Research Networking Programmes

Science Meeting – Scientific Report

Scientific report (one single document in WORD or PDF file) should be submitted online within two months of the event. It should not exceed seven A4 pages.

Proposal Title:

The Early-Middle Pleistocene transition: Significance of the Jaramillo subchron in the sedimentary record

Application Reference N°: 4312

1. Summary (up to one page)

This interdisciplinary meeting brought together specialists from various fields (magnetostratigraphy, palaeoclimatology, cyclostratigraphy, palaeoecology, biostratigraphy, geochronology, archaeology…) in order to provide an updated overview of the Early-Middle Pleistocene transition (~1.2-0.5 Ma), with a special focus on the Jaramillo Subchron (1.07-0.99 Ma). Despite its increasing importance in Quaternary studies as a chronological landmark within the second half of the Early Pleistocene, the information available about this subchron remains still quite fragmented. Consequently, the main goal of the meeting was to share new results and ideas that are relevant to this period of time and promote future studies.

This international meeting took place at the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) located in Burgos, Spain, from 25 to 27 September 2013. It involved 34 invited research scientists from eight different countries. The meeting was divided into six main sessions over 2.5 days, each of them including an opening key note lecture of ~45 min focused on an updated overview of a given field, and between two and five standard presentations of ~20 min centered on more specific/punctual research aspects, as summarized below :

	Session	Day	Key note lecture given by	Standard presentations per session
0	Introduction	Day 1, morning	Martin Head (Brock University, Canada)	0
1	Magnetostratigraphy	Day 1, morning	James E.T. Channell (University of Florida, USA)	3
2	Radiometric dating methods	Day 1, afternoon	Brad Singer (University of Wisconsin-Madison, USA)	5
3	Palaeoclimatology / Palaeoenvironment	Day 2, morning	Mark Maslin (University College London, UK)	5

4	Sedimentary record / Cyclostratigraphy	Day 2, morning	Philip Gibbard (University of Cambridge, UK)	2
5	Biostratigraphy	Day 2, afternoon	Lorenzo Rook (Università di Firenze, Italy)	5
6	Human evolution / Archaeology	Day 3, morning	José M. Bermúdez de Castro and María Martinón (CENIEH, Spain)	5

Keys: Day 1= Wednesday 25 September 2013; Day 2= Thursday 26 September 2013; Day 3= Friday 27 September 2013.

In order to encourage scientific exchange and debate, some time was intentionally left for discussion in the programme, not only right after each talk, but also at the end of some sessions. In addition, a final Round Table was organised at the end of the meeting, in order to summarize the main ideas developed during the days before, raise unsolved questions and indicate new avenues worth exploring in the future.

In terms of national and international visibility, this ESF meeting was announced via the websites of two prestigious international organisations, the INQUA Commission on Stratigraphy and Chronology (INQUA-SACCOM) (http://www.inqua-saccom.org/diary/) and the Subcommission on Quaternary Stratigraphy (http://quaternary.stratigraphy.org/), which is part of the International commission on Stratigraphy. The meeting was also announced at national http://www.dicyt.com/noticias/el-evento-magnetico-del-jaramillo-centra-un-encuentro-internacional-en-el-cenieh) and local levels (http://www.elcorreodeburgos.com/noticias/2013-09-25/30-cientificos-extranjeros-analizan-en-burgos-el-fenomeno-jaramillo). In addition, a webpage has been created (https://sites.google.com/site/jaramillomeeting/). During the meeting, each talk has been announced in direct via Facebook (https://www.facebook.com/pages/Centro-Nacional-de-Investigacion-sobre-la-Evoluci%C3%B3n-Humana-CENIEH/251459968233642) and Twitter (https://twitter.com/CENIEH). Finally, the contributions presented at the meeting will be published in a special volume of the peer-reviewed journal Quaternary International.

2. Description of the scientific content of and discussions at the event (up to four pages)

This international meeting took place at the *Centro Nacional de Investigación sobre la Evolución Humana* (CENIEH) located in Burgos, Spain, from 25 to 27 September 2013. It involved 34 invited research scientists from eight different countries with the objective to discuss about the Early-Middle Pleistocene Transition (EMPT) and the significance of the Jaramillo Subchron in the sedimentary record. The meeting has been divided into six main sessions in order to tackle the topic from various perspectives: magnetostratigraphy, radiometric dating methods, palaeoclimatology / palaeoenvironment, sedimentary record / cyclostratigraphy, biochronology / biostratigraphy and human evolution / archaeology. To ensure the success of the meeting, several outstanding research scientists from USA, Canada, UK, Spain and Italy were invited to give a key note lecture (see details in Summary). Each session was introduced by a key note lecture of ~45 min and followed by two to five standard presentations of ~20 min each focused on more specific research aspects, case examples, etc. The programme of the scientific meeting was designed to encourage discussion and scientific debate during the entire duration of the event. In

that regard, 5-10 min of questions were left after each key note lecture and ~5 min after each standard talk. In addition, two blocks of discussions (~30-40 min each) were scheduled at the end of the first session dedicated to magnetostratigraphy (day 1) and after the session on biochronology / biostratigraphy (day2). A final Round Table of 45 min involving the keynote lecturers was also organised at the end of the meeting.

Figure 1: Participants and organisers of the ESF EARTHTIME-EU meeting from the 25th–27th September 2013 in Burgos, Spain, in front of the CENIEH, the 25th September 2013.

The meeting was introduced on Wednesday morning by **Josep M. Parés** from CENIEH, Spain, with a general presentation of the context and objectives of the workshop and a brief description of the Jaramillo Subchron, including its definition and the occurrences in continental domains. Then, **Martin Head** from Brock University, Canada, provided an overview of the EMPT, by describing the major events occurred during this period and defining some boundaries for this transition.

The first session was chaired by Josep M. Parés and logically dedicated to magnetostratigraphy, since Jaramillo has been defined as a normal magnetic subchron in the upper Matuyama Chron. The opening lecture was given by **James E.T. Channell**, University of Florida, USA, with an overview of Quaternary magnetic stratigraphy. Then, **Jaume Dinarès-Turell**, *Istituto Nazionale di Geofisica e Vulcanologia*, Italy, presented a paleomagnetic and

paleoceanographic overview of Mediterranean piston cores from the Sicily Channel margins. **Miguel Garcés**, *Universitat de Barcelona*, Spain, presented his results from a magnetostratigraphy-based chronostratigraphy of the Pliocene-Pleistocene deposits of the Guadix-Baza Basin (Southern Spain), while **Oriol Oms**, *Universitat Autònoma de Barcelona*, Spain, showed data derived from a magnetostratigraphic study carried out at Buia (Eritrea, Horn of Africa). The session ended with a final discussion of ~40 min about the results shown in the morning and on issues specifically related to palaeomagnetism.

Session 2 dedicated to radiometric dating methods was chaired by **Lee Arnold**, CENIEH, Spain. The objective of this session was to provide an overview of the numerical dating methods that are available for this specific time range (~1.4-0.6 Ma) with their potential and limitations. To do so, each standard presentation was given by a geochronologist specialised in a given dating method, about either a dating application to a specific section or an overview of the method. The opening lecture was given by **Brad Singer**, University of Wisconsin-Madison, USA, who presented an overview of the contribution of the Ar-Ar dating method to accurately date the limits of chrons and subchrons within the upper Matuyama Chron. **Sébastien Nomade**, from *Laboratoire des sciences du climat et de l'environnement*, France, presented a work focused on age and duration of the Brunhes/Matuyama and Upper Jaramillo event transitions using $^{40}Ar/^{39}Ar$ and unspiked K/Ar from various sedimentary sequences in Italy and Spain. Then, **Ángel Rodés** from Scottish Universities Environmental Research Centre, UK, showed the potential and limitations of surface exposure and burial dating using cosmogenic ^{10}Be-^{26}Al isotopes. Similarly, **Mathieu Duval**, CENIEH, Spain presented the potential of Electron Spin Resonance (ESR) method to date late Early Pleistocene hominid occupations, taking the archaeological site of Vallparadís as an example. Then, **Martina Demuro**, CENIEH, Spain, evaluated the suitability of novel luminescence dating techniques over Early and Middle Pleistocene timescales. Finally, the session ended with **Dirk Hoffmann**, CENIEH, Spain, who showed the potential and limitations of U-series dating for Early to Middle Pleistocene chronologies.

On Thursday 24, the meeting started with a short talk by **Miguel Garcés**, member of the steering committee of the EARTHTIME-EU, who presented the aim and scope of this Research Network Programme. The third session was dedicated to Palaeoclimatology / Palaeoenvironment and chaired by Dirk Hoffmann. The objective of this session was not only to provide an overview of the paleoclimate changes occurred during the EMPT but also to understand the origin of such changes and get a better idea of the tools that are available for palaeoclimate and palaeoenvironmental reconstructions from either marine or continental records. In that regard, the session has been composed of a large diversity of talks. An opening lecture has been given by **Mark Maslin**, University College London, UK, who reviewed the current theories of the causes of the EMPT and the role of orbital forcing. Then **Pere Anadón**, *Institut de Ciències de la Terra Jaume Almera*, Spain, showed the interest of geochemistry of biogenic carbonates as paleoenvironmental tool, taking the example of a section in Southern Spain, while **Hugues-**

Alexandre Blain, *Institut Català de Paleoecologia Humana i Evolució Social* (IPHES), Spain, used reptile and amphibian fossil remains as a proxy for seasonal rainfall variability. **Patrizia Ferretti**, *Istituto per la Dinamica dei Processi Ambientali*, Italy, and **Sébastien Joannin** from University of Manchester, UK, focused their presentations on marine cores with two different approaches. The first one was based on magnesium/calcium ratios, combined with oxygen isotope analyses from a deep-sea core recovered in the Southern Hemisphere (ODP Site 1123), whereas the latter was based on pollens derived from the ODP Site 976 marine core from Western Mediterranean region. Finally, **Adele Bertini** from *Università di Firenze*, Italy, ended the session with an overview of the EMPT in the Italian peninsula derived from terrestrial pollen records.

Session 4, still on Thursday morning, was a smaller session focused on the sedimentary record and cyclostratigraphy, and chaired by **Mathieu Duval**. The opening lecture was given by **Philipp Gibbard**, from University of Cambridge, UK, who provided an overview of the fluvial and glacial system responses to the EMPT. Then, **Luca Lanci**, from University of Urbino, Italy, presented the potential and limitations of Pleistocene cyclostratigraphy, while **Sila Pla Pueyo** from *Universidad de Granada*, Spain, ended the session with a talk about palaeohydrological evolution of the sedimentary systems in the Guadix Basin in order to contribute to a better understanding of the environmental transformations in southern Europe during Pleistocene times.

The session 5 organised on Thursday afternoon was dedicated to biostratigraphy/biochronology and chaired by **Dr Martin Head**. This session was especially important in the meeting since the EMPT correspond to a time range with important faunal turnover, in particular in Europe with the transition from the Villafranchian biochron to the Galerian. This is why research scientists with diverse specialties were invited, working either on Northern or Southern Europe, and either on large or small mammals. An opening lecture was given by **Lorenzo Rook** from Florence University, Italy, who presented an overview of the biochronological divisions based on large mammals for this time range. Then, the two following talks were focused on small mammal biostratigraphy. They were given by **Jordi Agustí**, IPHES, Spain and **Gloria Cuenca-Bescós**, *Universidad de Zaragoza*, Spain, and focused on continental records from Eastern and Northern Spain, respectively. **Jan van der Made** from *Museo Nacional de Ciencias Naturales*, Spain, presented a synthesis of large mammal biostratigraphy around the Lower-Middle Pleistocene boundary and the Jaramillo in Europe, while **Thijs van Kolfschoten**, Leiden University, The Netherlands, showed the changes in the Central and Eastern European mammalian fauna during the EMPT. Finally, **Bienvenido Martínez-Navarro**, IPHES, Spain, showed the interest of using the presence or absence of pigs as a reliable biochronological marker for the European continent. The session ended with a ~40 min discussion focused on specific biochronological issues, including the potential as well as limitations of biochronology/biostratigraphy approach.

The last session has been focused on Human evolution / Archaeology in order to evaluate the impact of such climatic changes on hominid evolution and migrations. To do so, a large diversity of specialist have been invited, such as archaeologists, palaoanthropologists and palaeontologists working in Northern and Western Europe, but also in Northern and Eastern Africa. The opening lecture of this session was given by **J.M. Bermúdez de Castro** and **M. Martinón-Torres**, CENIEH, Spain, who discuss the importance of the Atapuerca fossil remains in the context of the early hominid settlements in Europe. **Simon Parfitt**, from Natural History Museum, UK, presented the earliest hominid occupations in Northern Europe, while **Marta Arzarello**, *Università degli Studi di Ferrara*, Italy, showed an overview of Pirro Nord site in Southern Italy. Then, **Jesús Rodriguez**, CENIEH, Spain, centered his talk on palaeoecology of mammals as a factor in the distribution of *Homo* at the end of the Early Pleistocene. Finally, **Mohamed Sahnouni**, CENIEH, Spain and **Sileshi Semaw**, CENIEH, Spain, showed an overview of their work in the Haïn Hanech (Algeria) and Gona (Ethiopia) areas, with emphasis on the lithic tools record.

The meeting ended on Friday morning with a Round Table including the keynote lecturers in order to encourage a final discussion on the main issues that have been raised during the meeting. A post meeting excursion to the Atapuerca archaeological sites, declared UNESCO World Heritage in 2000, was organised on Friday afternoon.

Figure 2: Final Round Table of the ESF EARTHTIME-EU meeting, the 27th September 2013.

3. Assessment of the results and impact of the event on the future directions of the field (up to two pages)

The transition from Early to Middle Pleistocene is a period of important changes in Earth's climate cyclicity. First defined in the mid 1990s (e.g. Berger and Jansen, 1994), the Early-Middle Pleistocene transition (EMPT) has been increasingly studied since then. A first small workshop dedicated to this topic was organised in 2003 in University of Cambridge, and lead to the publication of a compilation of scientific papers published in a special volume of the Geological Society of London (Head and Gibbard, 2005). The present ESF meeting organised in Burgos was following a similar philosophy, by providing an updated overview of the EMPT ten years later, with a special focus on Jaramillo Subchron, which, so far, has never been done. Surprisingly, this Subchron located within this EMPT has been barely studied in European continental context, while it is usually used as a chronological landmark, in particular for faunal turnover.

This unique initiative lead to the organization of an international scientific meeting involving 34 research scientists representing nine different nationalities and coming from eight different countries (88% of the participants are from EARTHTIME-EU contributing countries). Statistics may be found in the following figure.

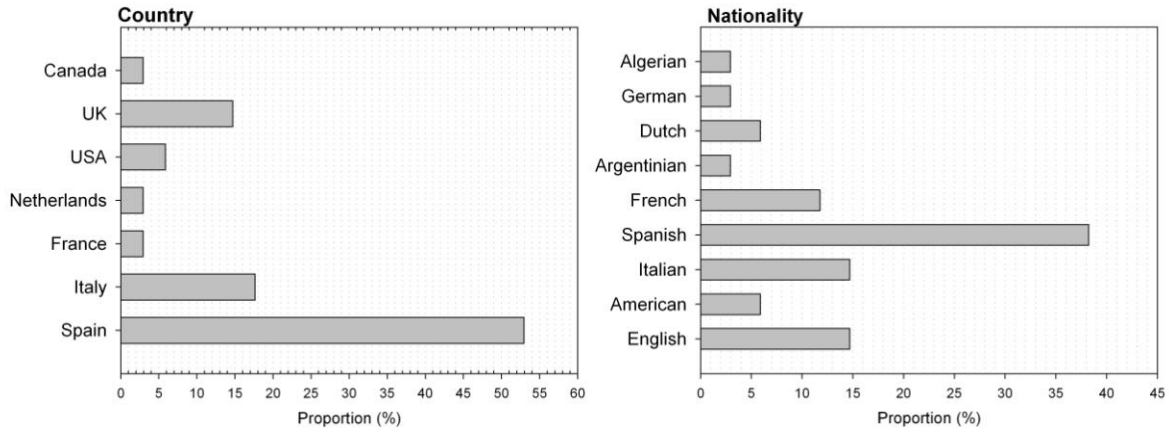

Figure 3: Basic statistics (Country of the Institution, Nationality) related to the participants of the ESF EARTHTIME-EU meeting.

Since the initial discussions about the organisation of the meeting, the priority has been given to the scientific quality over quantity. In that regard, all the invited speakers have been selected according to their scientific excellence following high international standards. These 2.5 days have offered very good talks, generating intensive and stimulating debates about the EMPT and Jaramillo subchron.

The outcome of the meeting has been very positive. This has been an excellent opportunity to bring together specialists of various fields that were not used to meet, in order to create productive scientific discussions, formulate questions and criticisms, raise new questions, provide new ideas and indicate new avenues worth exploring in the future. This intensive scientific debate has been encouraged by the small number of participants and the time intentionally left in the meeting programme for discussion. The large diversity of the talks has provided a good overview of the EMPT from a pluridiciplinary perspective. Many scientific fields, topics and contexts have been covered, like climate cyclicity, orbital forcing, the potential and limitations of numerical and non numerical dating techniques, paleoenvironmental changes, faunal turnover, animal migration

and hominid evolution in Europe and Africa, derived from either marine or continental records. Many experimental approaches have been presented, based on wavelet analysis, magnetostratigraphy, biochronology/biostratigraphy of large and small mammals, numerical dating techniques, techno-typology of lithic industry, the use of pollen record, foraminifera, continental shells, or herpetofauna for palaeoclimatic reconstructions, etc.

Consequently, the meeting has contributed to raise several questions, observations, and to indicate important avenues worth exploring in the future. One of the major issues highlighted during the meeting was the necessity to improve the chronology of the sections that are studied in non-volcanic context in Europe. The small amount of dating, combined with the large uncertainties, strongly limit any further interpretation for palaeoclimatic reconstruction and hominid evolution and migration. In that regard, a significant effort has to be made in refining the age of some known sections. One of the solutions would be to apply different dating techniques at a given section, similarly to the work performed at Atapuerca sites (Spain). This would help in preventing the "age drift", i.e. this natural tendency to make the sites older than they are without any solid data, which seems a problematic trend in particular in European archaeology. To improve these chronologies, the role of other methods such as magnetostratigraphy, biochronology and biostratigraphy is also crucial. In that regard, the resolution of these approaches for chronological purpose need to be further defined. A few questions have been raised during the meeting and would need to be further investigated, e.g. in order to understand in what extent short magnetic excursions can be identified in cave deposits, but also to provide a clear definition of the Epivillafranchian (or Protogalerian) biochron.

Hominid migrations and evolution have been probably the most debated topic during the meeting. The difficulty to identify archaic lithic industry from geofacts in some contexts (in particular quartz industry, or in high energy deposits) may induce doubtful attributions that are later repeatedly, and uncritically, mentioned in scientific communications. Similarly, the identification of cut marks on bones, in particular in sites where no lithic industry has been found, may also reasonably be questioned. In terms of migration, the meaning of the chronological gap between the occupation at Dmanisi (1.8 Ma) and the oldest hominid evidence in Western Europe (not before 1.2 Ma) has been debated. Is it an artifact of the dating results that involve large uncertainty? Is it only because of a lack of sites? Some parallels have been made with animal migrations, in particular Miocene species which barely left any evidence between Caucasus and Western Europe. To get a better understanding of these dynamics, several factors need to be further investigated. The main one is very likely the role of palaeogeography and paleoenvironment which may have created some natural barriers (seas, mountain range, dense forest, etc.), preventing (or limiting) thus hominid migration. In the same direction, the geographical fluctuation of the continental ice sheet over time is also somewhat unclear. In addition, the role of MIS 22, considered as the most important glacial event during the EMPT, needs to be further studied.

Nevertheless, perhaps the most striking observation derived from these 2.5 days is the difficulty to undoubtedly identify Jaramillo Subchron in European continental record. Some of the archaeological sections used as reference until now obviously show some weaknesses in their chronostratigraphic framework, resulting in a somewhat doubtful correlation to Jaramillo, such as Untermassfeld (Germany) or Le Vallonnet (France). Therefore, some specific efforts should be made on carrying out further dating studies on these sites. In addition, the talks and discussions highlighted the need to increase the number of hominid sites in Europe. In that regard, the

elaboration of accurate palaeogeographic maps could help to indicate the areas to focus the search for these hominid sites. Similarly, palaeovegetation maps derived from well calibrated and high resolution marine record would be of major importance to understand hominid evolution and migrations. The discussions clearly showed the need to develop new collaborations and pluridsciplinary studies in the future.

The scientific outcome of this ESF scientific meeting will be materialized with the publication of a special volume of the peer-reviewed journal Quaternary International.

References

Berger, W. H., and E. Jansen (1994), Mid-Pleistocene climate shift - The Nansen connection, in *The Polar Oceans and Their Role in Shaping the Global Environment*, *Geophys. Monogr*., pp. 295–311, AGU, Washington, D. C., doi:10.1029/GM085p0295.

Head, M.J., Gibbard, P.L. (Editors). Early Middle Pleistocene Transitions: The Land-Ocean Evidence (Special Publication, No. 247). Geological Society of London, 2005.

4. Annexes 4a) and 4b): Programme of the meeting and full list of speakers and participants

Meeting Programme

Tuesday, 24th September

19:30 Ice break at CENIEH

Wednesday, 25th September

8:00-9:00 Registration

9:00-9:25 WELCOME AND INTRODUCTION
J.M. Parés

9:25-10:10 OPENING LECTURE
M.J. Head, P. L. Gibbard
The Early–Middle Pleistocene transition: a global perspective and focus on the Jaramillo Subchron

10:10-10:25 Coffee break

Session 1: Magnetostratigraphy

Chairman: J.M. Parés

10:25-11:10 OPENING LECTURE
J.E.T. Channell
Quaternary magnetic stratigraphy: More than polarity reversals

11:10-11:30 J. Dinarès-Turell, A. Incarbona
The Early-Middle Pleistocene Transition (MPT): a paleomagnetic and paleoceanographic overview of Mediterranean piston cores from the Sicily Channel margins

11:30-11:50 M. Garcés
A magnetostratigraphy-based chronostratigraphy of the Pliocene-Pleistocene of the Guadix-Baza Basin

11:50-12:10 O. Oms, M. Ghinassi, M. Papini, Y. Libsekal, D. Araia, T. Medin, L. Rook

The Jaramillo chron at Buia (Eritrea, Horn of Africa): an expanded record in fluviolacustrine environments

12:10-12:40 Short discussion

12:40 End of the session
Conference group photo

13:00 Lunch at Taberna de Tanin (behind CENIEH)

Session 2: Radiometric dating methods

Chairman: L. Arnold

14:30-15:15 OPENING LECTURE
B.S. Singer

A Quaternary Geomagnetic Instability Time Scale (GITS) with focus on 40Ar/39Ar dating of geomagnetic field reversals and excursion of the upper Matuyama Chron

15:15-15:35 S. Nomade, H. Guillou, P. Renne, B. Giaccio, G. Scardia, G. Sottili, C. Sprain, V. Scao, G. Zanchetta, C. Kissel, L. Sagnotti,C. Laj, J.-C. Carracedo, P. Messina

Age and duration of the Brunhes/Matuyama and Upper Jaramillo event transitions using 40Ar/39Ar and unspiked K/Ar

15:35-15:55 Á. Rodés

Combined surface exposure and burial dating from cosmogenic 10Be-26Al depth profiles

15:55-15:15 *Coffee break*

16:15-16:35 M. Duval, J.-J. Bahain, C. Falguères, V. Guilarte Moreno, D. Moreno, Q. Shao, P. Voinchet, J. García, K. Martínez
On the challenge of dating late Early Pleistocene hominid occupations by Electron Spin Resonance (ESR): an example from Vallparadís (Spain)

16:35-16:55 M. Demuro, L. Arnold.
Testing the suitability of novel luminescence dating techniques over Early and Middle Pleistocene timescales

16:55-17:10 D. Hoffmann
Potential and limitations of U-series dating for early to middle Pleistocene chronologies

20:00 *Dinner at the Abba Hotel*

Thursday, 26th September

9:00-9:10 M. Garcés
Presentation of the ESF EU-EARTHTIME Research Networking Programme

Session 3: Palaeoclimatology / Palaeoenvironment

Chairman: D. Hoffmann

9:10-9:55 OPENING LECTURE
M.A. Maslin, C. Brierley, C. Tzedakis
Mid-Pleistocene Transition: The great precession versus obliquity debate

9:55-10:15 P. Anadón, O. Oms, V. Riera, R. Julià
Geochemistry of biogenic carbonates as paleoenvironmental tool for the upper Matuyama succession at Barranco León (Baza Basin, Spain)

10:15-10:35 H.-A. Blain, I. Lozano-Fernández, J. M. López-García, M. Bennàsar, G. Cuenca-Bescós
Seasonal rainfall variability during the Early-Middle Pleistocene transition in northern Spain (Atapuerca, Burgos)

10:35-10:55 P. Ferretti, H. Elderfield, M. Greaves, S. J. Crowhurst, I. N. McCave, D. Hodell, A. Piotrowski
Evolution of global ice volume and deep-water temperature in response to changing glacial and orbital boundary conditions during the past 1.5 million years

10:55-11:15 Coffee break

11:15-11:35 S. Joannin, N. Combourieu Nebout, F. Bassinot, O. Peyron
Did the first ice-sheets of the north hemisphere cause rapid climate changes over the Mediterranean region?

11:35-11:55 A. Bertini
The Early-Middle Pleistocene transition: an overview from the terrestrial realm as provided by the Italian pollen records

Session 4: Sedimentary record / Cyclostratigraphy

Chairman: M. Duval

11:55-12:40 OPENING LECTURE
P.L. Gibbard
Fluvial and glacial system responses to the Middle Pleistocene Transition

12:40-13:00 L. Lanci
Pleistocene cyclostratigraphy

13:00-13:20 C. Viseras, S. Pla-Pueyo
Climatic control on palaeohydrology and sediment distribution in the Pleistocene Guadix Basin (Betic Cordillera, Spain)

13:30-15:00 Lunch at Taberna de Tanín

Session 5: Biostratigraphy

Chairman: M. Head

15:00-15:45 OPENING LECTURE
L. Rook
The Early – Middle Pleistocene transition: the Italian large mammal record

15:45-16:05 J. Agustí, H.-A., Blain, O. Oms, I. Lozano, P. Piñero
Biostratigraphic and climatic events in the early-middle Pleistocene transition of Eastern Spain

16:05-16:25 G. Cuenca-Bescós, H.-A. Blain, J. Rofes, I. Lozano-Fernández, J. M. López-García, M. Bennàsar
The biostratigraphic position of the Lower Red Unit of the Sima del Elefante site (TELRU) based upon its small mammal assemblages (Atapuerca, Spain, Early Pleistocene), and the pre-Jaramillo faunas

16:25-16:40 Coffee break

16:40-17:00 J. van der Made
Large mammals and biostratigraphy around the Lower-Middle Pleistocene boundary and the Jaramillo in Europe

17:00-17:20 T. van Kolfschoten, A. K. Markova
Changes in the Central and Eastern European mammalian fauna during the mid-Pleistocene transition

17:20-17:40 B. Martínez-Navarro, J. Madurell-Malapeira, S. Ros-Montoya, Mª P. Espigares, T. Medin, P. Palmqvist
The Epivillafranchian and the arrival of pigs into Europe

17:40-18:20 Discussion

20:00 Dinner at the Gallego (behind CENIEH)

Friday, 27th September

Session 6: Human evolution / Archaeology

Chairman: M. Maslin

9:00-9:45 OPENING LECTURE
J.M. Bermúdez de Castro, M. Martinón-Torres
Continuity versus discontinuity of the Early Pleistocene European human populations: The Atapuerca evidence

9:45-10:05 S. Parfitt
The Early Human Colonization of Europe: A view from the North

10:05-10:25 M. Arzarello, J. Arnaud, C. Peretto, A. Potì.
The Pirro Nord site (Apricena, FG, Southern Italy) in the context of the first European peopling: convergences and divergences

10:25-10:45 Coffee break

10:45-11:05 J. Rodríguez, G. Rodríguez-Gómez, J. A. Martín-González, A. Mateos
Palaeoecology of mammals as a factor in the distribution of Homo at the end of the Early Pleistocene

11:05-11:25 M. Sahnouni
Hominid settlements in the Maghreb during the Early and Middle Pleistocene

11:25-11:45 S. Semaw, M. Rogers, D. Stout
Plio-Pleistocene Archaeology of Gona Study Area, Afar, Ethiopia

11:45-12:30 Round Table and final discussion

12:30 End of the meeting

12:45 Lunch at Forum de la Evolución

List of Participants

Name	Institution
Jordi Agustí	Universitat Rovira i Virgili de Tarragona, Spain
Pere Anadón	Institut de Ciencies de la Terra "J. Almera", Spain
Lee Arnold	CENIEH, Spain
Marta Arzarello	Università degli Studi di Ferrara, Italy
José M. Bermúdez de Castro	CENIEH, Spain
Adele Bertini	Università di Firenze, Italy
Hughes Alexandre Blain	Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Spain
James E.T. Channell	University of Florida, USA
Gloria Cuenca-Bescos	Universidad de Zaragoza, Spain
Martina Demuro	CENIEH, Spain
Jaume Dinarès-Turell	Istituto Nazionale di Geofisica e Vulcanologia, Italy
Mathieu Duval	CENIEH, Spain
Patrizia Ferretti	University of Venice, Italy
Miguel Garcés	Universitat de Barcelona, Spain
Philip Gibbard	University of Cambridge, UK
Martin Head	Brock University, Canada
Dirk Hoffmann	CENIEH, Spain
Sébastien Joannin	University of Manchester, UK
Thijs van Kolfschoten	Leiden University, The Netherlands
Luca Lanci	University of Urbino, Italy
Jan van der Made	Museo Nacional Ciencias Naturales, Spain
Bienvenido Martínez Navarro	Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Spain
María Martinón	CENIEH, Spain
Mark Maslin	University College London, UK
Sébastien Nomade	Labo. des Sciences du Climat et de l'Environnement, France
Oriol Oms	Universitat Autònoma de Barcelona, Spain
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