existed at the place of the flooded hydrographic network of Palaeo-Belaya, the other - on the site of Palaeo-Sakmara. Between them was the Sakmara-Belaya watershed, which is the eastern part of the Obshyi Syrt and the Nakas Upland. Within the upland there were freshwater lakes. The Urals was low mountains, to the south of it was a low Zilair Plateau. In the western part of the region there was a high plain (the eastern part of the Russian platform) with Ufa Plateau, Belebei Upland. The coastal part of the land was a low plain. The Ural Mountains and the high western plain of the region were the main areas of denudation. The rivers flowed into the gulf, the existence of which is evidenced by deltas (Akkulaevo, Sultanaevo sites: Nemkova et al., 1972; Yakhemovich et al., 1983).

The flora was of a modern type with a small admixture of *Tsuga*, with the predominance of modern species and the presence of forms corresponding to the Gelasian stage (Yakhimovich et al. 1970; Danukalova et al., 2002). During the maximum of the Akchagylian ingression in the territory of the Southern Fore-Urals, dark-coniferous taiga forests with spruce and fir were common. The vegetation of this time reflects several phases of cooling and warming.

For the Akkulaevo time, a complex of various freshwater molluscs is characterized by *Viviparus, Bithynia, Lithoglyphus*, a variety of smooth and sculpted Unionidea, and brackish and marine molluscs (Mactridae, Cardiidae, *Clessiniola*), and the highest variety of brackish and marine ostracods (Yakhemovich et al., 1970, 1983, 1992; Danukalova, 1996).

At the end of Akkulaevo time, as a result of tectonic uplifts, the gulf was reduced, and part of the territory formerly occupied by the sea was drained. Isolated residual reservoirs continued to exist. The hydrographic network began to form in the foothills of the western slope of the Urals. The climate at that time was continental, dry and cool.

In the open spaces after the regression, poor grassy vegetation grew – Chenopodiaceae, Artemisia, etc.

Voevodskoe horizon (to 12 m is represented by alluvial deposits) at the base and by brackish water liman sediments with marine ostracods and molluscs at the top (Danukalova, 1996).

At the end of the Gelasian stage, in the Voevodskoe time, an ingressial short-term sea gulf was formed again in the territory of the Southern Fore-Urals. The marine deposits of the Voevodskoe time are separated from the Akkulaevo by alluvial sediments.

Flora of the Voevodskoe time is modern of the forest-steppe type, upwards passing into the taiga, there are some species phylogenetically close to modern, and species that now have more southern areals (ash, loch). Vegetation varied from Poaceae-herbage-steppe, forest-steppe, xerophytic steppe with birch-pine island forests to the spruce taiga. Species composition of molluscs and ostracods of Voevodskoe time contains freshwater, brackishwater and marine species, which do not differ from Akkulaevo (Yakhemovich et al., 1970, 1980, 2000; Danukalova, 1996). The continental climate was warm; at the end of the time, it became cooler.

At the end of the Gelasian (Paleipleistocene), the continental regime was established on the territory of the Fore-Urals region.

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DATESTRA: A DATABASE OF TERRESTRIAL EUROPEAN STRATIGRAPHY (INQUA FUNDED FOCUS GROUP SACCOM: 1612F)

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SEQS for the 2016-2019 Intercongress period will aim to build a Database of Terrestrial European Stratigraphy (DATESTRA). This is the European Geographic Stratigraphical Database that will summarize the main sites of stratigraphic interest across Europe.

DATESTRA follows the need for a concise, informative and easy to use system in order to share as many information as possible at least about the main or most important Quaternary sites across Europe. The main goal of the IFG is therefore to create a Database that summarize the litho-, bio-, pedo-, morpho and chrono-stratigraphical data fundamental for climate changes reconstructions and natural hazards and related risks assessment. Creation of shared database is also among the main topics of Horizon 2020, the financial instrument implementing the Innovation Union – Europe 2020 flagship initiatives aimed at securing Europe's global competitiveness.

The design, structuring and compilation of DATESTRA will provide an excellent tool for cross-border correlations of the main Quaternary subdivisions in Europe. Combining available and existing knowledge and expertise of regional/national specialists is a major necessary step to establish a Quaternary stratigraphy at a continental scale. The Database will be an open-source tool that will works as a starting point for the European Quaternary Stratigraphy knowledge, to be implemented and updated by scientists that especially in the future could face problems with old terminology or old references about key-sites that in many cases disappeared or faded away in the memory

The main outcome expected by the activities of this IFG is a GIS-based Geographic Database (DATESTRA) containing the basic information about the key-sites of the Terrestrial Quaternary Stratigraphy of Europe. The Database will be shared and made available to all the Quaternary audience on open GIS based Web platforms. The platform will be managed through web-based facilities where it will be possible to open forums and blogs for discussion, implementation and updating. The Database will be made available as web-GIS applications like "Story Maps" in order to give to the wider audience as possible, also at informative level, the chance to have an overview of the European Terrestrial Quaternary setting.

At the next INQUA Congress (2019 Dublin), SEQS will apply for a dedicated session for DATESTRA where the final results and outputs will be presented and shared among all the Quaternary audience.

THE ITALIAN CONTRIBUTION TO THE DATESTRA PROJECT (INQUA FUNDED FOCUS GROUP SACCOM: 1612F): A FIRST COMPILATION OF THE MAIN ITALIAN QUATERNARY SITES

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In the framework of the DATESTRA Project (INQUA-SACCOM 1612F) we present the first contribution to the compilation of the Database with 28 selected Quaternary sites from Italy.

The sites are described following the proposed table for DATESTRA containing the main attributes as follows:

1) Registry: main geographic and compiler information, including the type of site and the state of preservation of the succession;

2) Stratigraphy: this section include all the attribute regarding chronostratigraphy, geochronology (and its reliability), depositional environment and eventual unconformities, biological proxies, litho-, morpho, pedo- and magnetostratigraphy;

3) Correlation: the main correlations with MIS;

4) Documents: containing the documents (article, pictures, logs etc.) useful in order to get the main bibliographic information.

The sites were chosen following their stratigraphical importance and the chronostratigraphic attribution, focusing on the sites embracing the main Quaternary boundaries.

MIDDLE, UPPER PLEISTOCENE (NEO PLEISTOCENE) AND HOLOCENE KEY-SITES OF THE SOUTHERN URALIAN REGION (RUSSIA): SUMMARY FOR THE DATABASE

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DATESTRA – is a Database of Terrestrial European Stratigraphy which creation is in the list of the INQUA-SEQS International Focus Group activities for the 2016-2019 Intercongress period. This Database will allow scientists from all over Europe and adjacent areas to visit, observe and discuss basic information of key-sites of the Terrestrial Quaternary Stratigraphy of Europe.

The quaternary terrestrial sediments of the Fore-Uralian region were studied by numerous researchers. These works were accompanied by the study of reference sections through the entire region. The analysis of the obtained materials made it possible to fill lacunae in the stratigraphic scale: stratotype and parastratotype sections were first defined for all the stratigraphic units (horizons and formations). In addition, it was established that the characteristic feature of some Quaternary horizons is incomplete, which is explained by the fragmentary distribution of corresponding sediments because of ascending tectonic movements and strong erosion in the Fore-Uralian region.

The lower boundary between the Neopleistocene and Eopleistocene is correlated with the boundary between the Matuyama reversed and Brunhes normal polarity chrons.

Lower Neopleistocene deposits (time interval is 0.78-0.43 Ma) are known in alluvial, lacustrine, subaerial (eluvial, colluvial, deluvial) facies. In the Southern Urals region the stratigraphical subdivisions have local names and we can recognize the following horizons: Minzitarovo, Baza, Tanyp, Atasevo and Chusovskoi, Baza, Tanyp, and Atasevo horizons are part of the Chui-Atasevo Superhorizon. On the basis of their mammalian assemblages, these units have been correlated with the Cromerian (without Cromerian I) – Elsterian stage interval in the western European stratigraphical timescale.

Lower Neopleistocene deposits have been investigated and described from 10 sites (Fig.). Six key sections have been studied palaeobotanically (154 samples in total). Three of these localities have yielded mammalian fossils (1300 identifiable mammal remains). Four localities contain mollusc shells (nearly 1500 mollusc shells or their identifiable fragments).

Deposits of the Middle Neopleistocene (time interval is 0.43-0.127 Ma) were preserved on the local territories according to the following erosion processes. Middle Neopleistocene units were recovered in alluvial and sub aerial deposits on the territory of the Southern Fore-Urals. Subdivisions have local names and make up the Middle link of the Regional stratigraphic scheme with horizons: Belaya, Larevka, Klimovka, Yelovka. Units were determined on the base of the mammalian record and correlated with Holstenian – Saalian interval.

Middle Neopleistocene deposits were recovered and described from 18 sites (Fig.). Sixteen key sections were palaeobotanically studied (nearly 170 samples altogether). Four localities contain mammal fossils (more than 4 thousands definable small mammalian remains). Five sites contain ostracod shells (1944 definable specimens). Eight localities contain mollusc shells (nearly 758 mollusc shells or their definable fragments).

Deposits dating from the Upper Neopleistocene (time interval 0.127-0.01 Ma) are locally preserved. The systematic study of the Neopleistocene deposits of the Southern Urals region has been carried out during more than 50 years. Over 50 key localities, that expose the Upper Neopleistocene deposits, are described. All these sites are located in the Belaya River basin and particularly in the terraces resting above the modern floodplain and in the caves of the mountainous part of the Southern Urals (Fig.).

Forty Upper Neopleistocene deposit localities amongst 50 sites have been biostratigraphically investigated and described (Fig.).

16 and 18 of these localities have yielded small (around 29 thousand determinate bones) and large mammalian (more than 31 thousand determinate bones) fossils (over 50 thousands identifiable mammal remains are known). 22 localities contain mollusc shells (nearly 8 thousands mollusc shells or their identifiable fragments have been studied). 25 localities display clear palynological characteristic

In the Southern Fore-Urals region the Holocene (time interval is 0.01-nowadays) is represented by the Agidel Horizon with three subhorizons. The Holocene deposits form the high and lower flood plain terraces and the unconsolidated deposits in the caves.

One hundred thirteen Holocene key localities have been biostratigraphically investigated (Fig.).

Twenty-six of these localities have yielded amphibian fossils (8020 determinable bones). Twenty-four sites contain reptile remnants (5051 determinable bones). Thirty-two localities have yielded 43584 determinable bones of small and eleven sites contain 6938 determinable bones of large mammalian fossils. Fifteen sites contain more than 15000 mollusc shells. Fifty nine localities display palynological characteristics

We would like to present a list of Middle and Upper Neopleistocene (Table 2) and Holocene (Table 1) key-sites of the Southern Uralian region (Russia).

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Table 1. Main key-sites of the Holocene of the Southern Uralian region (Russia)

General Stratigraphic scheme of Russia				Regional stratigraphic scheme (Danukalova, 2007, 2010)	Sites		
System	Superdivision	Division	Link	Horizon	Stratotypes	Key sites	References
Quaternary	Holocene (Fig. 1, A)			Agidel	Upper: Stratotype – Zorenka (54); Parastratotype – Uteimullino I (33).	Bajslan-Tash (1); Archaeologist's Grotto (2); Tashmurun (3); Muinak-Tash (4); Chernyshevskaya (5); Syrtinskaya cave (6); Dema I (7); Tyulyan (8); Nukatskaja cave (9); Yurmash 3 (13); Azan-Tash (14); Lemeza I-IV (16-19); Mullino II (20); Klimovka I (21); Karlaman I (22); Atysh I (23); Sim III, IV (24-25); Zigan Grotto (27); Nugush 1 (28); Ishkarovo (29); Ustyevoi Grotto (30); Gumerovo Grotto (31); Ustinovo overhang (32); Uteimullino I (33); Khydolaz (34); Alekseevskaya cave (35); Chernorechka (36); Verkhnaya cave (37); Ust-Atysh (38); Biktimirivo (39); Starye Kiishki I (40); Asha I (41); Babye Ukho (42); Beidinskaya cave (43); Kuryatmasovo (45); Nicolsky overhang (47); Sykiyaz-Tamak (49); Tugai-Chishma (51); Yukalykul (53); Zapovednaya cave III (55); Baza (56); Oktyabrskyi (57); Gruzdevka (58); Bazitamak (59); Chui-Atasevo I-V (60); Symbugino (61); Ilchino I (62); Ilchino II-III (63-64); Tyuryushevo (68); Tyurkeevo (69); Sevady (71); Kalkan-Tau (72); Voevodskoye (76); Ishbulatovo (77); Ilenka II-IV (78-80); Utyaganovo (81); Karamaly (82); Novokudashevo (84); Novobelokatai (85); Arkaulovo (86); Seryat' (87); Verkhnaya Lemeza (88); Tanalyk I, II (89-90); Kutanovo (91); Magash (92); Kuznetsovka (93); Privolnoye (94); Mukasevo (95); Krasnyi Yar I, II (96-97); Smakovo (98); Petropavlovskoye (99); Syuren' (101); Mrakovo (102); Nizhnebikkuzino (103); Basurmanovka (104); Yumaguzino (105); Khudaiberdino (106); Nazarbulovo (107); Kabakovo (108); Gornova I (109); Vorota Arkyalana (110); Syun' I, II (112-113).	Yakovlev et al., 2006; Danukalova, 2006; Danukalova et al., 2007a, 2008, 2011, 2014; Kosintsev et al., 2013.
					Middle: Stratotype – Ishkarovo (29); Parastratotype – Uteimullino I (33).	Bajslan-Tash (1); Tashmurun (3); Syrtinskaya cave (6); Tyulyan (8); Kazyrbak (10); Maksyutovo Grotto (11); Yurmash 4 (12); Idrisovo (15); Lemeza II (16); Mullino II (20); Kalinovka I (21); Karlaman I (22); Ustinovo overhang (32); Alekseevskaya cave (35); Biktimirivo (39); Starye Kiishki I, (40); Asha Ia (41); Kuryatmasovo (45); Tallykulevo (52); Yukalykul (53); Baza (56); Oktyabrskyi (57); Ilchino I (62); Tyuryushevo (68); Kileevo-Ilikovo (70); Kalkan-Tau (72); Abdullino (73); Kushnarenkovo (74); Novosultanbekovo (75); Novosultanbekovo (75); Ishbulatovo (77); Utyaganovo (81); Arkaulovo (86); Seryat' (87); Tanalyk I, II (89-90); Kutanovo (91); Klimovka I (100); Syun (112-113).	
					Lower: Stratotype – Mullino (20); Parastratotype – Bajslan-Tash (1).	Chernyshevskaya V (5); Syrtinskaya cave (6); Dema I (7); Tyulyan'(8); Nukatskaja cave (9); Maksyutovo Grotto (11); Lemeza III (19); Kalinovka I (21); Karlaman (22); Ishkarovo (29); Alekseevskaya caves (35); Biktimirovo (39); Starye Kiishki I (40); Cave 9 (44); Tallykulevo (52); Yukalykul (53); Baza (56); Ilchino I (62); Chermasan (65); Idyash (66); Kuvash (67); Tyuryushevo (68); Kalkan-Tau (72); Abdullino (73); Ishbulatovo (77); Ilenka IV (80); Utyaganovo (81); Arkaulovo (86); Seryat' (87); Verkhnyaya Lemeza (88); Tanalyk I, II (89-90); Kutanovo (91); Syun' (112).	

Table 2. Main key-sites of the Middle, Upper Pleistocene (Neopleistocene) of the Southern Uralian region (Russia)

General Stratigraphic scheme of Russia				Regional stratigraphic scheme (Danukalova, 2007, 2010)		Sites		
System	Superdivision	Division	Link	Superhorizon	Horizon	Stratotypes	Key sites	References
Quaternary	Pleistocene	Neopleistocene	Upper (Fig. 1, B)	Valdai	Kudashevo	Stratotype – Novokudashevo (29). Parastratotype – Gornovo I (5).	Voevodskoe (2); Tabulda (3); Buribai (6); Sultanaevo (1); Baza (21); Syun (22); Old Kiishki (9); Kabakovo (10); Karlaman (30); Novobelokatai (8); Uteimullino II (11); Magash (23); Kuznetsovka (12); Basurmanovka (13); Nizhnebikkusino (14); Tanalyk I, II (15); Ilchino II, III (16); Kaga (17); Akbuta (24); Kalinovka II (25); Syuren (18); Mrakovo (19); Zapovednaya cave (20); Bajslan-Tash cave (26); Shulgan-Tash (Kapova) cave (27); Novokudashevo (29); Karlaman (30); Ignatievskaya cave (31); Prizhim 2 cave (33); Maksyutovo Grotto (34); Ustinovo Grotto (35); Syrtinskaya cave (36); Serpievskaya 2 cave (37); Smelovskaya 2 cave (38); Verkhnaya cave (39); Serpievskaya 1 cave (40); Tabulda (41); Yabalakovo (43).	Danukalova et al., 2002, 2006, 2007a, 2011, 2016a; Danukalova, Eremeev, 2006; Danukalova, Yakovlev, 2006; Yakovlev et al., 2013
					Tabulda	Stratotype – Tabulda (3). Parastratotype – Gornovo II (5).	Voevodskoe (2); Minzitarovo (28); Buribai (6); Sultanaevo (1); Novobelokatai (8); Syun (22); Old Kiishki (9); Kabakovo (10); Uteimullino II (11); Kuznetsovka (12); Basurmanovka (13); Nizhnebikkuzino (14); Tanalyk I, II (15); Ilchino II, III (16); Kaga (17); Syuren (18); Mrakovo (19); Zapovednaya cave (20); .	
					Saigatka	Parastratotype – Tabulda (3); Sultanaevo (1).	Voevodskoe (2); Chui-Atasevo III (4).	
					Kushnarenkovo	Stratotype – Sultanaevo (1)	Voevodskoe (2); Tabulda (3); Chui-Atasevo III (4).	
			Middle (Fig. 1, C)	Middle Russian	Elovka	Parastratotype – Sultanaevo (11).	Klimovka II, III (10); Gruzdevka (6); Voevodskoe (12); Chui-Atasevo III (8).	Danukalova et al., 2002, 2006, 2007b, 2016a; Danukalova, Yakovlev, 2004; Danukalova, 2006
					Klimovka	Stratotype – Klimovka II (10). Parastratotype – Sultanaevo (11).	Voevodskoe (12); Chui-Atasevo III (8); Klimovka II (10); Gruzdevka (6).	
					Larevka	Parastratotype – Gornovo II (1); Sultanaevo (11).	Krasnyi Yar (5); Old Tukmakly (3); Chui-Atasevo I, III (6, 8), V; Voevodskoe (12); Klimovka II, III (10)	
					Belaya	Stratotype – Gornovo II, III (1, 2). Parastratotype – Sultanaevo (11).	Valley of Belaya river near Ufa city; Old Tukmakly (3); Old Kiishki (13); Gurovka (4); Krasnyi Yar (5); Chui-Atasevo I-III, V (7-9); Klimovka II, III (10).	
			Lower (Fig. 1, D)		Chusovskoi	Parastratotype – Sultanaevo (9).	Chui-Atasevo I, II; Karmaskaly.	Danukalova et al., 2002, 2012, 2016b; Danukalova, 2006
				Chui-Atasevo	Atasevo	Stratotype – Chui-Atasevo I (3).	Sultanaevo (9); Karmaskaly (11); Chui-Atasevo II (4)	
					Tanyp	Stratotype – Chui-Atasevo V (7)	Sultanaevo (9); Karmaskaly (11).	
					Baza	Stratotype – Chui-Atasevo I (3). Parastratotype – Sultanaevo (9); Chui-Atasevo III (5).	Chui-Atasevo I-V (3-7); Bazitamak (8); Krasnyi Yar I (10)	
					Minzitarovo	Stratotype – Minzitarovo (1).	Yulushevo (2).	

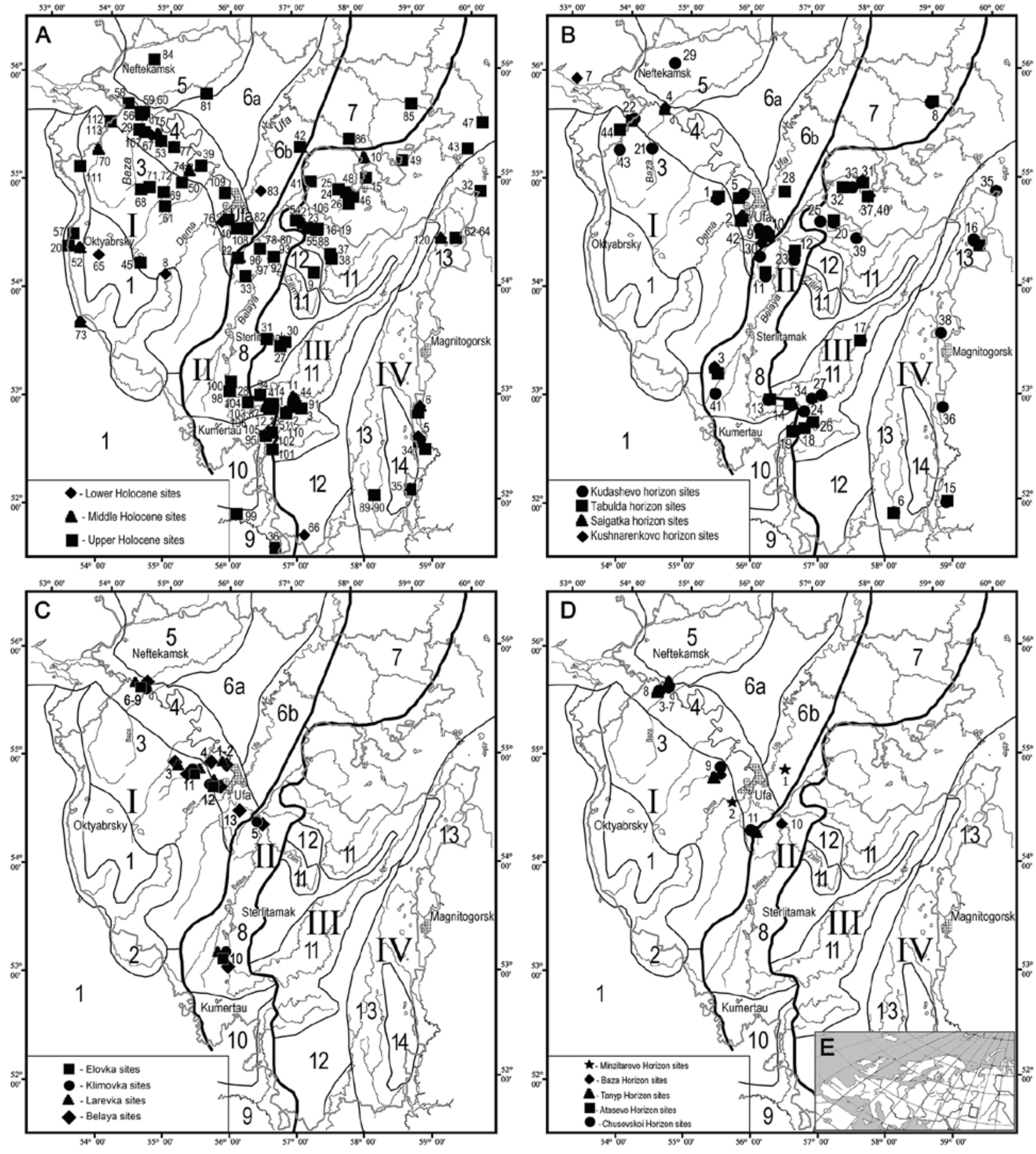

Figure. Location of the studied area showing the key Holocene (A) and Upper (B), Middle (C), Lower Neopleistocene sites (D) and general map (E).

Legend: I-IV-s: I – South-East of the Russian platform; II – Fore-Uralian; III – Uralian; IV – Trans-Uraltau; 1-11 – regions: 1 – Bugulma-Belebei Highland, Obzhyi Syrt Highland (eastern part); 2 – Ik and Dema (upstreams) Rivers Basin; 3 – High left bank of the Belaya River (Syun' and Baza Rivers); 4 – Belaya River Basin between Ufa town and the river mouth; 5 – High right bank of the Belaya River (Bui and Bystryi Tanyp Rivers); 6a – Ufa River Bassin (between Krasnoufimsk city and the river mouth); 6b – western slope of the Ufimian Plateau; 7 – Yuryuzan and Ai Rivers Basin (56°-55° N); 8 – Belaya River Basin (including high right and left banks of the river) (55°-53° N); 9 – Sakmara and Ural Rivers Basin (53°-52°30′ N); 10 – Interfluves; 11 – Belaya River Basin with tributaries (between the upstream of the Belaya River and the Nizhnebikkuzino village); 12 – Interfluves; 13 – Ui, Sakmara, Ural Rivers Basin (from the upstream of these rivers to Kuvandyk town); 14 – Interfluves. For key sites (small Arabic numbers) see table in the text, please.

MINERALOGICAL AND PETROLOGICAL FINGERPRINTING OF PLIO-QUATERNARY INTRAMOUNTAIN BASINS IN NORTHEASTERN SLOVENIA

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This study aims to compare mineralogical and petrological composition of Plio-Quaternary alluvial clastic sediments in three intramountain basins, Maribor, Slovenj Gradec and Nazarje basin, located at the junction of Eastern and Southern Alps.

In total 10 samples of sandy-silty gravel (3, 3 and 4 in Maribor, Slovenj Gradec and Nazarje basin, respectively) were analysed using bulk-petrology (> 2 mm), heavy minerals (supported by Raman spectroscopy) (0.250 - 0.063 mm), carbonate analysis (< 0.063 mm and < 2 mm) and X-ray diffraction (< 2 mm).

Macroscopical petrological analysis were conducted on 8-16 mm, 16-31.5 mm and 31.5-63 mm fractions. In the Slovenj Gradec basin, the gravel consist of mostly gneiss and granitoid lithologies, followed by mica schist, schist, pegmatite and vein quartz. Composition of pebbles in the Maribor basin consists mostly of mica schist and gneiss, followed by granitoid lithologies, reddish extrusive magmatic rock, tuff, sandstone and vein quartz. The gravel of the Nazarje basin is characterized by mostly tuff (breccia, sandstone and silty varieties), followed by sandstone, reddish extrusive rock, granitoid lithologies, schists and vein quartz.

Clast morphology analysis included shape, roundness and surface texture observations. The shape of the clasts varies mostly between blocky and slabb whereas roundness varies from very angular to rounded. In most of the samples, moderate to strong weathering with rugged surfaces and disintegrating character of the clasts can be observed.

The semi-quantitative XDR analysis (10% of LiF internal standard) showed predominantly quartz, mica, feldspars and clay minerals. Wide spectrum peaks as a weathering indication can be, in parts, observed. The heavy mineral assemblage contains large percentage of opaque minerals, followed by pyroxenes, amphiboles, tourmalline, garnet, zircon, zoisite, kyanite, epidote, rutile and staurolite.

Carbonate measurements yielded no significantly contents of $CaCO_3$ in the samples from Maribor and Slovenj Gradec basins. However, in one sample from Nazarje basin, 12.5 and 25.1% of $CaCO_3$ were measured in the fractions <0.063 mm and <2 mm, respectively, which could indicate a local carbonate origin.

In general, preliminary results of the composition indicates Eastern Alps provenance where predominantly crystalline rocks occur. The petrological and mineralogical fingerprint varies considerably between different basins, indicating different source areas and rather basin-isolated sedimentation. Results will be further used in the upcoming comparison with southerly sedimentary basins.

COASTAL VERSUS INLAND AEOLIAN DEPOSITION ALONG THE NORTH-WESTERN COAST OF SARDINIA

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The north-western coast of Sardinia preserves some very thick sedimentary successions containing usually relatively thin beach deposits referred to the Last Interglacial high stand and aeolian deposits attributed to the time span between MIS 5 to MIS 3. Only in a very few places OSL dating revealed the existence of Aeolian deposits attributed to the beginning of MIS 2 (Andreucci et al., 2014).

The present-day coastline corresponds to the inner margin of a large coastal plain during the Last Glaciation.

The investigation carried out in the framework of the new geological map of the Sassari Sheet 1:50.000 scale map, allowed the recognition of a dune field up to 5 km inland from the coast overlying alluvial plain sediments with weakly developed soils. According to the radiocarbon dating of the organic layers found in these soils, the Aeolian facies was dated back to the Late Glacial period, after 13 ka, that most probably corresponds to the Younger Dryas cold event.

In this work the distribution of the aeolian sediments along the coast of north-western Sardinia has been investigated and the stratigraphic setting, facies analysis and chronology of the sediments cropping out in the Rio Serra dune field and other sites in north east Sardinia are presented, with the aim to constrain their chronological setting. For this purpose, new Luminiscence dating are also ongoing on the overlying Aeolian deposits.

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PROPOSAL OF POLISH KEY SITES TO THE DATA BASE OF THE QUATERNARY STRATIGRAPHY OF EUROPE

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There hundreds of geological sites with Quaternary deposits in Poland but only several dozens of them are significant for a stratigraphical record of Europe. The sites are not evenly distributed: most open-air sites are located in the eastern and southern part of the country and sites with cave speleothems are limited to the southern part of Poland where calcareous Palaeozoic and Mesozoic rocks outcrop at the land surface. Cave sites are rich in archaeological findings and they are so farrepresentative for MIS 6-1 only. Interglacial sites are crucial for documentation of glaciations and the reliable key sections with deposits of 4 interglacials (Podlasian, Ferdynandovian, Mazovian, Eemian) represent MIS 21-17, 15-13, 11 and 5e.

The Early Pleistocene sites are underrepresented. There are a few sites, in which the Pliocene / Pleistocene boundary is indicated but a chronology in these sites is based mostly on pollen analysis and there is generally no real time-control of the sections.

However, there is a huge hiatus above until the late Early Pleistocene (MIS 22) as indicated by scarce palaeomagnetic investigations. There are at least two sites (Kalaejty, Kończyce), in which the Brunhes / Matuyama palaeomagnetic boundary was detected within a sequence of interglacial deposits and what is more important, the sites contain the oldest till in the Polish territory (correlated with MIS 22) that is undoubtedly beneath the Brunhes / Matuyama boundary.

There are numerous sites with the Ferdynandovian Interglacial and it is usually connected with MIS 15-13 but there is in fact no reliable evidence for this setting, except for the geological data as proved by its pre-Holsteinian age. Among the numerous Mazovian (Holsteinian) Interglacial sites there are at least two (Ossówka, Hrud), in which there is a continuation of the lake sedimentation into MIS 10 and for this reason they should be included in the data base. Above this post-Holsteinian sequence there is a hiatus until MIS 6.

The following part of the section is well indicated by several sites with the Odranian till, in northern Poland overlain by well examined Eemian marine sediments (Cierpięta, Licze, Obrzynowo), in which two sea transgressions were noted during this interglacial.

The Eemian lake deposition continued within the last Scandinavian glaciation (Vistulian, Weichselian) until at least MIS 4 and it is represented in several sites.

The ice sheet advance is well documented by the overlying radiocarbon-dated organic deposits in a couple of sites. In the world-famous Gościąż site in central Poland, the Pleistocene / Holocene boundary was dated in the lake laminated deposits at 11.510 cal yrs BP.

DATESTRA IN BRITTANY AND NORMANDY. THE PRE-DATESTRA CORRELATIONS AND OTHER TRANS-EUROPEAN CONSIDERATIONS

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Since the organization of the SEQS Meeting in Rennes in 2008 and titled "***Differences and similarities in Quaternary Stratigraphy between Atlantic and continental Europe"*** we have always been interested in the stratigraphic comparison between the main European key sites. It is why we introduced in many of the papers we published since that time tables showing the equivalences between the different European Pleistocene stratigraphic subdivisions. Contrary to the actual purpose of DATESTRA which mainly focus on the accurate description of the most important sites recognized in each European country, our initial aim was to compare the limits of the main stratigraphic ensembles defined between the two ends of geographical Europe (that is to say between Finistere in France and the Urals in Russia) and to try to correlate the local names used in the different countries (see references). During these synthesis we have been facing some peculiar problems which maybe of interest for the actual DATESTRA compilation.

- The splitter-lumper problem (Fig.). We think that this problem should be discussed in the frame of the DATESTRA program. A "lumper" is an individual who takes a gestalt view of a definition, and assigns examples broadly, assuming that differences are not as important as signature similarities. A "splitter" is an individual who takes precise definitions, and creates new categories to classify samples that differ in key ways. However, if we take account of the surface of the different European countries, a "lumper" selection of the sites retained for Brittany will be considered as a "splitter" description when compared with the sites selected for Russia which is a much larger country.

- The stratigraphic gradient problem. Comparison of the density of the different key sites which will be selected for Easternmost and Westernmost Europe shows that some areas must be described in a "splitter" way and others in a "lumper" way. This is explained by the rapid evolution of the stratigraphy of the sites bordering the North Atlantic Ocean and by the rather monotonous evolution of the sites located in more continental areas.

- During the Vienna SEQS meeting in 2014 we proposed an East-Section running between the Celtic Sea and Germany. This section was clearly showing the evolution between the deep marine sedimentation in the West and the pure continental sedimentation in the East. We consider that the systematic comparison between the "continuous" offshore sedimentation and the "discontinuous" recording of the onshore sedimentation must be considered. It is why we suggest the organization of a joint meeting where Quaternary Marine stratigraphers could meet our SEQS group. The progressive "continentalisation" of the West European countries towards the East during Pleistocene times is certainly a valuable topic.

-Introduction of other parameters in the basic table which will be used by all DATESTRA participants such as: heavy minerals, the precise technics used for dating the samples, a brief description of the archaeological artefacts, alkanes and $\delta^{18}O$ measurements and the dip of the layers would be important to quote because they sometimes better help to locate the boundary between two monotonous stratigraphic formations.

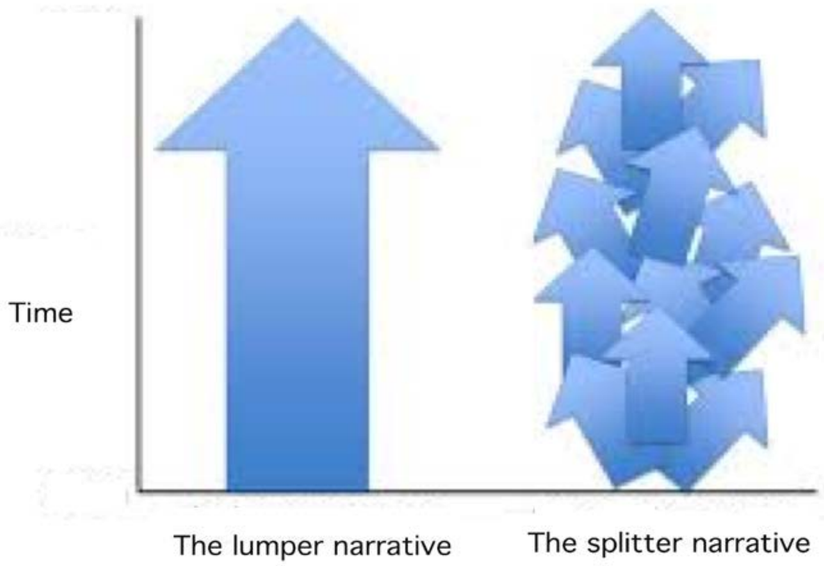

Figure. The splitter-lumper problem

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USING OF PALEOMAGNETIC DATA FOR CORRELATION OF THE PLIOCENE-QUATERNARY SEQUENCES OF ARABIAN-CAUCASUS REGION

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Paleomagnetic study is one of the main sources for dating and correlation of Quaternary sedimentary sequences. It is especially important for correlation of intercontinental sedimentary sections of large intermountain basins of the Arabian-Caucasus region, which lack fauna finds as well as material for isotopic dating.

Best results were obtained by combination of paleomagnetic, faunal, pollen and isotopic data for sections in intermountain basins of the Armenian Volcanic Highland. 25 sedimentary sections of Quaternary deposits were examined, and in most cases paleomagnetic data was correlated with isotopic and faunal data. For example, for Karakhach sedimentary unit, where U-Pb zircon dating was used, we were able to clarify the date, based on the paleomagnetic Olduvai episode (1.87-1.67 ka), which is clearly traced in the Karakhach outcrop.

Intermountain depressions of the Eastern Anatolian Highland have much smaller amount of volcanic material suitable for isotopic dating. As a result, the role of paleomagnetic data in combination with faunal, palynological and archaeological data significantly increases here. We have described 21 sections of sediments of Quaternary river terraces, and two distinctly traced paleomagnetic episodes were identified. This allows us to interpret them, as Olduvai and Jaramillo, respectively, and thereby chronologically dismember the strata.

An example of using of solely paleomagnetic data for correlation and age interpretation of Quaternary sections is presented in our works on the Iranian Highlands (the southwestern slope and foothills of Zagros), and also at the territory adjacent to the Mesopotamian foredeep basin. Boundary of the lower fine-grained and upper course molasses consequently rejuvenates from external to internal zone.

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COMPARISON OF QUATERNARY SEDIMENTARY SEQUENCES OF THE WEST SEVAN BASIN AND BASINS OF NW ARMENIA

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The Sevan basin is the largest intermountain basin in Armenia. The study of the its sedimentary and volcanic sequences is essential for paleogeographic reconstruction as well as contributes to the tectonic history of the Lesser Caucasus. The most important sedimentary sequences of the Great Sevan Lake are exposed along the western coast of the lake (Noratus village). Previous investigations were supplemented by more detailed description of the outcrops, paleomagnetic sampling and single fauna find. Noratus-1 consists of pebble alluvium at the bottom and horizontally bedded silts with interbeds of reworked volcanic ash and pumice. The lower 5-m portion of Noratus-1 showed reverse magnetic polarity, the rest of sediments showed normal polarity. Black pumice layer above the sediments has the age of 2.30±0.15Ma. Thus, the lower part of the outcrop may be interpreted as Kaena event and the upper – the Gauss epoch. No fauna was found in Noratus-1. Noratus-2 outcrop consists primarily of sandstone. All the Noratus-2 outcrop showed normal magnetic polarity. Within N2 remnants of deer's horn (presumably *Cervus* cf. *elaphus)* was found, it is aged the Pliocene.

Previous investigations revealed that Shirak Basin sequences are subdivided into Karakhch, Ani (~1.25–0.75 Ma) and Arapi (0.7±0.05 Ma) sedimentary units, underlied by effusive rocks of the Gelasian and older volcanic complexes and covered by Leninakan tuff. The age equivalent for Ani and Arapi untits is Kurtan unit (~1.2–0.6 Ma) found in the Upper Akhuryan, Lori and Pambak Basins. The stratotype consists of fine-grained sand, silt and clayey loam. The upper part of the unit has normal polarity, and the downmost part – reverse polarity. In the downmost part a leftover humerus of the elephant *Archidiscodon* ex.gr. *meridionalis* (Nesti) was found. Its stratigraphic range covers the upper part of the low and lower part of the middle Pleistocene. Within the upper part of the unit bones of deer *Praemegaceros* cf. *verticornis* (Dawkins), Bovidae gen. (cf.Bison) as well as of small mammals – *Ochonta* sp., shrubby and gray field voles *Terricola* sp., *Microtus* sp., mole rat *Ellobius (Bramus)* ex.gr. *lutescens* were found. The unit rests on a reworked pumice with ash interbed, which is incised into basaltic complex II with a K-Ar date of 2.08±0.10 Ma. The SIMS U-Pb age of pumice is 1.495±0.021 Ma, of ash – 1.432±0.028 Ma.

Comparison of the Sevan sequences with those of the Shirak basin shows that these two basins have never had direct connection and have been developing separately from one another. In contrast, basins along the Pambak river valley did have connection with the Shirak Basin at least during the Gelasian.

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LATE GLACIAL AND HOLOCENE ENVIRONMENTAL AND CLIMATE CHANGES IN NORTH LITHUANIA ACCORDING TO CHIRONOMID STUDIES

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The Late Glacial and Holocene period was characterized by several rapid and extreme climatic fluctuations. The magnitude of these shifts has been recognized from sediment records using various proxies. The dipteran family *Chironomidae* is the most widely distributed and frequently the most abundant group of insects in freshwater, with representatives in both terrestrial and marine environments. The ability to exist in a wide range of conditions makes *Chironomidae* ideally suited for generating high-resolution quantitative and qualitative past temperature reconstructions (Brooks, 2006). The first attempts on fossil chironomid assemblage studies were performed in Lieporiai palaeolake (North Lithuania), a boggy meadow at the present day, where Late Glacial and early Holocene sediments are relatively well-expressed. A detailed multiproxy analysis, e.g. pollen and spores, diatoms, plant macrofossil, isotope ^{14}C, geochemistry and loss-on-ignition measurement were applied.

A rich taxa *Chironomidae* fauna, 36 taxa from 4 main subfamilies were found in the studied sediments, and the taxa *Corynocera ambigua, Psectrocladius* sp., *Tanytarsus* sp., *Microtendipes* sp., *Chironomus* sp. were dominant. According to changes in species composition five zone of palaeolake development were distinguished. During the initial stages of palaeolake formation sedimentation took place in relatively shallow oligotrophic lake with cool water and poor in nutrients as indicated by dominant taxa *Microtendipes pedellus*-type and *Paratanytarsus austriacus*-type. Slight climate fluctuations are fixed during the zones two and three. The prevalence of warm, nutrient rich environment *Chironomus plumosus*-type and *Tanytarsus mendax*-type taxa points on water eutrophication during the fourth zone. The final stage of lake development could be characterized as increasingly acid and suggest overgrowing of the lake species.

Corynocera ambigua was noticed throughout the all sediment section. It is generally regarded as a cold stenotherm (Brooks et al., 2007) and it is the main driver of the decrease in temperature. However, this taxon has also been found in abundance in warm, shallow eutrophic lakes (Brodersen and Lindegaard, 1999), implying that temperature may not be the limited factor in its distribution.

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STRATIGRAPHY AND FORMATION PROCESSES OF UPPER PLEISTOCENE SITES IN THE RIVER MULA BASIN (MURCIA, SPAIN)

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Archaeological research undertaken since 2006 in the River Mula basin (Murcia, Spain) has revealed a complex succession spanning most of the Late Pleistocene, thanks to the correlation of three Palaeolithic sites, which were extensively excavated and dated. The sites span a similar chronology but show distinct formation processes, and represent a unique opportunity for the study of the Middle-to-Upper Palaeolithic transition in SE Iberia (Zilhão & Villaverde 2008; Zilhão et al. 2010).

Cueva Antón is a Middle Palaeolithic cave in the valley of River Mula. The site is opened into the base of an Eocene limestone fault escarpment and contains a ca. 4 m-thick well-stratified stratigraphic succession that corresponds to a well-preserved Upper Pleistocene fluvial terrace of the River Mula (Angelucci et al. 2013). OSL and radiocarbon dating indicate that the succession accumulated between MIS 5a (72-85 ka) and the mid part of MIS 3 (35.1-37.7 ka), with a depositional hiatus related to valley incision occurring around MIS 4 (Burow et al. 2015; Zilhão et al. 2016). Archaeological features with Mousterian assemblages are present, although scarce, and associated to short-term occupation events (Zilhão et al. 2016).

Abrigo de la Finca de Doña Martina (FDM) and Abrigo de la Boja (ADB) are two rock-shelters located at Rambla Perea, a left tributary of River Mula. They are ca. 50 m far from each other, at the base of a rock cliff cut in Miocene limestone in relation to the incision of the Rambla Perea watercourse (Angelucci et al. 2017).

At FDM, the succession rests over two stepped bedrock platforms. This topography allowed the preservation of the archaeological record. An escarpment marks the outer boundary of the site; outwards, sedimentary facies are indicative of a slope deposit and no archaeological remains were detected. The sedimentary inputs derive from the Miocene walls and accumulated through gravitational processes combined with the action of surface water. OSL dating was not possible due to unsuitability of the material, while only minimum radiocarbon ages could be obtained on the humic acid fraction of charcoal samples from a few layers. The Mousterian, the Aurignacian, the Gravettian, the Solutrean and the Epimagdalenian are represented in the succession.

At ADB, the Pleistocene deposit shows the same sedimentary characteristics throughout. Stratigraphic units were distinguished thanks to the presence of archaeological features; their good preservation suggests a regular and rapid rate of sediment accumulation. Radiocarbon dating is consistent with the diagnostic stone tool assemblages and places the site's almost continuous human occupation between the Middle Palaeolithic, ca. 45-50 ka, and the end of the Upper Palaeolithic, ca. 15 ka.

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HISTOLOGICAL ANALYSIS AND COMPARISON BETWEEN BONES OF *STEPHANORHINUS KIRCHBERGENSIS* FROM GORZÓW WIELKOPOLSKI (POLAND), WOOLLY RHINOCEROS *COELODONTA ANTIQUTITATIS,* INDIAN RHINOCEROS *RHINOCEROS UNICORNIS,* BLACK RHINOCEROS *DICEROS BICORNIS* AND WHITE RHINOCEROS *CERATOTHERIUM SIMUM* – PRELIMINARY DATA AND PERSPECTIVES

Kotowski Adam[1], Nowakowski Dariusz[2], Kuropka Piotr[3], Kołaczyk Karolina[3], Badura Janusz[4], Borówka Ryszard K.[5], Stachowicz-Rybka Renata[6], Ratajczak Urszula[1], Shpansky Andrey[7], Urbański Krzysztof[4], Stefaniak Krzysztof[1]

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During construction of express way S3 in april 2016 in the environs of Gorzów Wielkopolski a very well-preserved skeleton of rhinoceros was found. Preliminary expertise shows it belonged to species *Stephanorhinus kirchbergensis.* The state of preservation enabled taking samples of metapodial bones suitable for microscopic analyses. Several comparative samples were taken from metapodial bones of woolly rhino *Ceolodonta antiquitatis* from sites in Poland and from extant species of rhinos: indian (*Rhinoceros unicornis*), black (*Diceros bicornis*) and white (*Ceratotherium simum*).

Two methods were applied. In first bones were merged in metyloacrylic resin and cut with diamond saw. Observations were conducted in passing and polarized light. In the second bone roundels were observed in fluorescent microscope without submerging in resin. The objective was to compare the arrangement and diameter of osteons, and diameter of Haversian canals, which may be characteristic for certain taxons, in attempt to answer the question whether it is possible to distinguish extinct species of rhinos using such method.

Preliminary results show that there is no significant difference in trabeculae's thickness in pairs *C. simum – D. bicornis* and *C. antiquitatis – R. unicornis. S. kirchbergensis* shows significant difference when compared to the rest. Distribution of trabeculae's thickness confirms those differences.

There are also differences in arrangement of bone's structure. *S. kirchbergensis* and *C. simum* have well developed compact bone tissue in which trabeculae form tubes all along the long axis of bone, whereas *C. antiquitatis* lacks osteons. *D. bicornis* and *R. unicornis* show some transitional forms.

STEPPE BROWN BEAR *URSUS ARCTOS PRISCUS* GOLDFUSS, 1818 – HUGE SCAVENGER OF LATE PLEISTOCENE GRASSLANDS PALEOCOMMUNITIES

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With opportunistic behaviour, extremely broad diet, ability to adapt to various habitats ranging from semi-deserts to Arctic tundra, including arid and mountain areas, *Ursus arctos* could adapt to the changes of environmental conditions. The brown bear remains from many European sites document the occurrence of a very particular kind of bear. This giant bear, called steppe brown bear *Ursus arctos priscus*, was a rare but permanent member of open grasslands mammal palaeocommunities. It is very characteristic that this form is always strangely difficult to find not only in open sites but also in caves. Compared to other carnivores, the steppe brown bear was never common in one locality and tended to be a solitary hunter and scavenger, which required large expanses of open grassland. This bear was a scavenger and kleptoparasit, whose huge size gave it advantage over other predators (also ancient hunters) (Figure 1). It also followed herds of herbivores and took animals which died naturally or in another way. Occasionally it also hunted. In its behaviour it resembled the modern *Ursus maritimus* or *Arctodus simus* from North America in the past. It can be conjectured that, except pregnant females, the steppe brown bear was active year-round following herbivores and other carnivores in search of food.

Isotopic analysis shows that brown bears were highly carnivorous till the late glacial and became more omnivorous with the change of climate and environmental conditions. The last postglacial warming brought about a shrinkage of open grasslands, disappearance of ungulate herds and expansion of forests. The largest species like mammoths, rhinoceros, and some bovids became entirely extinct, other forms lived in smaller herds or small groups, and carcasses were much harder to obtain than previously. The density was much lower, and the amount of available food much smaller. There was not enough food and space for such a huge bear. During the postglacial times, the brown bear slowly dwarfed, and also smaller bears similar to the nominate subspecies entered from the south and southeast. The dwarfing process, however, was not the same in entire Europe, since in some regions large, robust bears of *priscus*-type survived longer. The form is only a smaller descendant of the Late Pleistocene form, which occurred till the early Holocene over the coast of the North and Baltic Seas as well as in some parts of Germany and Poland. Some populations slowly retreated to the northeast, while others were genetically swamped by the modern European bear. Finally, in the early Holocene, the modern brown bear appeared and became the sole bear species in Europe.

Figure 1. The relationships with humans, like other apex carnivores were not peaceful. Scene showed visit the kill place by not-welcome guest at the famous mammoths hunter camp Spadzista street (Kraków, Poland).

NEW DATA ON LATE PLEISTOCENE MAMMALIAN FAUNA FROM IGNATIEVSKAYA CAVE, SOUTHERN URALS

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During the excavations in Ignatievskaya cave (entry cave – “excavation V”), which started in 1984 (Smirnov et al., 1990) and continued in 2014, numerous bones of mammals were found. We investigated the zoogenic deposits of this cave (depth of 3.10-5.20 meters) (2014).

A total 9642 identified remains of the rodents (*Microtus gregalis, M. agrestis, M. oeconomus, Microtus* ex gr. *arvalis-agrestis, Arvicola terrestris, Dicrostonyx* sp., *Lemmus sibiricus, Lagurus lagurus, Eolagurus luteus, Clethrionomys rufocanus, Cl. rutilus, Cl. glareolus, Eliomys quercinus, Cricetulus migratorius, Allocricetulus eversmanni, Cricetus cricetus, Sciurus vulgaris, Spermophilus* sp., *Marmota* sp., *Sicista subtilis, Sylvaemus flavicollis, S.* ex gr. *uralensis-sylvaticus*), 541 – lagomorphs (*Lepus* sp., *Ochotona pusilla*), 687 – bats (*Eptesicus nilssoni, Plecotus auritus, Myotis* sp.), 210 – insectivorous mammals (*Talpa sp., Crocidura leucodon, Sorex minutissimus, S.minutus, S.caecutiens, S. tundrensis, S. isodon, S. araneus*), 666 – carnivorous (*Canis lupus, Vulpes vulpes, Alopex lagopus, Gulo gulo, Mustela nivalis, M. erminea, Martes* sp., *Ursus savini, Ursus* sp., *Panthera leo spalaea*) and 7 – ungulates (species are not defined) were found in these cave deposits.

The teeth of *M. gregalis* dominate in all layers (61.6% (4.30-4.40 m) → 38,8% (3.10-3.20 m). The gregaloid morphotype prevails among m1 of *M. gregalis* (>75% (5.00-5.20 m) → 38.1% (3.10-3.20 m), n=905). The frequencies of the gregaloid morphotype decreased (>50% → ~20%) between approximately 90 and 50 ka BP (MIS5b-MIS4) from localities of NE European Russia (Ponomarev, Puzachenko, 2017). The values for SDQ m1 of water vole 83.0-96.7±2.8-111.3 (n=14) correspond to different populations of *Arvicola terrestris* from Late Pleistocene of Europe deposits (Kolfschoten, 1990). The morphological stage of the teeth of collared lemming is not defined due to the small amount of whole teeth of this specie. The composition of the insectivorous mammals varies over time: *S. tundrensis, S. minutissimus, S. araneus, Cr. leucodon, Talpa* sp. (3.75-4.90 m) and *S. araneus, S. minutus, S. isodon, S. minutissimus, S. caecutiens, Cr. leucodon, Talpa* sp. (3.10-3.55m). The bones of *Eptesicus nilssonii* dominate among the bones of the bats.

The fauna of the large mammals are represented by species that discovered in faunas of late Middle and Late Pleistocene. The proportion of the open spaces species decreases (83.4% (4.30-4.40 m) → 61.1% (3.10-3.20 m), the proportion of the forest species increases (3.3% (4.30-4.40 m)→15,0% (3.20-3.25 m). The greatest species diversity of mammals is recorded at depths of 3.35-3.90 m. According to preliminary data zoogenic deposits of the cave Ignatievskaya (3.10-5.20 meters) were formed in the first half of the Late Pleistocene (MIS5c-d).

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PLEISTOCENE STRATIGRAPHY AND KEY-SECTIONS IN KOLA PENINSULA, NORTH WEST RUSSIA. AVAILABLE DATA

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According the current Quaternary System subdivisions for European Russia, available data from Kola Peninsula evidence the Neopleistocene (middle-late Pleistocene in the West Europe) record begins here with the Chekalin (MIS 9) Horizon. Corresponding key-section is situated in the southern Kola on the bank of the Lower Varzuga River. The basal part of the Varzuga section is represented by marine clayey sediment with subfossil mollusc shells ESR dated between 319 and 316 ka. Recurring vegetative assemblages characterized by increasing quantity of *Betula* sect. *Albae* with occurrence of mesophilous and thermophilous components indicate several Middle Neopleistocene warm climatic events, and Middle Neopleistocene Vologda (MIS 8) and Gorka (MIS 7) Horizons are probably represented in the Varzuga key-section too.

Tills and melt-water deposits of Moscow (MIS 6) Horizon are known in the numerous outcrops from western and central Kola, and from sea coasts. Four key-sections are situated in the head of the Svyatoi Nos Bay of the Barents Sea, in the valleys of the Chapoma, Malaya Kachkovka, and Ponoi rivers. Interglacial (MIS 5) sediments overlay glacial deposits here.

Generally represented by marine and brackish-water sediments, Mikulino (MIS 5) Horizon includes the both Ponoi and Strelna Beds identified in the Kola Upper Neopleistocene stratirgaphy. The ESR/OSL-age of the Ponoi Beds and Strelna one ranges from approximately 120-130 to 100-105 ka (MIS 5e-d) and 100-105 to 70-80 ka (MIS 5c-a), correspondingly. The key-sections are situated in the valleys of the Strelna, Chapoma, Malaya Kachkovka, and Ponoi rivers. Palynological proxies and diatoms from Ponoi Beds indicate a more favorable environment as compared with the modern one; indicated from the Strelna Beds, environments are close to the modern one or colder.

Glacial deposits of the Podporozh’e (MIS 4) Horizon are known from the central and western Kola region. Three natural exposures with Podporozhian till, melt-water and glaciomarine sediments have been found on the Terskii Coast of the White Sea in the outcrops from Kamenka, Bolshaya Kumzhevaya, and Chavanga River valleys.

The Kamenka key-section provides a record of Valdaian (Middle and Late Weichselian) glacial and marine deposition. ESR-dated to about 59 ka and 52 ka, marine loam and sand correlate here to the Leningrad (MIS 3) Horizon. In addition, interstadial peats and lacustrine sands are known from the Kovdor open pit in the western Kola, and from boreholes in the Lovozero Mnts.

Tills and melt-water sediments of glacial Ostashkovo (MIS 2) Horizon are the most common in the region. Nevertheless, the corresponding key-areas have not yet admitted.

This is a contribution to the DATESTRA project.

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LOGOVO HYENY (HYENA'S DEN) CAVE AS A PALEOLITHIC PALEONTOLOGICAL OBJECT

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In the Altai region (Southern Siberia, Russia) there are multitudes of caves, some of which were used by prehistoric people and some – by animals. One of the caves where the material was deposited without any human input is Logovo Hyeny (Hyena's Den) cave. It is located in northwestern Altai in the Inya river basin, near the village of Tigirek.

In 2008, in the cave's central chamber, in undisturbed deposits, a 3-meter section was made, in which 6 layers were identified. Abundant bone material was obtained from this section.

Over 3 thousand bone remains of large mammals were obtained, the list of species found exceeding 20. The majority of bone remains were those of *Equus ferus*, *Equus* ex. gr. *hydruntinus, Equus* sp., *Bison priscus*. Only few remains of the forest fauna representatives were discovered.

As far as small mammals are concerned, over 6 thousand of their remains were found, the list of species exceeding 30. In each layer, the prevailing species are high-mountain voles (*Alticola*) and narrow-skulled voles (*Stenocranius gregalis*) as well as zokors, or mole-rats (*Myospalax myospalax*). The share of other species is insignificant.

All in all, the composition of the fossil fauna of mammals demonstrates the domination of open spaces: steppes, meadows, rock streams. An earlier radiocarbon dating, based on the bison's bone from this cave, stated the age of 32700±2800 years. The morphological analysis of small mammals remains provides the evidence of late Pleistocene to Holocene age of deposits where the remains belonged to.

In the nearby Strashnaya (Scary) cave, the traces of prehistoric people's vital activity were noticed. The deposits of Strashnaya cave account for 13 layers. Stone implements of late Pleistocene complexes, corresponding to the final of mid- and upper Paleolith, were found there. A comparison of the material from the two studied caves based on mammal remains revealed that the deposit accumulation in Strashnaya cave had been more intense than in Logovo Hyeny.

Conclusions:
1. The age of deposits from logovo hyeny cave is late pleistocene to holocene.
2. Meadow and grassland landscapes were prevailing. Forests were insignificant.

THE UKRAINIAN CANDIDATE SECTIONS FOR DATESTRA

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In terms of Quaternary stratigraphy, the territory of Ukraine is subdivided in such main parts: the area formerly covered by the Middle Pleistocene glaciation and the non-glaciated area. Within the first one, the northern (Polissya) region with the Upper Pleistocene cover of aeolian sands and interbedded paleosol or organic deposits, and the region of the Dnieper glacial lobe with the Upper Pleistocene loess-paleosol cover are distinguished. Within the non-glaciated area, the northwest, northeast, central and southern regions differ significantly by the ratios in thicknesses of loess and paleosol units, zonal types of paleosols and palaeontological indices of palaeoenvironments. The key sites studied with a complex of methods are described in each of the forenamed regions (Veklitch et al., Adamenko et al., Boguckiy et al., Gozhik et al., Matviishina et al., Gerasimenko et al., Vozgrin et al., etc). The most representative of these sites will be suggested as candidates for DATESTRA.

In this paper, four reference sites are represented: Muzychi from the Polissya area (Gerasimenko, 1988; Karmazinenko, 20 ; Gerasimenko et al., 2012); Vyazivok – Linden Gully (Veklitch et al., 1967, 1981; Rousseau et al., 2001; Matviishina, Gerasimenko, 2005; Haesaerts et al., 2016, Glavatsky et al., 2016) and Gun'ky – Lamane (Vekitch, 1968; Markova, 1982; Rekovets, 1994; Velichko et al., 1997; Gozhik, 2006; Gerasimenko, 2015) from the loess region within the Dnieper glaciation, and Stari Kaydaky – Sazhavka (Veklitch et al., 1977; Buggle et al., 2009,2011; Gerasimenko et al., 2016) from the central region of non-glaciated area. The Muzychi, Vyazivok and Stari Kaydaky-Sazhavka sites include all units, which are the terrestrial correlatives of OIS 2-23 with the established (and recently re-checked) Matuama-Brunhes boundary. The studies applied in these sites are lithology (including grain-size, bulk chemical, organic matter and clay mineralogy analyses), paleopedology (including micromorphology), pollen and malacology, partially magnetic susceptibility and geochronological methods (the TL, ^{14}C and amino acid datings). The Gun'ki – Lamane site includes a marker bed with the Likhvinian (Holsteinian) small mammal assemblage. In recent years in all the forenamed sites, lateral profiles of the deposits that follow different elements of paleorelief have been studied (including high-resolution pollen analysis). They demonstrated both the paleosols' catenas and (in the record from paleorelief depressions) the short period environmental changes during the formation of the pedocomplexes, particularly of those which are the equivalents of OIS 5, 7 and 9.

The framework of the candidate sites for DATESTRA in the other regions of Ukraine will be proposed.

INQUA-SEQS ACTIVITIES (1996-2017)

Danukalova Guzel[1,2]

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The Section on European Quaternary Stratigraphy (SEQS) is a constituent body of the International Union of Quaternary Research (INQUA), Commission on Stratigraphy and Geochronology (SACCOM). The SEQS is a group devoted to the study of the Quaternary Period in Europe, the last 2.6 million years of Earth's history.

The SEQS scientific activities are carried out through projects, websites, publications and meetings, particularly through close co-operation with local sister national organisations, as well as through collaboration with other organisations.

First draft of the SEQS Conference list and list of the previous and actual SEQS board is presented in Figure, Tables 1 and 2 and need to be updated in the nearest future.

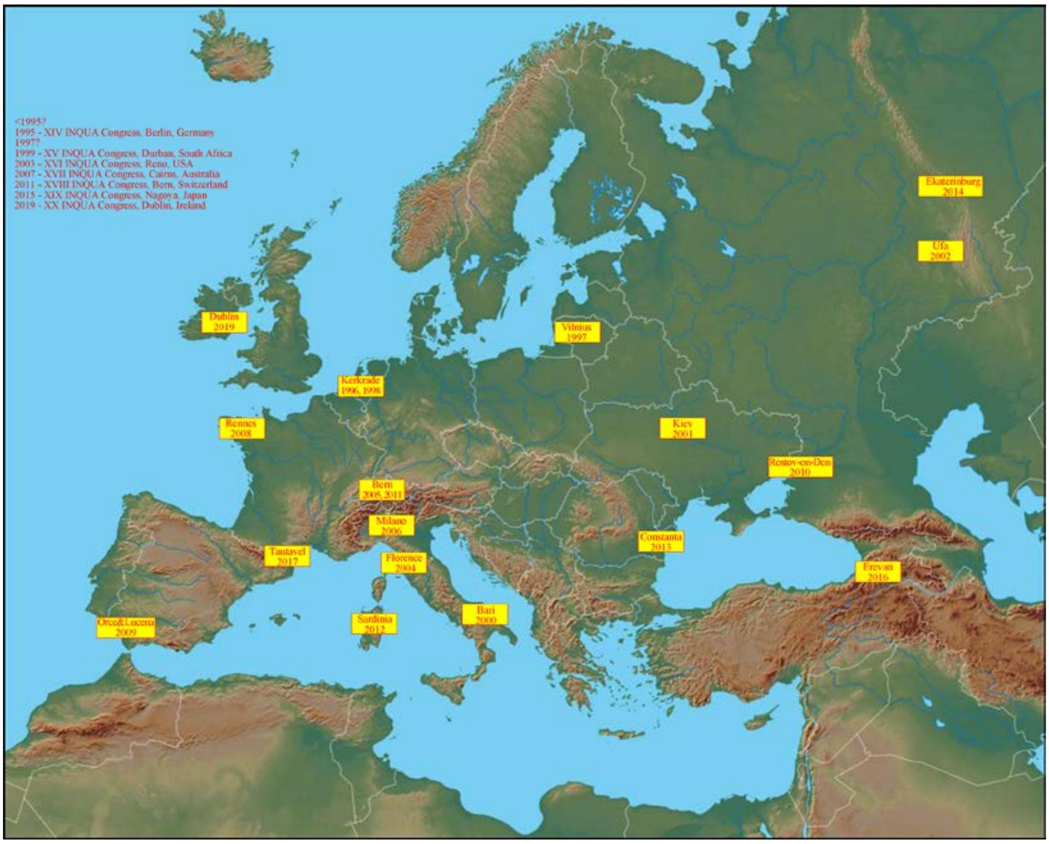

Figure. Map of Europe with indication of the places where INQUA-SEQS conferences were organized.

Table 1. INQUA – SEQS Conferences

Year	Dates	Place	Country	Title	Organizing Committee	Number of talks	Participants	
1996	16-21 June	Kerkrade	The Netherlands	The Dawn of the Quaternary	Dr. Thijs van Kolfschoten	96	160	
1997	14-19 September	Vilnius	Lithuania	The Late Pleistocene in Eastern Europe: Stratigraphy, Palaeoenvironment and Climate	Drs V.Baltrünas, A. Bitinas, A. Gaigalas, Ph. Gibbard, A. Grigienè, A. Jurgaitis, Th. Litt, J.Satkünas, P,Sinkünas	?	?	
1998	6-11 September	Kerkrade	The Netherlands	The Eemian: Local sequences, global perspectives	Dr. Thijs van Kolfschoten	93	160	
1999		Durban	South Africa	Congress title? Session title?	Conveners: Prof. T. Van Kolfschoten, M. Coltorti	?	?	XV INQUA Congress
2000	25-29 September	Bari	Italy	The Plio-Pleistocene Boundary and the Lower/Middle Pleistocene transition: Type areas and sections	Dr. N. Ciaranfi, M.B. Cita, M. Coltorti, M.Marino, F. Massari, L. Rook, D. Rio	43	130	
2001	9-14 September	Kiev	Ukraine	The Ukraine Quaternary Explored: the Middle and Upper Pleistocene of the Middle Dnieper Area and its importance for the East-West European correlation	Dr. N. Gerasimenko, P. Gozhik,	88	150	
2002	30 June – 7 July	Ufa	Russia	Upper Pliocene and Pleistocene of the Southern Urals Region and its significance for correlation of the Eastern and western parts of Europe	Drs. G. Danukalova, A. Yakovlev, E.Osipova, L. Belan, V. Puchkov	61	89	
2003	23 - 30 July	Reno	USA	Shaping the Earth: A Quaternary Perspective	Conveners: Prof. T. Van Kolfschoten, M. Coltorti	?	?	XVI INQUA Congress
2004	9-11 September	Florence	Italy	Pleistocene chronostratigraphic subdivisions and stratigraphic boundaries in the mammal record	Conveners: Dr. M. Coltorti, Dr. P. Pieruccini	?	?	
2005	4-9 September	Bern	Switzerland	The Quaternary Record of Switzerland	Dr. F. Preusser, Ch. Schlüchter, M. Coltorty, W. Westerhoff	38	113	
2006	11-15 September	Milano	Italy	Quaternary Stratigraphy and Evolution of the Alpine Region in the European and Global Framework	Dr. C. Ravazzi, R. Pini, M. Cremaschi, F.Ferraro, G.Muttoni, G.Orombelli, D.Sciunnach, M.Peresani, M.Coltorti, M.Fiebig	77	132	
2007	28 July – 3 August	Cairns	Australia	“The tropics: heat engine of the quaternary”.	Conveners: Prof. T. Van Kolfschoten, M. Coltorti	?	?	XVII INQUA Congress
2008	22-27 September	Rennes	France	Differences and similarities in Quaternary Stratigraphy between Atlantic and continental Europe	Dr. J.-P. Lefort, J.-L. Monnier, G. Danukalova	41	126	

Year	Dates	Place	Country	Title	Organizing Committee	Number of talks	Participants	
2009	28 September – 3 October	Orce&Lucena	Spain	The Quaternary of Southern Spain: a bridge between Africa and the Alpine domain	Dr. B.Martinez-Navarro, I.Toro Moyano, P.Palmqvist, J.Agusti	53	130	
2010	21-26 June	Rostov-on-Don	Russia	Quaternary stratigraphy and paleontology of the Southern Russia: connections between Europe, Africa and Asia	Dr. V. Titov, A. Tesakov	90	173	
2011	21-27 July	Bern	Switzerland	Quaternary sciences – the view from the mountains. Session 103 pan-European correlations in Quaternary stratigraphy	Conveners: Prof. M. Coltorti, Dr. W. Westerhoff	32	32	XVIII INQUA Congress
2012	26-30 September	Sassari, Sardinia	Italy	At the edge of the sea: sediments, geomorphology, tectonics, and stratigraphy in Quaternary studies	Prof. V. Pascucci, M. Coltorti, A. Stefano, P.Pieruccini, S. Laura	58	147	
2013	23-27 September	Constanta	Romania	Correlations of Quaternary fluvial, eolian, deltaic and marine sequences	Dr. S. Rădan, S.-C. Rădan, C. Vasiliu	24	65	
2014	10-16 September	Ekaterinburg	Russia	The Quaternary of the Urals: global trends and Pan-European Quaternary records	Dr. A. Borodin, E. Markova, T. Strukova	82	229	
2015	26 July – 2 August	Nagoya	Japan	Quaternary Perspectives on Climate Change, Natural Hazards and Civilization. Session S03: Progress in European Quaternary stratigraphy	Conveners: Dr. W. Westerhoff , G. Danukalova, M. Fiebig	14	14	XIX INQUA Congress
2016	3-10 September	Erevan	Armenia	Bridging Europe and Asia: Quaternary stratigraphy and Paleolithic human occupation in Armenia and Southern Georgia	Dr. Kh. Meliksetian, B. Gasparyan, D. Arakelyan, M. Fiebig	36	43	
2017	10-16 September	Tautavel	France	Quaternary stratigraphy and hominids around Europe: Tautavel (Eastern Pyrenees)	Dr. V. Celiberti, M. Calvet, M. Delmas, Th. Saos, S. Grégoire, A.M. Moigne, Ch. Perrenoud	35	129	
2018	September	Postojna	Slovenija		Dr. Mihevc Andrej			
2019		Dublin	Ireland					XX INQUA Congress

Table 2. INQUA – SEQS Board

Inter-Congress period	SEQS Board	Country, Institution, E-mail
1996-1999	Thijs van Kolfschoten (President)	Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands; t.van.kolfschoten@arch.leidenuniv.nl.
	(Secretary)	
2000-2003	Thijs van Kolfschoten (President)	Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands; t.van.kolfschoten@arch.leidenuniv.nl.
	Leszek Marks (Secretary)	Faculty of Geology, Warsaw University; Polish Geological Institute – National Research Institute; leszek.marks@uw.edu.pl; leszek.marks @pgi.gov.pl
2004-2007	Th. van Kolfschoten (President)	Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands; t.van.kolfschoten@arch.leidenuniv.nl.
	G. Danukalova (Vice-President)	Laboratory of the Cenozoic Geology, Institute of Geology of the Ufimian Scientific Centre, Russian Academy of Sciences; Ufa, Russia; danukalova@ufaras.ru.
	W. Westerhoff (Secretary)	TNO Geological Survey of the Netherlands, P.O. Box 80.015, 3508 TA Utrecht, The Netherlands. Visiting address: Princetonlaan 6, Utrecht.emal: wim.westerhoff@tno.nl
2008-2011	M.Coltorti (President)	University of Siena, Siena, Italy; mauro.coltorti@unisi.it
	G. Danukalova (Vice-President)	Laboratory of the Cenozoic Geology, Institute of Geology of the Ufimian Scientific Centre, Russian Academy of Sciences; Ufa, Russia; danukalova@ufaras.ru.
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	M. Fiebig (Secretary)	Department of Civil Engineering & Natural Hazards Institute of Applied Geology University of Natural Resources and Life Sciences, Vienna, Austria, markus.fiebig@boku.ac.at.
2016-2019	M. Fiebig (President)	Department of Civil Engineering & Natural Hazards Institute of Applied Geology University of Natural Resources and Life Sciences, Vienna, Austria, markus.fiebig@boku.ac.at.
	G. Danukalova (Vice-President)	Laboratory of the Cenozoic Geology, Institute of Geology of the Ufimian Scientific Centre, Russian Academy of Sciences; Ufa, Russia; danukalova@ufaras.ru.
	P. Pieruccini (Secretary)	Department of Physical, Earth and Environmental Sciences, University of Siena, Siena, Italy, pieruccini@unisi.it.

Some information about Fieldtrip

THE CAUNE DE L'ARAGO (ARAGO CAVE): MIDDLE PLEISTOCENE SEQUENCE*

The Arago cave is located in the surroundings of Tautavel (France).

Coordinates: 42°50'22.47"N, 2°45'20.53"E.

This karst cave is in the Urgonian limestone (Jurassic period).

The cave was occupied from 600,000 to 400,000 B.P.; it is the earliest occupation known from the middle Pleistocene to archaeology of the Pyrenees. Scraper and chopper tools found within the cave were of the Tayacian Industry.The current cave dimensions are smaller than those from the time when the hominid inhabited the cave, the current measurements being 30 metres long and between 10 and 15 metres wide.

The first person to find objects at the location did so during 1828. These were animal bones considered antediluvian by Marcel de Serres, a professional geologist at the University of Montpellier. The Proto-Mousterian Industry tools found by Jean Abélanet during 1963, initiated the beginning of the Lumley led excavations of 1964.

The skeletal remains of two individual hominids have been found in the cave: a female older than 40 (Arago II, July 1969), and a male aged no more than 20 (Arago XXI, July 1971, and Arago XLVII, July 1979). The male skull has a flat and receding forehead with well-developed supraorbital ridges ("eyebrows") and a large face with rectangular eye sockets. The cranial cavity had a volume of 1,150 cubic centimetres. The rest of the skeleton has been reconstructed from 75 fossil remains and casts from fossils found at other sites; an interpretation suggesting in a sturdier skeleton than that of modern humans and a height of 1.65 metres.

Compared to H. erectus in North Africa and China, H. erectus tautavelensis is closer to early H. sapiens and thus form a morphologically distinct group together with other European Middle Pleistocene hominids, because they show some of the characteristics of Neanderthals. The oldest indirect evidence of hominids in Europe are date to perhaps 1 to 2 million years ago and while Arago is certainly younger, the stalagmite floor under the cave deposits has been ambiguously dated to 700,000 years old by electron spin resonance but to 300,000 years old by thermoluminescence. No signs of fire, ash, charcoal, burned stone, or clay is documented in the cave which seems to suggest the art of fire is a recent discovery, though traces at a 1 to 4 million years old erectus site in East Africa indicate the opposite.

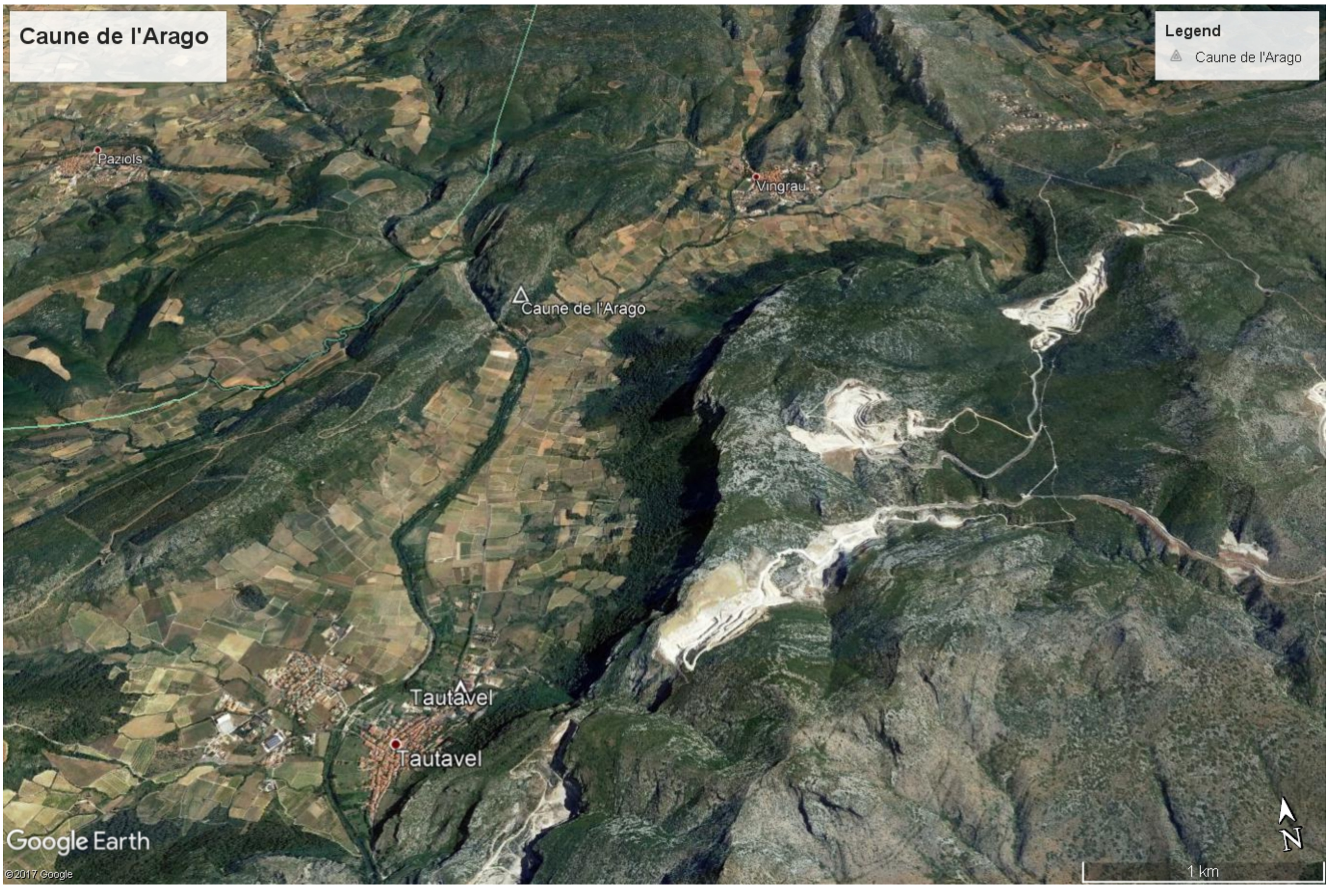
Recovered stone tools originate from within a 5 kilometres radius of the cave, while animal bones suggest the inhabitants could travel up to 33 kilometres for food.

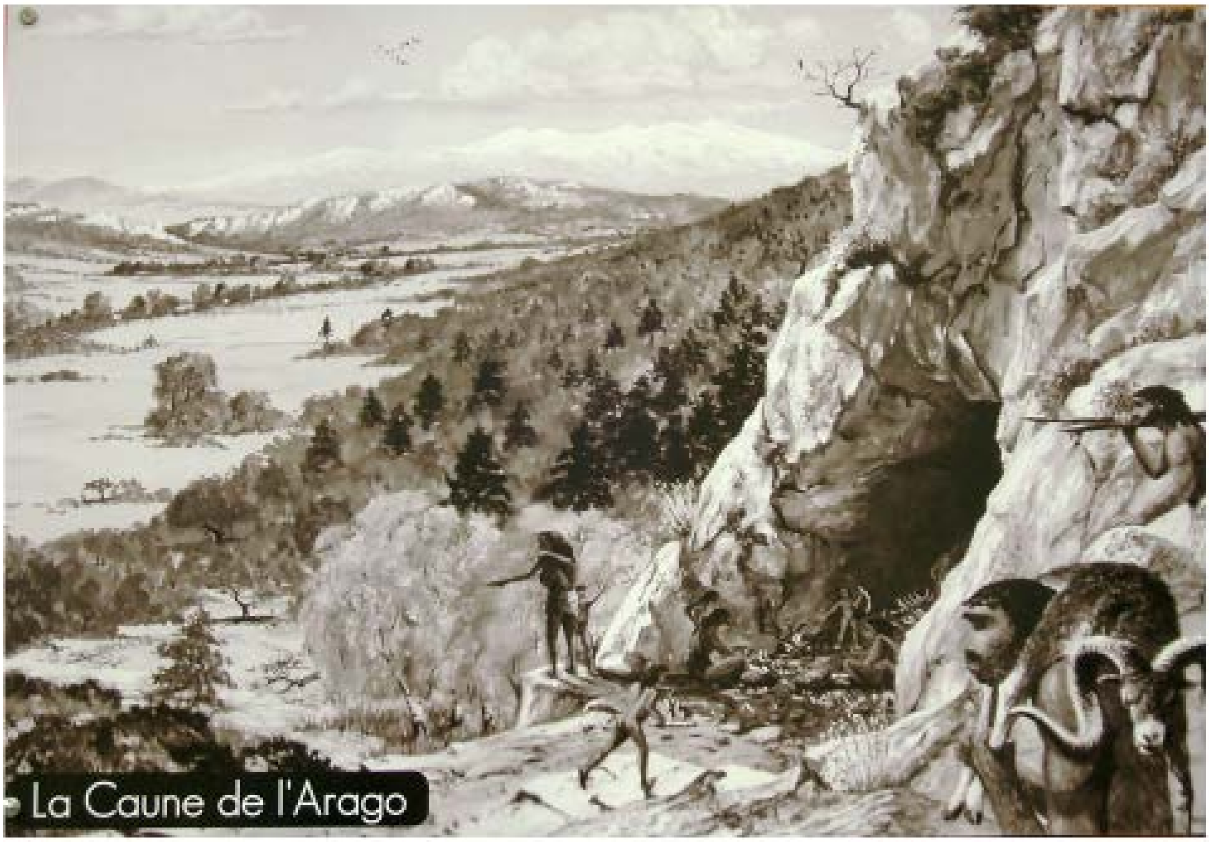
All fossils recovered from Arago were found by Henry and Marie-Antoinette de Lumley and are now located at the Institute for Human Palaeontology in Paris.

Useful information used for this summary:

http://www.showcaves.com/english/fr/caves/Arago.html

https://en.wikipedia.org/wiki/Tautavel_Man


Caune de l'Arago
Legend
Caune de l'Arago
Paziols
Vingrau
Caune de l'Arago
Tautavel
Tautavel
Google Earth
©2017 Google
N
1 km

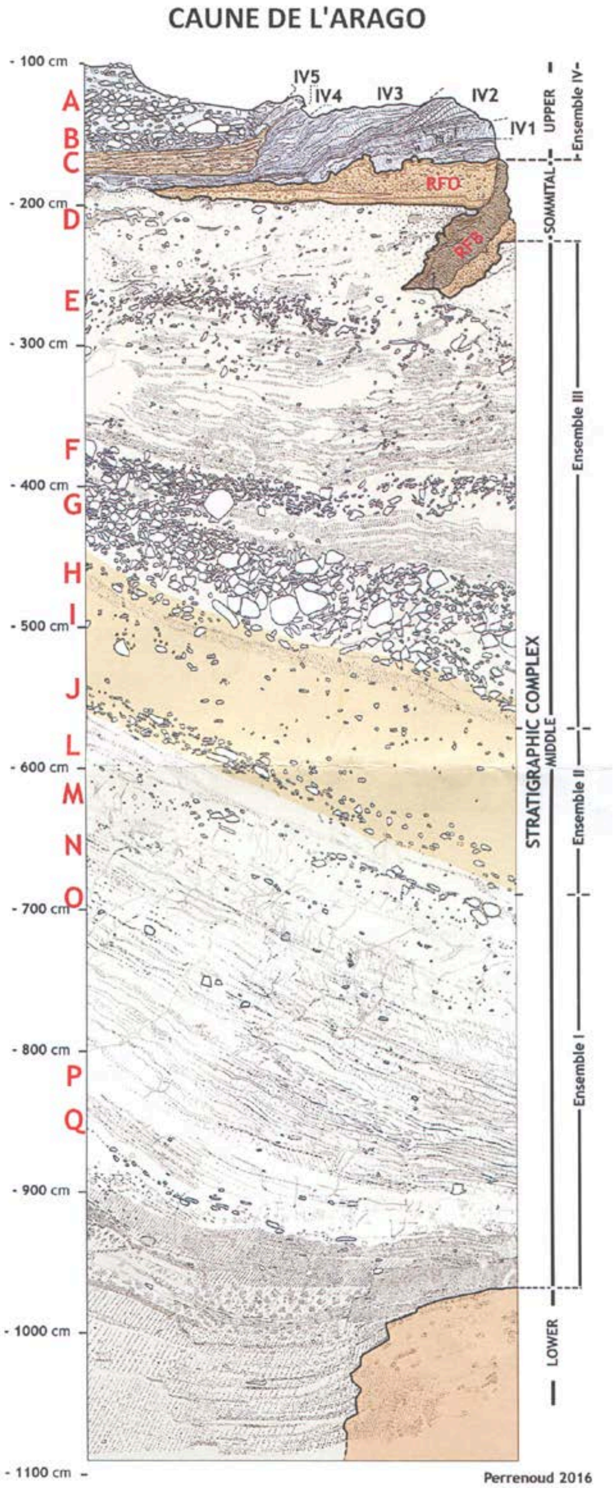

La Caune de l'Arago


D
E
F
G
H
I
J

Radiometric age (scale)	Radiometric age	Isotopic stage	Stratigraphy: Complex	Stratigraphy: Ensemble	Stratigraphy: Speleothem	Stratigraphy: Archaeological unit	Lithology	Palynology	Palaeontology	Climate
0 - 10 000 -		1	SOMMITAL							
20 000 -		2								
30 000 - 40 000 - 50 000 - 60 000 -	35 000	3			SP	RFB	Stalactites Intrusive brown sands		*Ursus spelaeus* *Hemitragus cedrensis* *Capra aff. caucasica*	
70 000 -		4								
80 000 - 90 000 - 100 000 - 110 000 - 120 000 -	92 000 128 000	5	UPPER	V IV	IV 8 IV 7 IV 6	A B	Sands interstratified with stalagmitic floors	Cool temperate forest Temperate forest with deciduous trees Cool temperate forest	*Hemitragus bonali* *Equus ferus mosbachensis* *Stephanorhinus hemitoechus* *Cervus elaphus* *Dama clactoniana* *Ursus deningeri*	Alterning cold dry and temperate humid Temperate and humid Cool and humid
130 000 - 140 000 - 150 000 - 160 000 - 170 000 - 180 000 -		6				Cs				
190 000 - 200 000 - 210 000 - 220 000 - 230 000 - 240 000 -	195 000 220 000	7			IV 5 IV 4 IV 3	intrusions RFO		Temperate forest with deciduous trees		Temperate and humid
250 000 - 260 000 - 270 000 - 280 000 - 290 000 - 300 000 -	250 000	8				Cm		Larges herbaceous habitats		Cool and dry
310 000 - 320 000 - 330 000 -	320 000	9			IV 2	Ci		Temperate forest		Temperate & humid
340 000 - 350 000 - 360 000 -		10								
370 000 - 380 000 - 390 000 - 400 000 - 410 000 - 420 000 -	370 000 400 000	11			IV 1			Temperate forest with deciduous trees and mediterranean taxa		Temperate and humid
430 000 - 440 000 - 450 000 - 460 000 - 470 000 -	430 000 450 000	12	MIDDLE	III	III	D E F G	Bedded yellow coarse sands	Large herbaceous habitats dotted with pines and junipers (25 % AP)	*Ovis ammon antiqua* *Equus ferus mosbachensis* *Bison priscus* *Cervus elaphus* *Praeovibos priscus*	Cold and dry with strong winds
480 000 - 490 000 - 500 000 - 510 000 - 520 000 -		13		II		H I J	Reddish sandy-clayey silts	Temperate forest with dominant mediterranean pines	*Cervus elaphus* *Dama clactoniana* *Ovis ammon antiqua* *Stephanorhinus hemitoechus* *Felis silvestris*	Temperate and humid
530 000 - 540 000 - 550 000 - 560 000 -	540 000	14		I		K to S	Bedded yellow sands	Steppe dotted with pines and junipers (15 % AP)	*Rangifer tarandus* *Ovis ammon antiqua* *Equus ferus mosbachensis* *Ursus deningeri*	Cold and dry with strong winds
570 000 - 580 000 - 590 000 - 600 000 - 610 000 - 620 000 -		15	LOWER			T U V W	Yellow silty sandy clays	Cool temperate forest with pines and firs associated to deciduous hydrophilic trees		Temperate
630 000 - 640 000 - 650 000 - 660 000 -		16				X Y Z	Brown silty sandy clays	Cool forest with firs, pines birches and beeches		Cool and humid
670 000 - 680 000 - 690 000 - 700 000 - 710 000 -	690 000	17			Lower stalagmitic floor		Lower stalagmitic floor	Temperate open forest with dominant junipers, pines and mediterranean taxa		Temperate

Summary stratigraphy* of the Caune de l'Arago.

* Data are given to participants of the conference by Conference organizers



Stratigraphic section* of the Caune de l’Arago (according to Perrenoud, 2016)

Depth below excavation reference level.
Archaeostratigraphic units are in red. Speleotherms are in Roman numerals

* Data are given to participants of the conference by Conference organizers

THE PREHISTORY MUSEUM AND EUROPEAN RESEARCH CENTRE OF TAUTAVEL.

VISIT TO THE PALAEONTOLOGICAL, ARCHEOLOGICAL AND PALAEOANTHROPOLOGICAL COLLECTIONS (HOMO HEIDELBERGENSIS, ARAGO XXI)

The Museum of Tautavel European Center of Prehistory is a complex built around the “Homme de Tautavel”; it can be found at the heart of the Corbières, in the Pyrénées-Orientales. It presents the history of humanity in Europe since the first Europeans to the gates of history by taking examples from the nearby area of Tautavel. The Museum of Tautavel is as renowned for the richness of his collections as for his cultural and recreational activities that allow visitors throughout the year to capture the lives of their ancestors.

There are temporary exhibitions, events based on Prehistoric times. The Tautavel Man Days in July, the Festival of Prehistory in August and the Prehistoric Arms Shooting Competition in May are among the highlights of our calendar of events

Address: Museum: European Centre for Prehistory, 66720 Tautavel, Tel: +33-468290776, Fax: +33-468294009.
Cave: The European Centre for Prehistoric Research at Tautavel, Avenue Léon-Jean Grégory, 66720 Tautavel, Tel: +33-468294740, Fax: +33-468294766, e-mail: acerpt@tautavel.univ-perp.fr.

Information used for this summary:

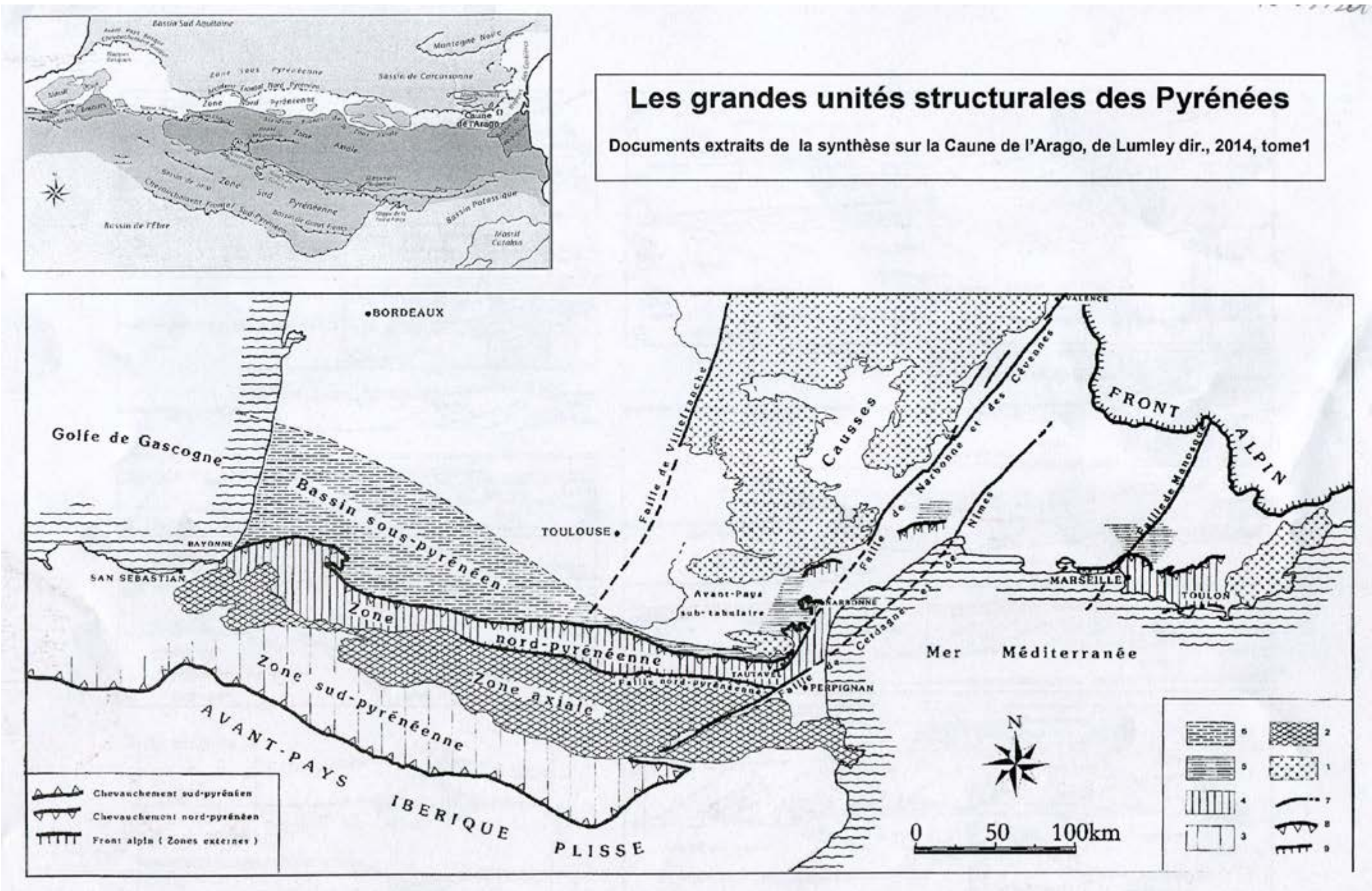
https://www.tripadvisor.co.uk/Attraction_Review-g1833701-d1830517-Reviews-Museum_of_Prehistory_Tautavel-Tautavel_Pyrenees_Orientales_Occitanie.html
http://efvblog.com/2011/07/musee-de-tautavel.html
http://www.midi-france.info/030602_tautavel.htm
http://europeforvisitors.com/europe/articles/tautavel-museum.pdf
https://www.france-voyage.com/tourism/museum-prehistory-at-tautavel-2051.htm

Centre Européen de Recherches Préhistoriques

Marie-Antoinette de Lumley


Caune de l'Arago

ALLUVIAL TERRACES AND ALLUVIAL SEQUENCES ALONG THE COASTAL RIVERS (TET, TECH AND OTHERS)*

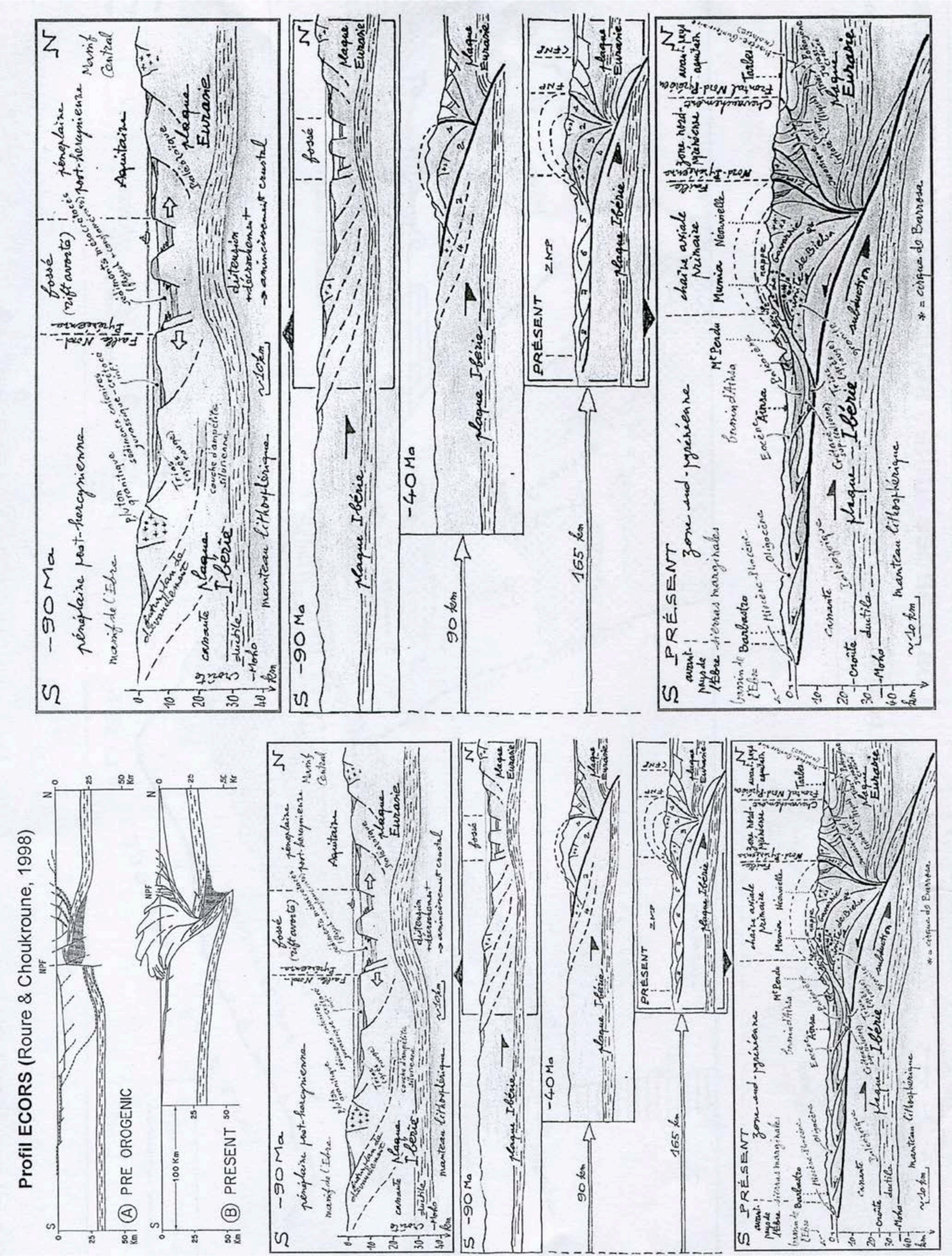


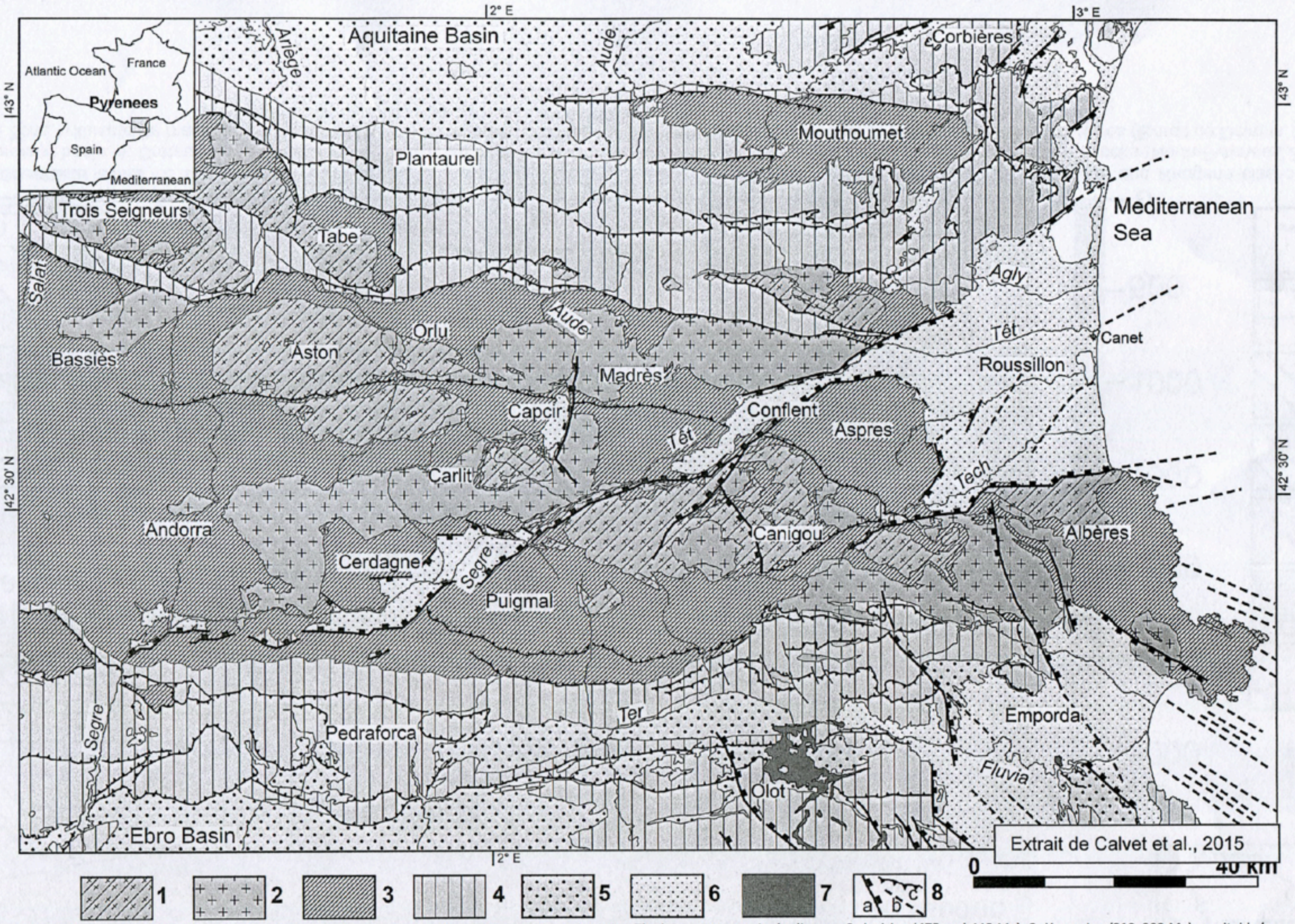
Photograph of the Les Orgues d'Illes-sur-Têt landscape by G. Danukalova.

* Data are given to participants of the conference by Conference organizers.

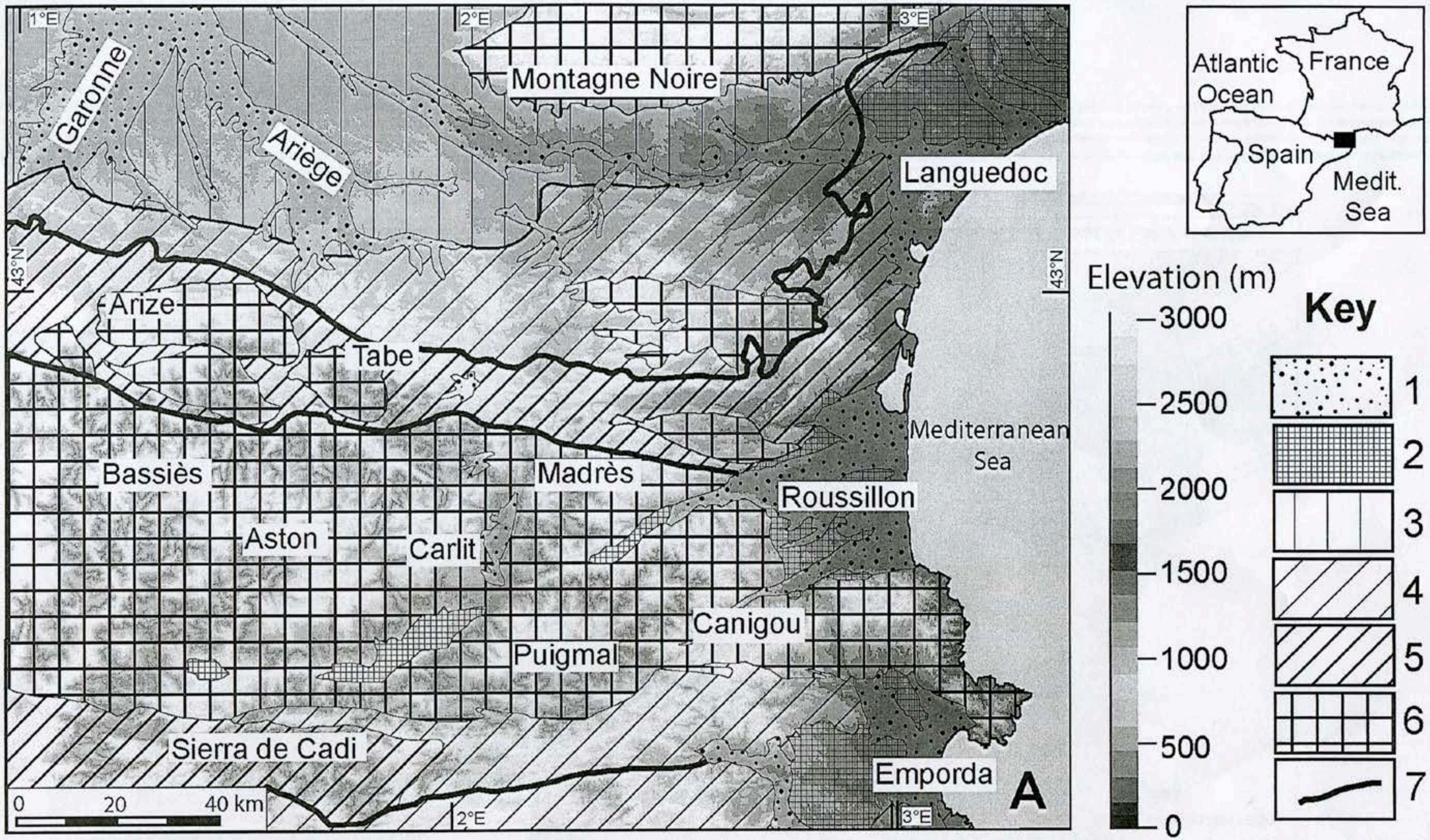

Tet valley
Legend
Stops 1-4
Stop1
Stop2
Stop3
Stop4
Stop8
Ille-sur-Têt
Google Earth
©2017 Google
600 m
N


Tet valley
Legend
Stops 5-7
Stop6
Stop5
Stop7
Corneilla-la-Rivière
Pézilla-la-Rivière
Saint-Féliu-d'Amont
Saint-Féliu-d'Avall
Google Earth
©2017 Google
1 km
N

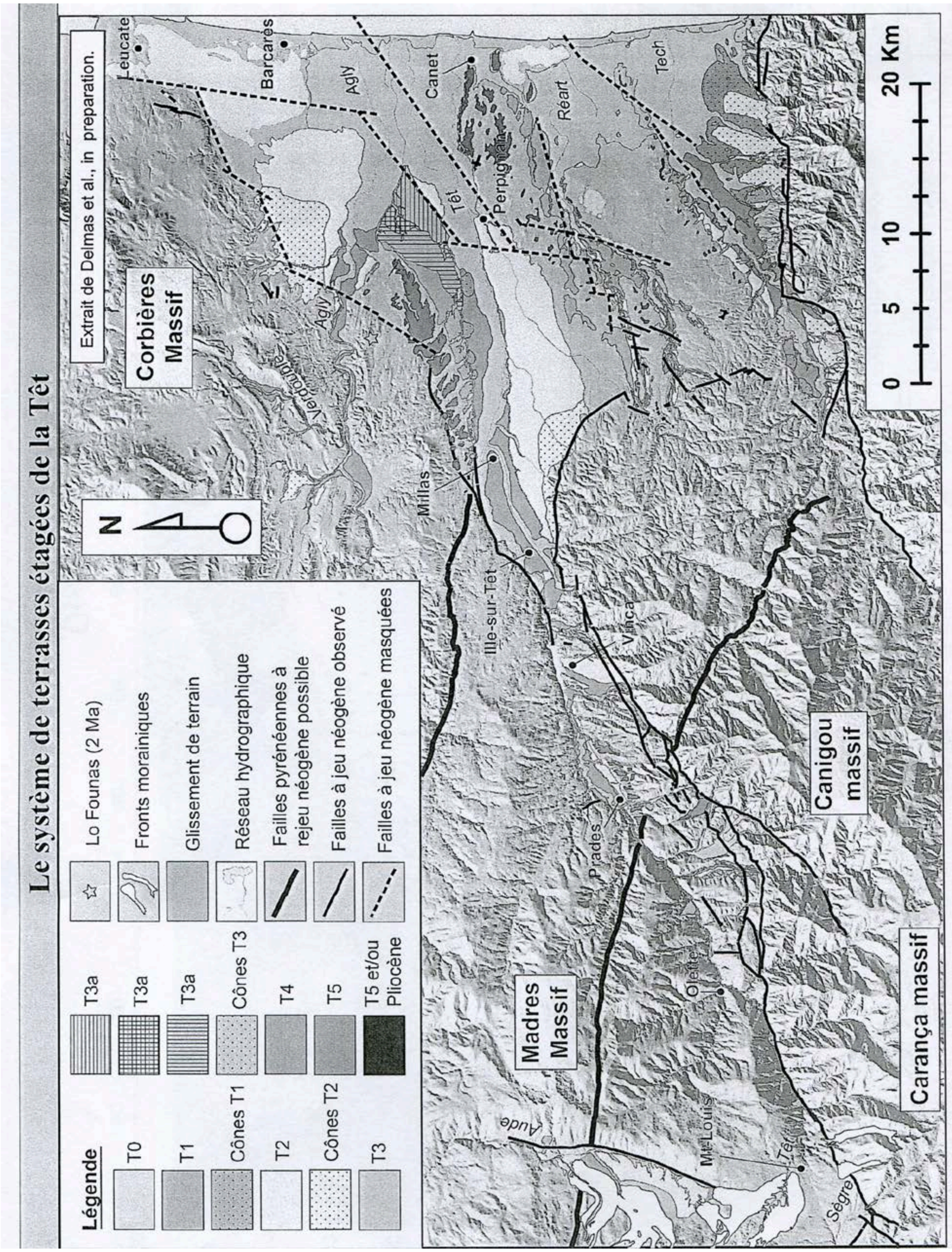

Profil ECORS (Roure & Choukroune, 1998)
A PRE OROGENIC
B PRESENT
100 Km
-90 Ma
-40 Ma
PRÉSENT
90 km
165 km
plaque Ibérie
plaque Eurasie
manteau lithosphérique

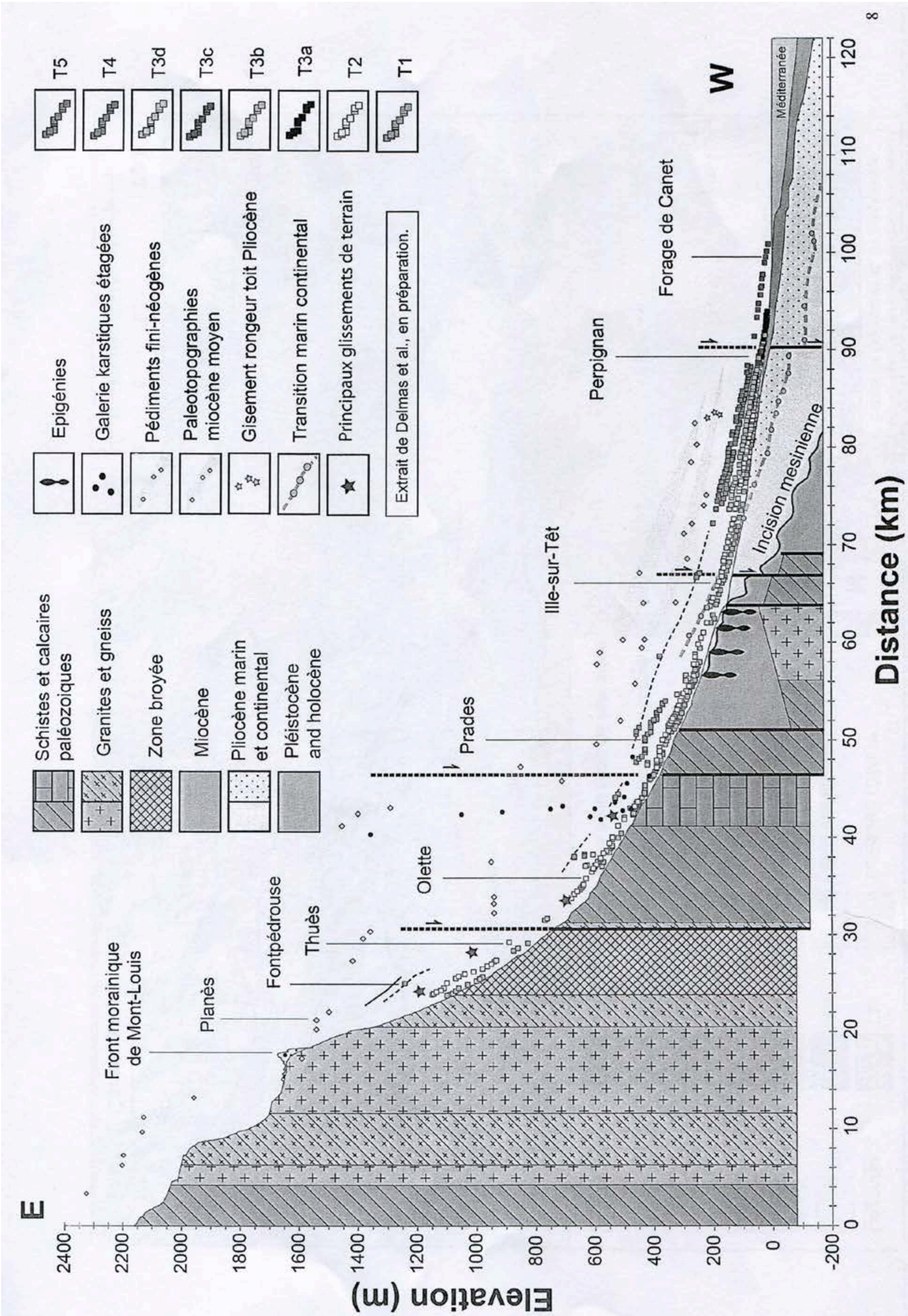


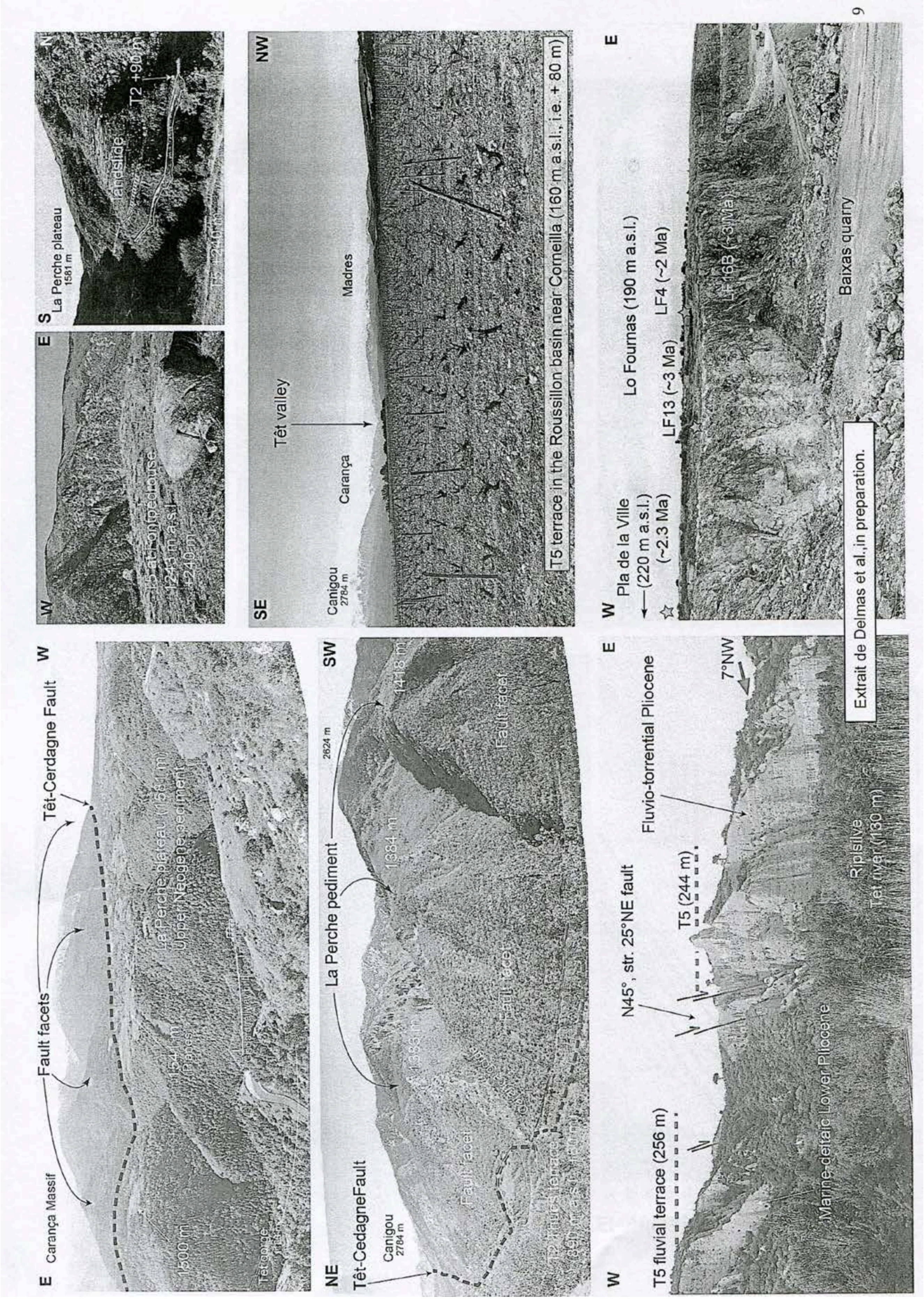
Structural map of the eastern Pyrenees and study area. Key: Hercynian basement—1: ortho- and paragneiss, migmatite. The large augen gneiss bodies are Ordovician (475 and 445 Ma); 2: Hercynian (310–300 Ma) granitoids (granodiorite, leucogranite); 3: Ediacaran to Lower Paleozoic metasediments (micaschist, marble, chlorite schist, quartzite) and Caradocian to Lower Carboniferous sediments (schist, conglomerate, black shale, limestone, flysch); Mesozoic and Cenozoic cover—4: Triassic to Eocene folded sedimentary cover (marl, limestone, sandstone, metamorphicmarble and hornfels along the North Pyrenean Fault); 5: Eocene to Oligocene syntectonic continental conglomerates, molassic marl and sandstone of the foreland basins; 6: post-tectonic deposits (continental and marine) relating to the opening of the Western Mediterranean (Oligocene, Miocene, Pliocene); 7: Neogene basalt and trachyte (11–2 Ma) ofEmpordá; Quaternary volcanic rocks (0.4–0.02 Ma) of La Garrotxa. Tectonic features—8a:Neogene normal faults; 8b: possible or hidden Neogene faults; 8c: synorogenic thrusts and reverse faults affecting the sedimentary cover and the basement.

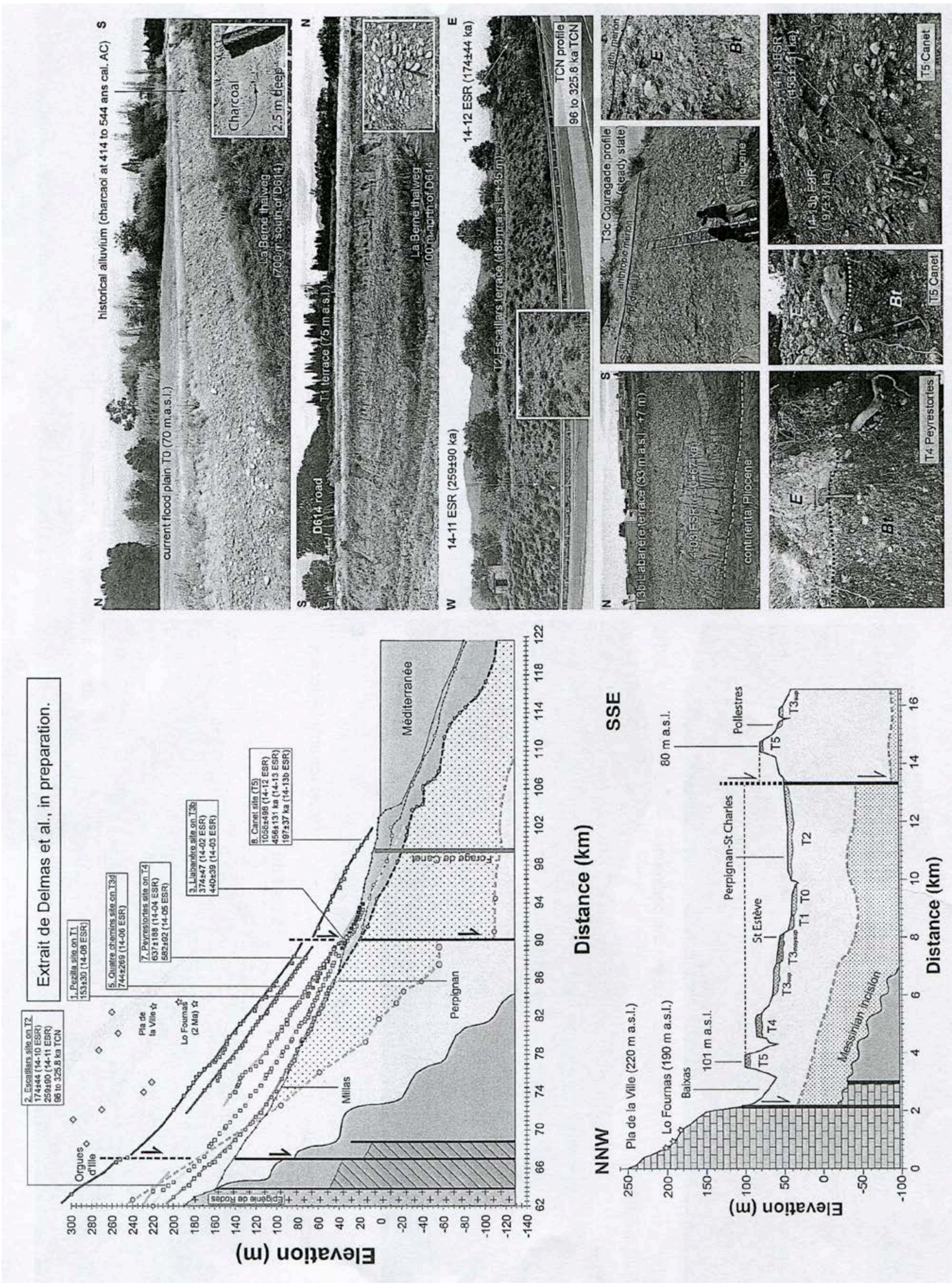


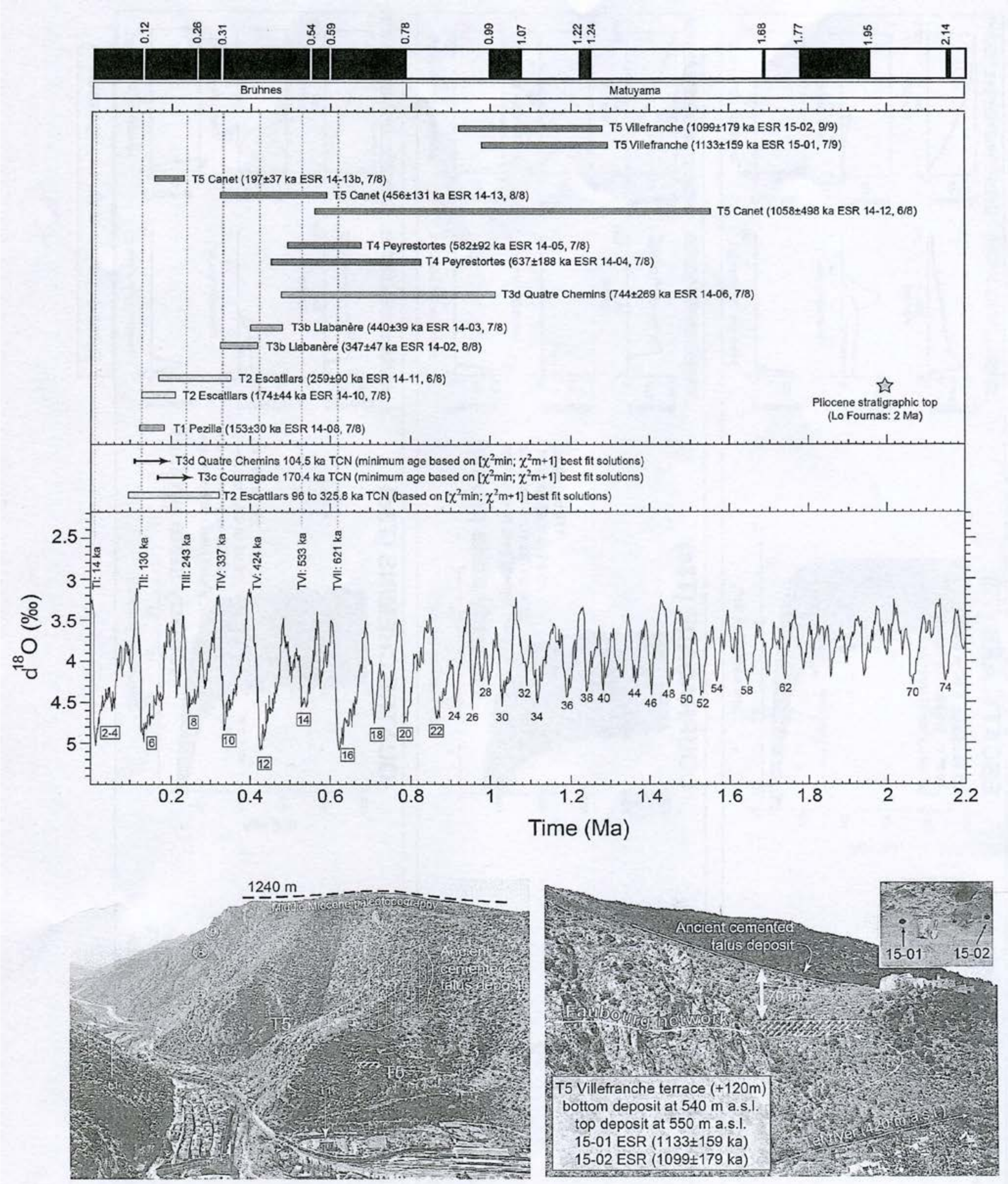
Main morphostructural units of the Eastern Pyrenees. 1: Quaternary deposits. 2: Neogene pull-apart basin fill sequences. 3: Paleocene and Neogene clastic sequences of the Aquitaine retro-foreland basin. 4: Cretaceous to Oligocene fold and thrust belts forming external sierras. 5: Thrust and folded Triassic to Cretaceous rocks (North-Pyrenean Zone), 6: Paleozoic rocks of the Axial Zone, with satellite massifs (granitic thrust sheets) incorporated into the North-Pyrenean tectonic wedge. 7: Main compressive structures (Extrait de Delmas, 2009).


Le système de terrasses étagées de la Têt
Légende
T0
T1
Cônes T1
T2
Cônes T2
T3
T3a
T3a
T3a
Cônes T3
T4
T5
T5 et/ou Pliocène
Lo Founas (2 Ma)
Fronts morainiques
Glissement de terrain
Réseau hydrographique
Failles pyrénéennes à rejeu néogène possible
Failles à jeu néogène observé
Failles à jeu néogène masquées
N
Extrait de Delmas et al., in preparation.
Corbières Massif
Madres Massif
Canigou massif
Carança massif
Leucate
Barcarès
Agly
Canet
Têt
Perpignan
Réart
Tech
Verdouble
Millas
Ille-sur-Têt
Vinça
Prades
Olette
Mt-Louis
Aude
Ségre
0
5
10
20 Km

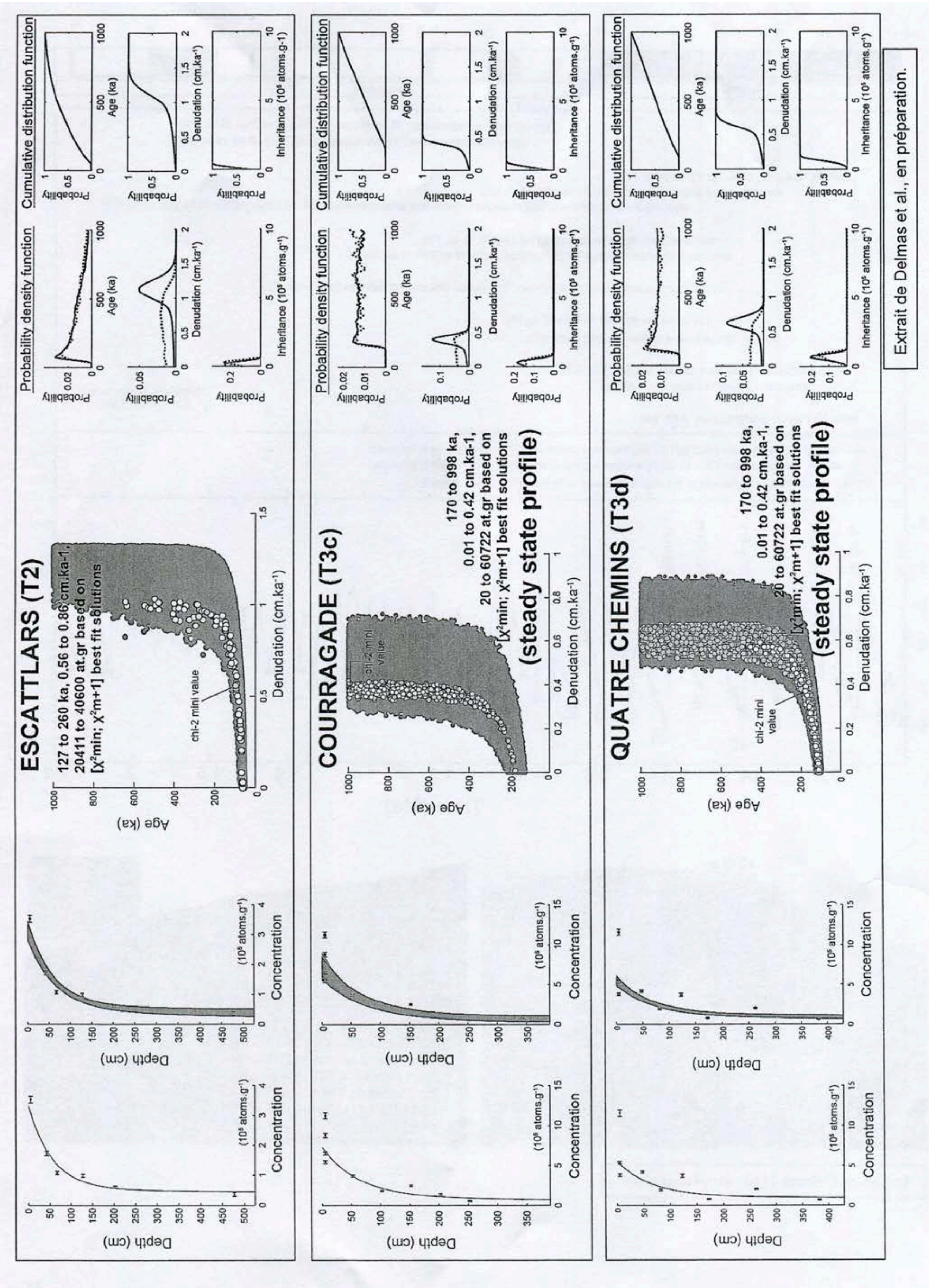

E
W
Elevation (m)
Distance (km)
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
0
10
20
30
40
50
60
70
80
90
100
110
120
Front morainique de Mont-Louis
Planès
Fontpédrouse
Thuès
Olette
Prades
Ille-sur-Têt
Perpignan
Forage de Canet
Incision mesinienne
Méditerranée
Schistes et calcaires paléozoiques
Granites et gneiss
Zone broyée
Miocène
Pliocène marin et continental
Pléistocène and holocène
Epigénies
Galerie karstiques étagées
Pédiments fini-néogènes
Paleotopographies miocène moyen
Gisement rongeur toit Pliocène
Transition marin continental
Principaux glissements de terrain
Extrait de Delmas et al., en préparation.
T5
T4
T3d
T3c
T3b
T3a
T2
T1

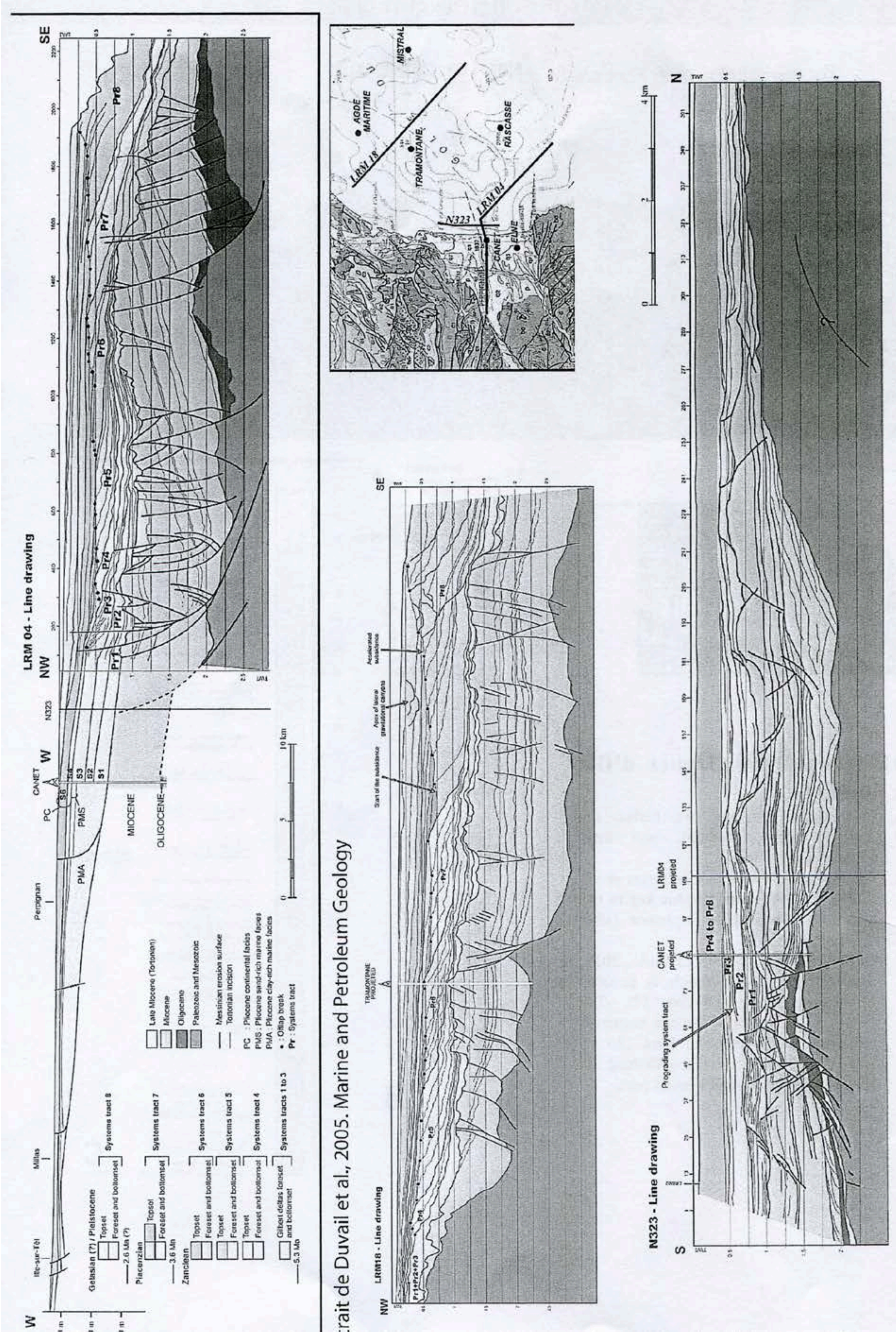

E
Carança Massif
Fault facets
Têt-Cerdagne Fault
W
La Perche plateau (1581 m)
Upper Neogene pediment
1500 m
NE
Têt-CedagneFault
Canigou
2784 m
La Perche pediment
2624 m
1384 m
1418 m
Fault facet
SW
W
T5 fluvial terrace (256 m)
N45°, str. 25°NE fault
T5 (244 m)
Fluvio-torrential Pliocene
7°NW
Marine-deltaic Lower Pliocene
Ripisilve
Têt river (130 m)
E
W
E
S
La Perche plateau
1581 m
landslide
T2 +90 m
N
SE
Canigou
2784 m
Carança
Têt valley
Madres
NW
T5 terrace in the Roussillon basin near Corneilla (160 m a.s.l., i.e. + 80 m)
W
Pla de la Ville
(220 m a.s.l.)
(~2.3 Ma)
Lo Fournas (190 m a.s.l.)
LF13 (~3 Ma)
LF4 (~2 Ma)
Baixas quarry
E
Extrait de Delmas et al.,in preparation.


Extrait de Delmas et al., in preparation.
Elevation (m)
Distance (km)
Méditerranée
Perpignan
Millas
Forage de Canet
NNW
SSE
Pla de la Ville (220 m a.s.l.)
Lo Fournas (190 m a.s.l.)
Baixas
101 m a.s.l.
80 m a.s.l.
Pollestres
Perpignan-St Charles
St Estève
Messinian incision
historical alluvium (charcaol at 414 to 544 ans cal. AC)
current flood plain T0 (70 m a.s.l.)
D614 road
14-11 ESR (259±90 ka)
14-12 ESR (174±44 ka)
TCN profile
96 to 325.8 ka TCN
T4 Peyrestortes
T5 Canet



Extrait de Delmas et al., en préparation.


ESCATTLARS (T2)
127 to 260 ka, 0.56 to 0.86 cm.ka-1, 20411 to 40600 at.gr based on [χ²min; χ²m+1] best fit solutions
chi-2 mini value
COURRAGADE (T3c)
170 to 998 ka, 0.01 to 0.42 cm.ka-1, 20 to 60722 at.gr based on [χ²min; χ²m+1] best fit solutions
(steady state profile)
chi-2 mini value
QUATRE CHEMINS (T3d)
170 to 998 ka, 0.01 to 0.42 cm.ka-1, 20 to 60722 at.gr based on [χ²min; χ²m+1] best fit solutions
(steady state profile)
chi-2 mini value
Depth (cm)
Concentration
Age (ka)
Denudation (cm.ka⁻¹)
Probability density function
Cumulative distribution function
Probability
Inheritance (10⁵ atoms.g⁻¹)
Extrait de Delmas et al., en préparation.


LRM 04 - Line drawing
W
SE
NW
Perpignan
Millas
CANET
PC
PMS
PMA
MIOCENE
OLIGOCENE
Pr1
Pr2
Pr3
Pr4
Pr5
Pr6
Pr7
Pr8
Systems tract 8
Systems tract 7
Systems tract 6
Systems tract 5
Systems tract 4
Systems tracts 1 to 3
Late Miocene (Tortonian)
Miocene
Oligocene
Paleozoic and Mesozoic
Messinian erosion surface
Tortonian incision
PC : Pliocene continental facies
PMS : Pliocene sand-rich marine facies
PMA : Pliocene clay-rich marine facies
Pr : Systems tract
rait de Duvail et al., 2005. Marine and Petroleum Geology
LRM18 - Line drawing
AGDE MARITIME
MISTRAL
TRAMONTANE
RASCASSE
LRM 18
LRM 04
N323
CANET
4 km
N323 - Line drawing
S
N
Prograding system tract
CANET projected
LRM04 projected
Pr4 to Pr8

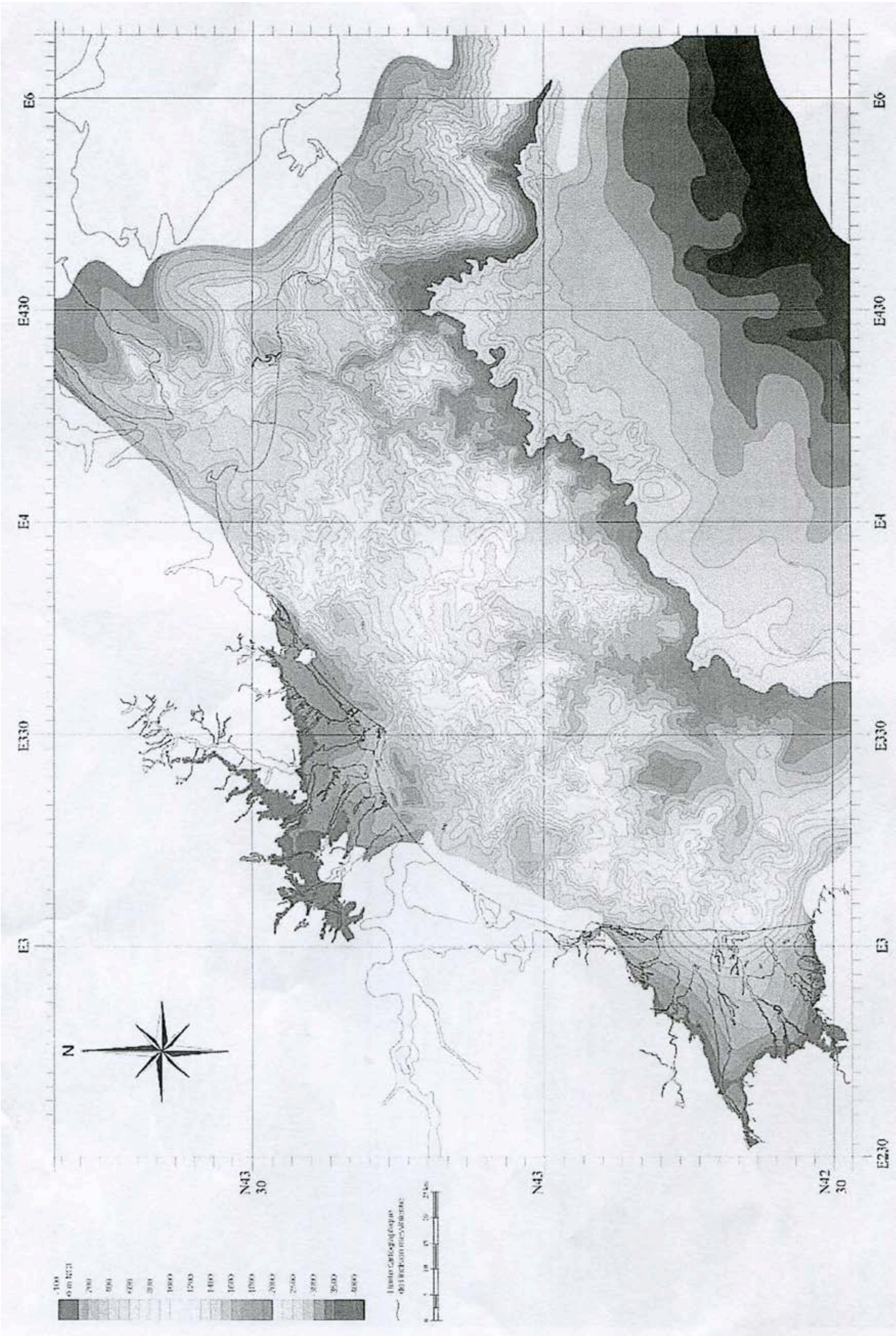
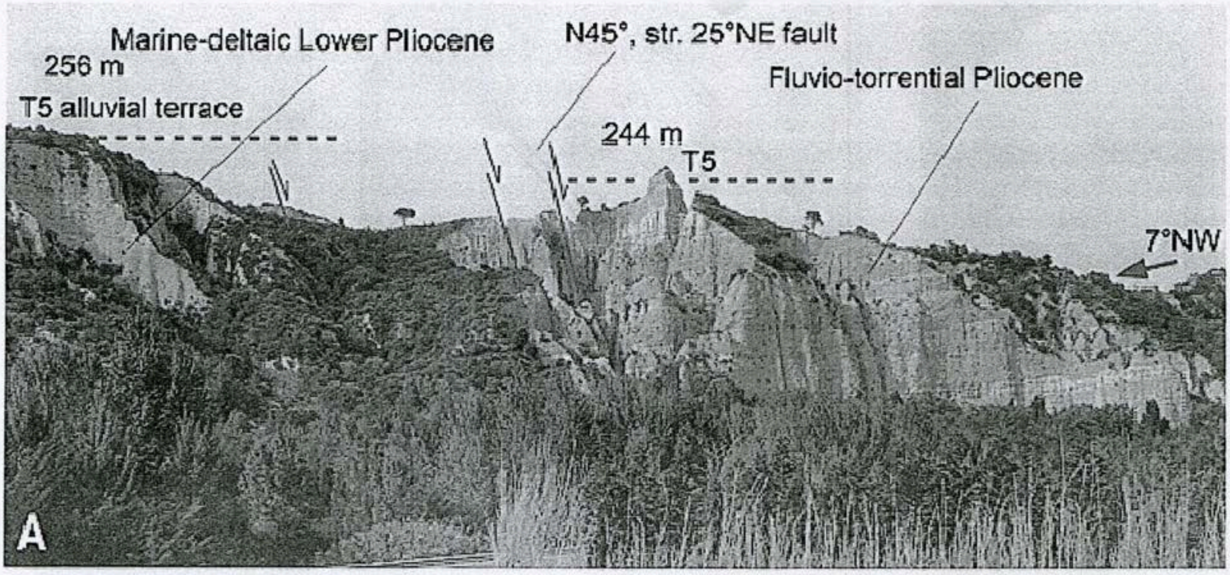
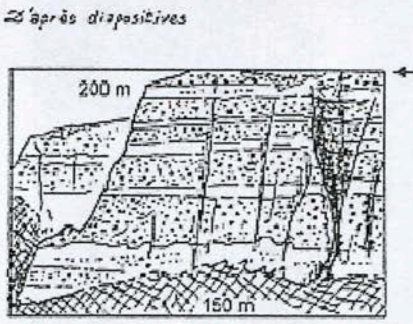
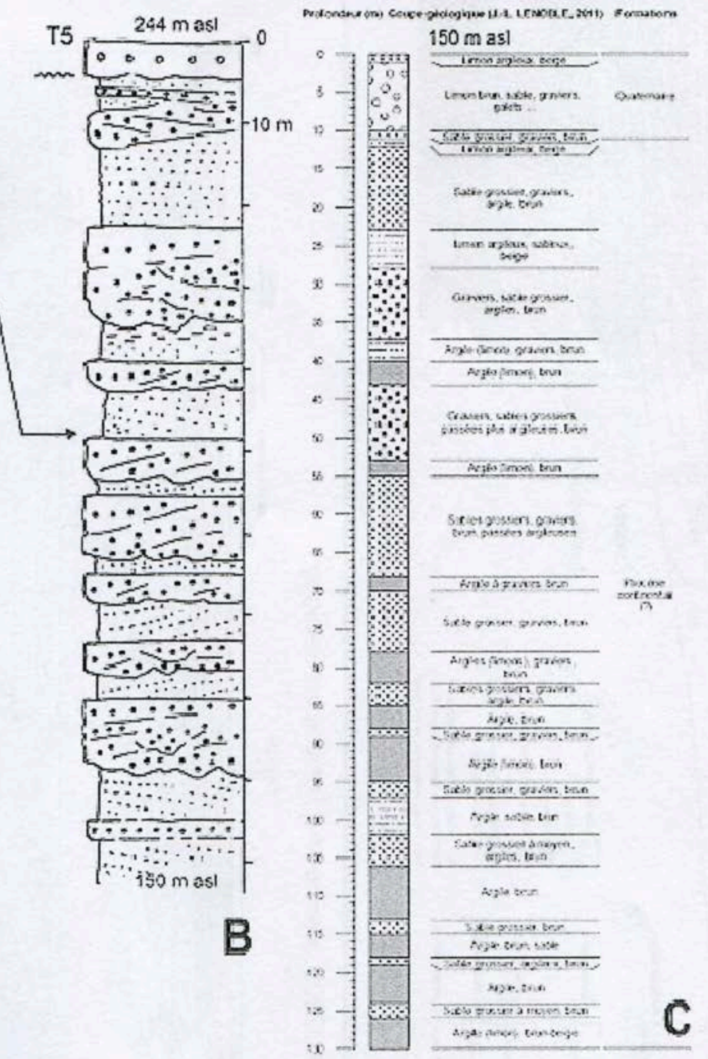


Figure 11: Carte des isohypses de la surface messinienne du Golfe du Lion suivant un transitionnel terre-mer (d’apres Guinnoc et al., 2000; Duval et al., 2—1; Fuchey & Le Strat, 2001; modifies dans Duvail & Le Strat, 2002).

Les orgues d'Illes-sur-Têt





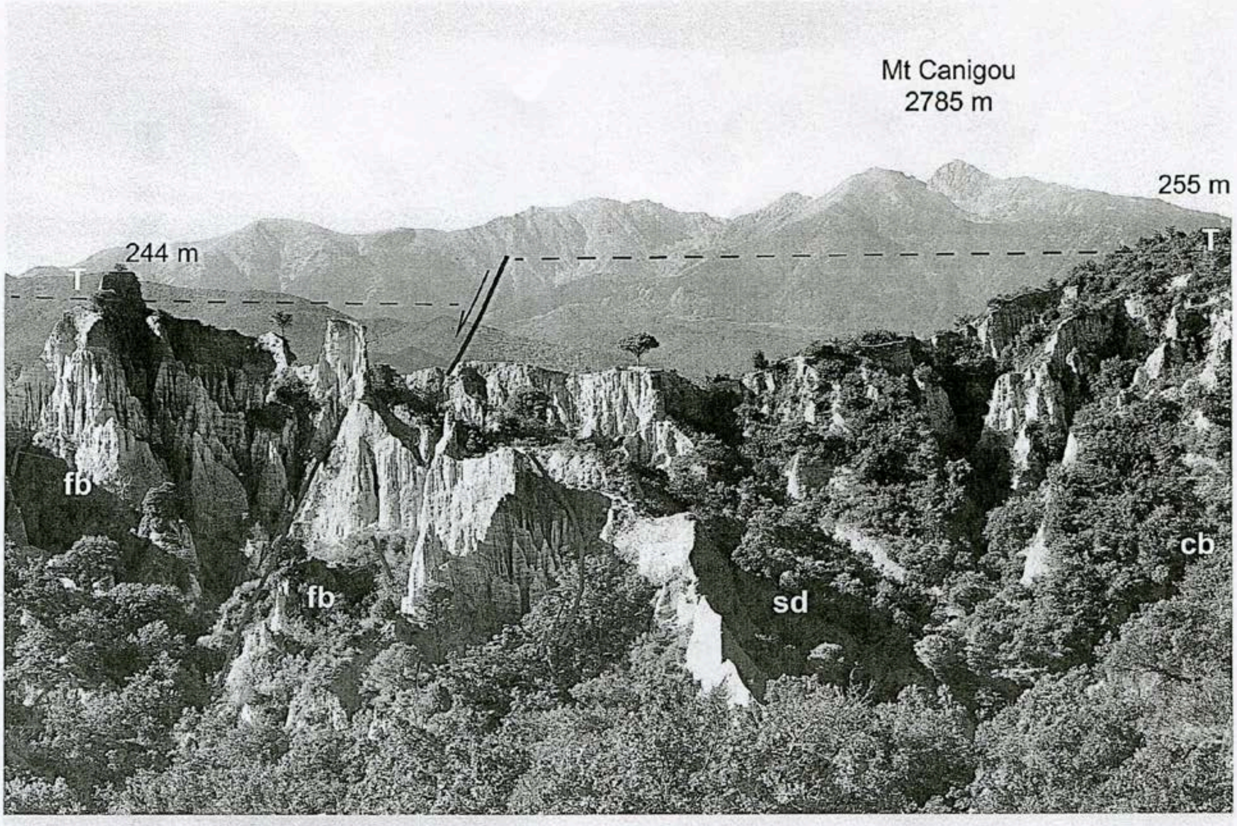


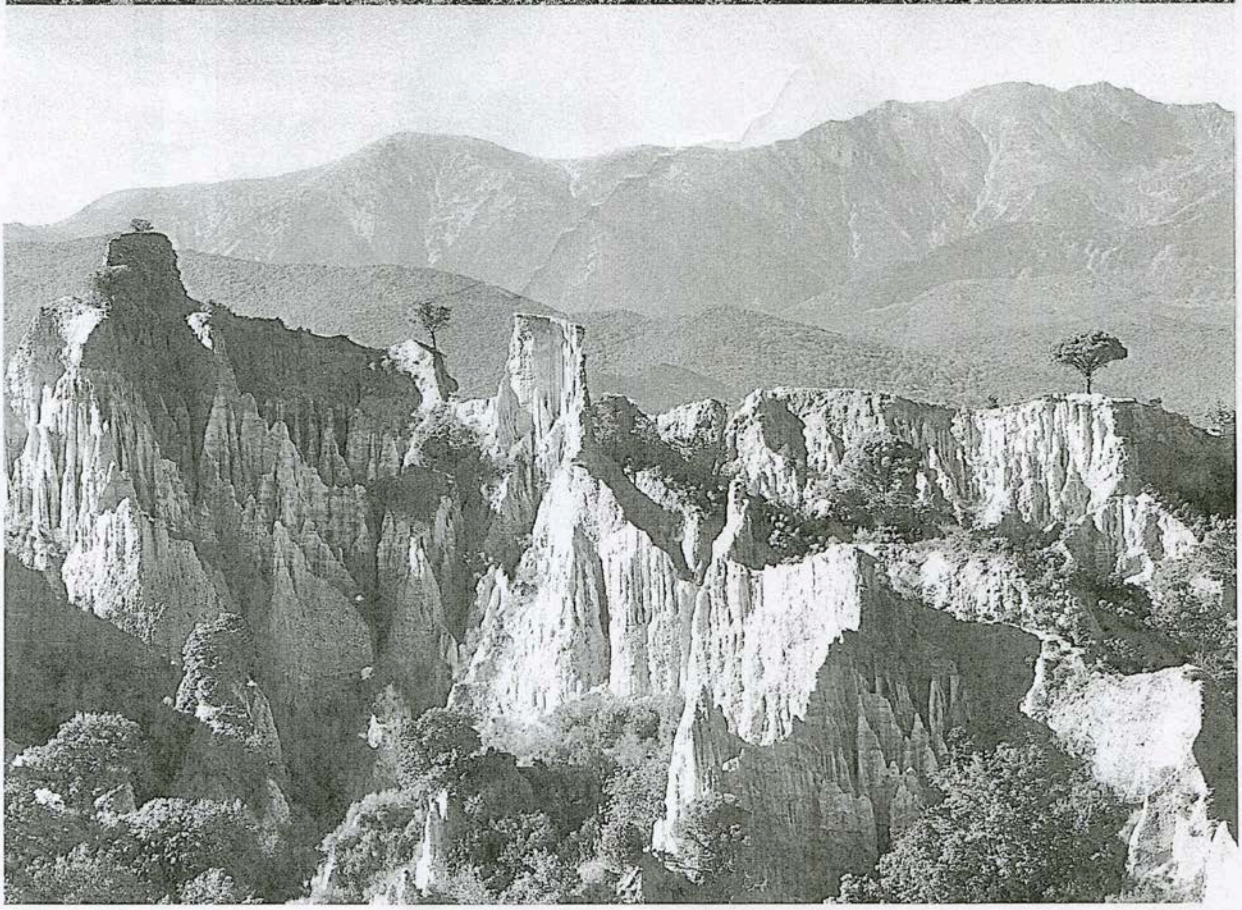
South face of the Orgues d'Ille rock pillars.

A. **Panorama**: note the two facies, i.e. marine and continental, and their tectonic deformation

B. features (after Calvet, in Passarius *et al.*, 2009). **B. Lithostratigraphic key to the Pliocene continental sequence** (after Calvet, 1996).

C. **Ille borehole log** (after Lenoble, 2011, unpublished). The borehole is situated on the right bank of the river Têt, ~700 m to the south. The Pliocene sequence reaches a thickness of at least 230 m, with facies successions confirming its continental nature for the most part.


Mt Canigou
2785 m
255 m
244 m
T
T
fb
fb
sd
cb



RAMANDILS CAVE (PORT LA NOUVELLE): COASTAL AND CONTINENTAL SEQUENCES*

1-Geographical and historical contexts

Localisée au pied du massif du Cap Romarin, à trois kilomètres au sud de Port-la-Nouvelle (Aude), la grotte des Ramandils se situe à mi-chemin entre les étangs de Lapalme et de Sigean, à moins de 1500 mètres du trait de côte actuel. Le gisement est découvert en 1925 par Théophile Héléna. Henry de Lumley étudie l'industrie (1965) Paul Boutié mène des campagnes de fouilles systématiques de 1983 à 1994. Une dent humaine est dégagée en 1990.

Coordinates: 42°59'52.33"N, 3° 2'19.07"E.

Fig. 1. Mousterian sites in the Languedoc – Roussillon region
(Morpho-bathymetric map of the Gulf of Lion in Berne, 2005, continental relief from ©IGN)

* Data are given to participants of the conference by V.Celiberti

2- stratigraphy

Au-dessus de la plage marine (fig. 2), rapportée au thyrrénien (Lumley, 1965) et cotée à 2,46m au-dessus du niveau de la mer (Boutié, 1984), le remplissage continental a été subdivisé en cinq ensembles respectivement décrits de bas en haut (fig. 2):

- Ensemble V, étendu de -4 à -3m sous le plan de référence est nommé niveau à sables jaunâtres (Boutié 1987, 1990).
- Ensemble IV, de -3 à -2,4 m de profondeur contient le niveau archéologique moustérien majeur
Niveau à sable gris à rare cailloutis, correspondant à une phase partielle d'effondrement du plafond
- Ensemble III : Il se subdivise en 2 sous-ensembles :
  - IIIb : de -2,4 et -1,3 m Niveau à gros blocs correspondant à la phase principale d'effondrement du plafond.
  - IIIa : de -1,3 à -1m Niveau à argiles rougeâtres surmonté par un paléosol à cailloutis
- Ensemble II Niveau de sables et de limons à poupées calcaires, résultant d'une phase de décalcification du niveau supérieur.
- Ensemble I situé au niveau du plan 0 de la grotte riche en cailloutis anguleux et en argile rouge.

Fig. 2. Thyrrenean shells of Ensemble VI

Fig. 3a. North section photograph

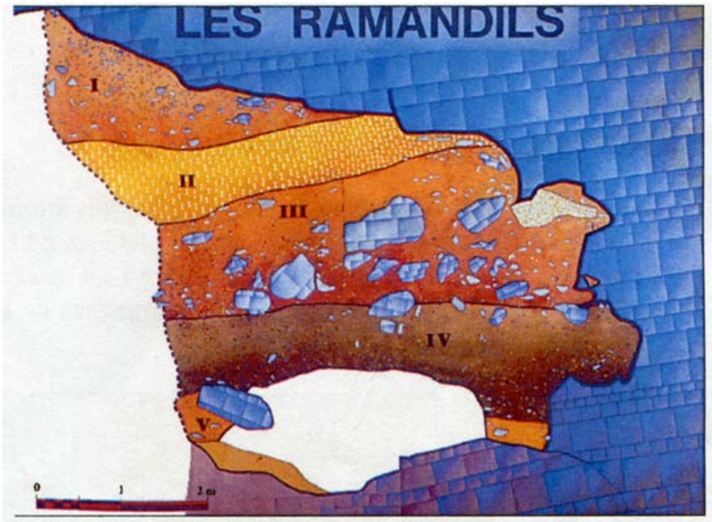


Fig. 3b. North section drawing (P. Boutié, 1984)

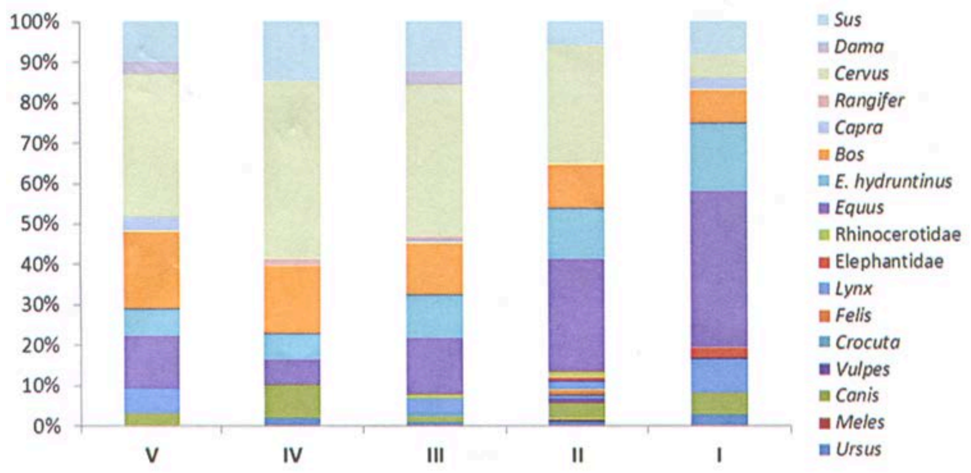


Fig. 3. Big mammal species (%NRdt) by stratigraphic levels (from Banès, 1998)

	Nucléus		Éclats		Débris		Galets		Blocs		Débris thermiques		*Total*
	Nb.	%	Nb.	%	Nb.	%	Nb.	%	Nb.	%	Nb.	%	
Ens. I	**22**	*2,3*	**708**	*73,9*	**136**	*14,2*	**1**	*0,1*			**91**	*9,5*	*95S*
Ens. II	**113**	*2,3*	**3301**	*65,9*	**1088**	*21,7*	**3**	*0,1*	**1**	*0,02*	**501**	*10,0*	*5007*
Ens. III	**97**	*3,S*	**1643**	*64,2*	**618**	*24,2*	**1**	*0,0*	**1**	*0,03*	**196**	*7,7*	*2556*
Ens. IV	**36**	*4,5*	**524**	*65,5*	**176**	*22,0*			**1**	*0,10*	**63**	*7,9*	*S00*
Ens. V	**19**	*4,0*	**312**	*65,4*	**102**	*21,4*	**1**	*0,2*			**43**	*9,0*	*477*
Total	**287**	*2,9*	**6488**	*66,2*	**2120**	*21,7*	**6**	*0,1*	**3**	*0,0*	**894**	*9,1*	*979S*

Fig. 4. Lithic composition (more than 15 mm length). 92% flint. Levallois, @micromousterian@ (from Molès, 2008)

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GRANDES CANALETTES CAVE GROTTES CANALETTES (EASTERN PYRENEES)

Grandes Canalettes cave is located at 300 metres from the medieval town of Villefranche-de-Conflent on the road to Corneilla-de-Conflent and Vernet-les-Bains, in the département of Pyrénées-Orientales, France (Coordinates: 42°34'59.19"N; 2°22'12.30"E) (Fig. 1).

The cave was discovered by chance in 1951 by Mr Motte. A few years later, in 1957, the Fuilla network of underground galleries was presented to Henri Salvayre, a hydro geologist and expert in underground galleries. In 1978, he met Edmond Delonca, a driller by trade. Together they embarked on the monumental job of exploring the galleries. It was the start of a long and deep friendship between the two men. Exploration of the galleries commenced in 1981 with the help of former miner Joseph Pujol and GEK caving member Henri Lozano. Salle Blanche (the White Gallery) was discovered in 1982.
Stringent planning and development studies ensued with the view of opening the unique Grandes Canalettes cave to the public (Fig. 2).
(http://grottescanalettes.com/les-grottes-des-canalettes/?lang=en)

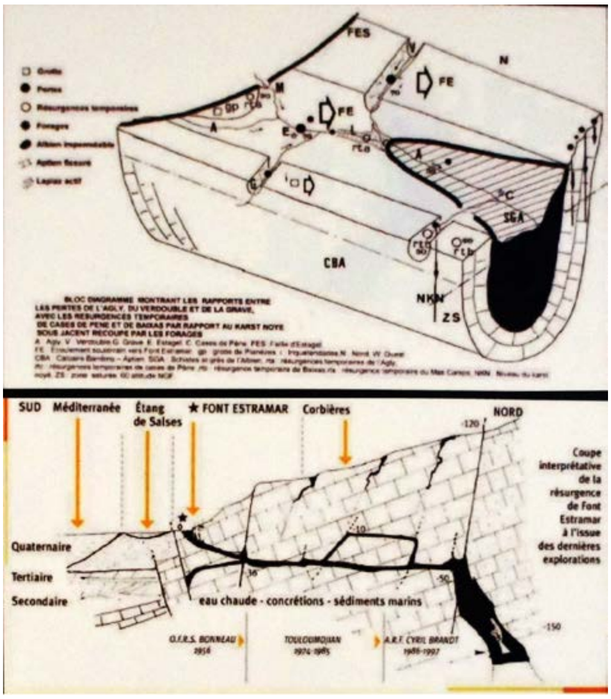

Fig. 1. A – Location of the Grandes Canalettes cave. B – Scheme of the cave.

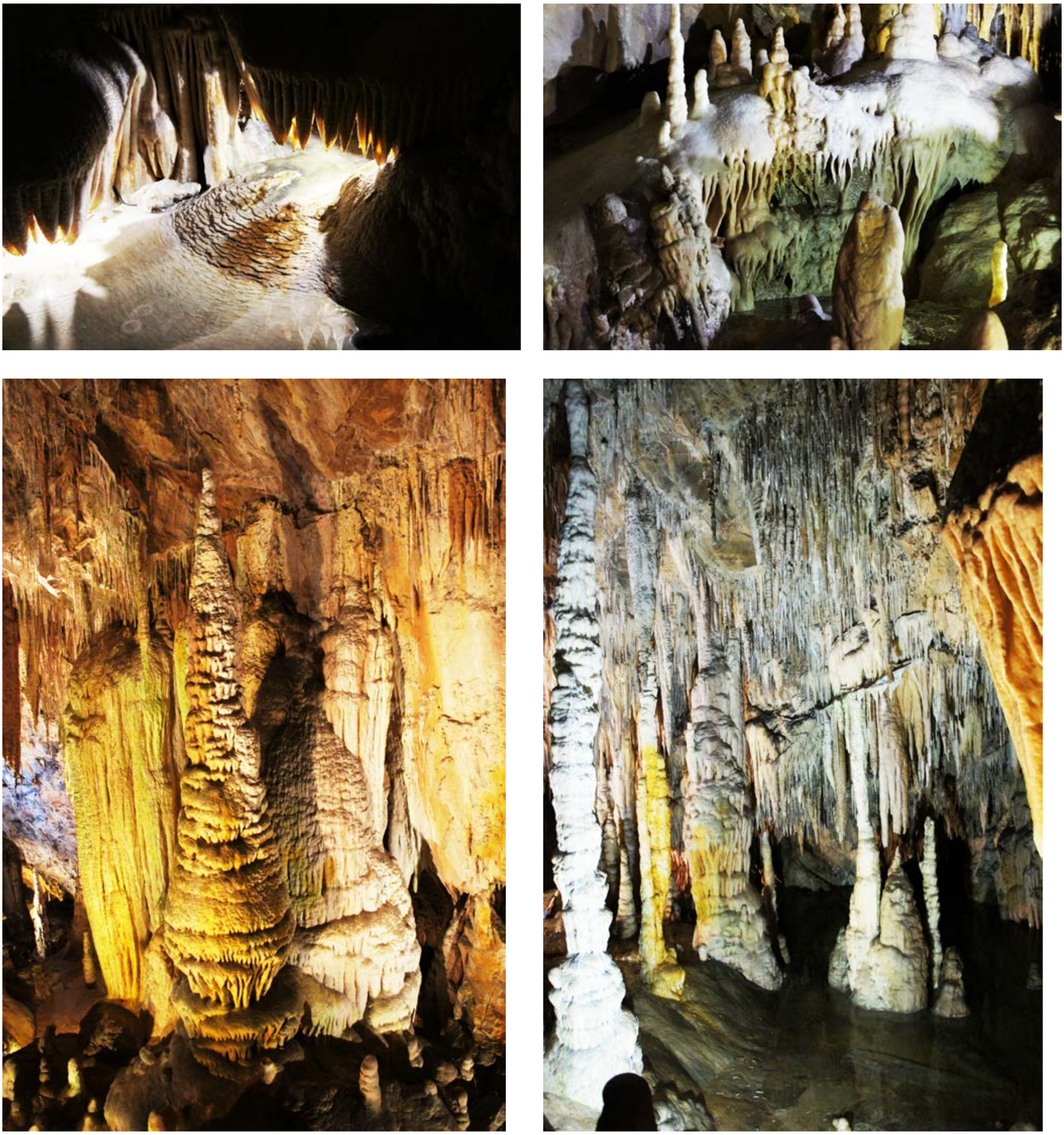

Fig. 2. Grottes des Canalettes. Photos by G. Danukalova

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