



4th ESF-MedCLIVAR WORKSHOP

FEEDBACKS OF THE MEDITERRANEAN DYNAMICS IN THE GLOBAL CLIMATE SYSTEM.

Sesimbra 28 – 30 September 2009

REPORT

Contributions from:

Portuguese Science Foundation (FCT)

Câmara Municipal de Sesimbra

1. Summary

In the framework of the ESF-MedCLIVAR programme, the fourth workshop took place in Sesimbra, Portugal between the 28th and 30th of September 2009. Sesimbra was considered by all participants to be a very enjoyable venue for this meeting.

We had 64 participants (24 women and 40 men) from 9 different countries according to the distribution shown in the following figure. We should emphasize the presence of 12 PhD students and 15 Post-docs among a large number of senior researchers attending the workshop.



We had the opportunity to listen to 34 oral presentations and discuss 28 posters covering the full spectrum of themes proposed for this workshop, namely:

- The impact of the Mediterranean water in the Atlantic and global oceanic circulations (present and past perspectives);
- The influence of the Mediterranean sea on the large-scale atmospheric circulation of the Northern Hemisphere and possible feedbacks;
- Mediterranean Sea – Atlantic basin exchange processes; pathways and dynamics of the MW in the Atlantic.
- Links and feedbacks between tropical circulation (ENSO, monsoons) and the Mediterranean climate system;
- Detecting changes in major teleconnections (spatial patterns and intensity) affecting the Mediterranean basin in the past (outlooks for future climate);
- Moisture sources and humidity transport modes affecting the Mediterranean.

The main objective of this two and a half day workshop was to foster interaction among

different earth science communities, namely: climatologists, oceanographers and paleoclimatologists. The 5 scientific sessions were roughly divided according to these 3 sub-disciplines. Monday morning and Tuesday afternoon mostly devoted to oceanographic aspects (14 oral presentations). Atmospheric sciences dominated during Monday afternoon and Wednesday morning (12 oral presentations) while Paleoclimatology presentations were concentrated on Tuesday morning (6). The three corresponding sets of posters (29 in total) were always accessible throughout the 3-day meeting, allowing successive visits during normal coffee-breaks and poster sessions with authors on attendance.

2. Scientific content presented and discussed at the event

2.1 Monday morning

The morning session opened with a presentation of an historic view of the research of Mediterranean Water in the Atlantic by **Isabel Ambar**. Almost 100 years of research were summarized from the early investigations on the salt water anomaly in the beginning of the 20th century, the discovery of Meddies and the technology developments in intermediate waters research to the nowadays sophisticated models.

During that morning session special attention was devoted to the Strait of Gibraltar processes and outflow dynamics across several talks. **Sanchez-Roman** has reported the effort that the University of Malaga group has been doing in maintaining long-term series of outflow measurements. The observations and models have been coupled to use single point observations in the estimate of the transport. These estimates allowed the confirmation of 0.79 Sv as a present day mean transport. The series continuity for up to 5 years allowed for the first time the detection of seasonal variability in the outflow (maximum in April and minimum in autumn-early winter) and the beginning of the study of an apparently marked interannual variability although the lack of definite results yet. **Gianmaria Sannino** presented his last results about the modeling of the Strait of Gibraltar exchange. Traditional two-layer idealizations of the Strait of Gibraltar for Hydraulic-control studies were criticized, and it was shown that the more sophisticated models, which allow intermediate layer representation and cross-channel variations, suggest that the exchange is predominately **maximum???** and that control acts less frequently and at fewer locations.

Sanchez Leal has shown an extensive database of CTD data on the outflow and commented on the complexity of the outflow-topography interactions which emerges when dense sampling is used. This session was closed by an invited talk by **James Price** who reported on work that is being conducted on the comparison of different overflows conditions in the north Atlantic. Despite local details the overflows present common features in what concerns the water mass transformation and the difference between source and product waters reveal similar aspects. The capacity of overflows to force the upper ocean circulations was also demonstrated and simplified models to parameterize the effect of overflows on large scale-coarse resolution ocean models was reviewed.

The talk of **Katrin Shroeder** about changes in the Western Mediterranean Deep Water (WMDW) was a clear highlight of this morning session. Starting from the winter 2005 the properties of the WMDW have abruptly changed, shifting towards higher temperature, salinity and density values. These new properties have been observed in the whole abyssal western basin, at depths below 1500 m depth, except for the Tyrrhenian Sea. In the Alboran Sea the fraction of new WMDW still seems to be very low and no signature could be found at a station west of Gibraltar. Nevertheless, CTD data collected in November 2008 have shown that the new WMDW has been sucked to much shallower depths inside the Alboran Sea (< 900 m). An attempt to follow the route of this vein in the direction of the Strait of Gibraltar

has been done, using a basin wide observation effort from European projects.

2.2 Monday afternoon

This session started with the invited talk by **Mikis Tsimplis** with an overview of the historical changes in mean sea level, its seasonality, decadal variability and extremes observed in the Atlantic and the Mediterranean Sea. It was stressed the need to identify research questions that need to be addressed in order to improve sea level change predictions for the next few decades. **Uwe Ulbrich** focused his presentation on the links between important large-scale teleconnection patterns (NAO, EA/WR and SCAND) and cyclonic activity within the Mediterranean basin. Moreover his group provided important results on the link between cyclone activity and extreme wind activity in the Mediterranean region. The last talk before the coffee break was given by **Elke Hertig** that presented results on the capacity to link the occurrence of extreme events in the Mediterranean area (extreme precipitation and temperature) with large scale fields such as geopotential heights at various levels, specific and relative humidity, vorticity and atmospheric instability index.

After the coffee break **Simon Josey** presented his last results on the role of major teleconnections in influencing air-sea interaction in the Mediterranean basin using both coarse resolution and downscaled atmospheric model reanalyses. Of particular interest were his novel results on the influence of large scale circulation modes (NAO, EA, EA/WR, SCAND) on deep water formation at the 3 major sites (the Gulf of Lions, Adriatic and Aegean Seas) in the Mediterranean basin. The following presentation was significantly different from the remaining ones given during this afternoon with **David Gallego** showing the added value that ship's logbooks can offer to the climate reconstruction. In particular, he showed the possibilities (and caveats) associated with the recently construct index of the Atlantic westerly flux from 1650 to 2008. The final presentation was assured by **Laurent Li** (Invited) with an interesting evaluation on the potential impacts of the Mediterranean sea in the atmospheric large-scale circulation of the Northern Hemisphere. Among other results it was possible to grasp this impact through idealized experiments in a General Circulation Model (GCM) such as a 2K cooling of the Mediterranean Sea that have induced teleconnections with strong zonal characteristics following the sub-tropical jet-stream to the North Pacific and North America.

2.3 Tuesday morning

The morning of the second day was the period dedicated to paleoclimate presentations, with the exception of the talk presented by Pinhas Alpert, included in this session to accommodate to Prof.'s Alpert tight schedule. A reference to his talk is included in the Wednesday morning session review.

Considering the acceptance of global warming as a fact, and the recognition of the importance of paleorecords by the last IPCC report, given that they constitute the only means to determine effects and rates of change caused on any part of the climatic systems by internal or external forces, the session was planned to concentrate mainly in the most recent past warm periods as well as on rapid climate changes. On that note, we started with a talk on the Pliocene warm period by **Alan Haywood**. His presentation concentrated into modeling results at the global and the regional scale and a comparison between the conditions at Present and Pliocene warm period. The presented results indicate no major SST change at the Equator but an increase of ± 2 °C in the Polar Regions during the Pliocene warm period. The following talk, covered the same period, but was mainly based on data collected by **Nabil Khélifi**, who presented it. His study relates to the west Mediterranean basin conditions but it also takes into

account the characteristics of the Mediterranean Water Outflow (MOW) as well as its possible effect on NADW formation. The presented results indicate an increase in MOW temperature by about 3 °C during the Pliocene as well as an increase in its rate of formation around 3.4 Ma. Furthermore, comparison of the presented data (ODP sites 978, 548, 982) and North Atlantic existing data shows no clear effect on NADW formation.

Bjoern Machalett was the third speaker and his presentation dealt with a study of loess sequences across Eurasia, showing that the polar front influence on dust dynamics is not only an Asian phenomena but it is also important in Europe.

David Brayshaw moved from the Pliocene into the Holocene and exploited the impact of the tropical and extratropical dynamical processes on the Mediterranean climate, through a series of simulations performed with the Hadley Centre's global and regional models (HadSM3 and HadRM3) covering time slices across the last 12,000 years. The work presented is part of the multidisciplinary Water, Life and Civilization programme, based at the University of Reading. Overall, these simulations suggest that the Mediterranean region may have been rather wetter during the Early Holocene period (approximately 8,000 - 12,000 years ago).

Antje Voelker reported on the variability of the MOW as recorded in sedimentary sequences retrieved from the Portuguese S and W margins at two time intervals, between 12,000 and 70,000 years, the interval characterized by the occurrence of a millennial scale abrupt variability between climate extremes, and at older times, between 300,000 and 580,000 years. The results from these sequences' study was also compared with records from the north Atlantic and main conclusions point to an increase in deep convection in the Mediterranean and subsequent export of MOW into the north Atlantic whenever there was reduced production of NADW at the millennial scale on both intervals. **Roland Stumpf** presented an attempt to use of radiogenic Nd and Pb isotopes determined from both surface sediments and sediment sequences, as a proxy for past MOW variability. However the time series presented, which are located beneath the modern MOW path, showed quite low variability and were inconclusive. However, more work is needed to understand this promising approach to a good proxy for deep-water flow when measured in marine precipitates. **Uwe Mikolajewicz** ended the session with the presentation of a series of simulations done with a regional version of the ocean general circulation model MPIOM with the objective of elucidating the mechanisms responsible for the formation of the sapropels. These experiments show the need for a sudden initial perturbation, such as a sudden onset of an outflow from the Bosphorus, combined with a weak but more continuous forcing, such as a gradual inflow from the Atlantic due to melting ice sheets, to create the anoxia state needed for sapropel formation.

2.4 Tuesday afternoon

The afternoon session of the 2nd day was in great part dedicated to "Meddies". **Xavier Carton** opened the session with an invited talk about eddy structures in the Mediterranean outflow. Eddy-eddy and eddy topography dynamics was reviewed. It was demonstrated how eddies and in particular Meddies suffer strong interactions in their live cycles and how that might contribute to the propagation of the Mediterranean water salt tongue in the Atlantic. **Igor Bashmashnikov** presented advances on the induction of surface signatures by Meddies and in Meddy detection by the use of Satellite Altimetry. **Manuel Ruiz-Villarreal** has shown multiple examples of Meddy like salinity anomalies on the north and northwest of the Iberian Peninsula suggesting that northern Meddies might be ubiquitous features. **Alvaro Peliz** closed this Meddies session with a presentation on model results of high resolution 4-year simulations of eddy structures in the Mediterranean outflow. His results show that the main characteristics of observed Meddies can already be reproduced and that the Model statistics compare very favorably with the observations. Scenarios for eddy generation patterns were proposed and interannual variability in these generation patterns is suggested by the model

results.

After the poster session the presentations were dedicated to the variability of the Mediterranean Water characteristics in the Atlantic. The highlight talk was given by **Alexandra Bozec** on a mechanism for linking the NAO with the Mediterranean water salt tongue through the variability in the Labrador Sea. A. Bozec presented modeling results where the Mediterranean Outflow Water (MOW) reservoir variability has been reproduced for a constant MOW production using the HYCOM model. The Atlantic-scale simulations show that the variability is due to circulation changes in the Atlantic Ocean induced by the atmospheric forcing. Separating the impact of the wind-stress and the buoyancy forcing, she has been able to determine that these circulation changes are primarily due to the variability in buoyancy forcing through the formation and flushing of Labrador Sea Water during low and high NAO periods that pull and push the MOW tongue from/toward the eastern part of the basin.

Alicia Lavin closed the session with an extensive presentation of the observational programs in execution at the Instituto Español de Oceanografía all along the northwestern Iberia for several years. This observational programmes allowed for the detection of strong interannual variability of temperature and salinity characteristics at the Mediterranean Water levels.

2.5 Wednesday morning

The last session of this workshop was mostly devoted to oral presentations on atmospheric sciences data analysis with the exception of the introductory invited talk by **Vicenzo Artale** that presented very recent results obtained with the new regional system consisting of the RegCM (atmospheric model), the MITgcm (ocean model) and BATS (Biosphere-Atmosphere Transfer Scheme), coupled via OASIS3. He focused his results on the analysis of the 40-yr validation simulation driven by ERA40 reanalysis fields at the lateral boundaries and scenario simulations using as boundary conditions outputs the IPCC-AR4 models. **Anita Drumond** (on behalf of Raquel Nieto) showed their group's results related to the use of the FLEXPART model (a 3-D Lagrangian method) to determinate and rank, the major moisture sources and sinks affecting the Mediterranean. The following two speakers provided different analysis related to cyclonic activity and associate impacts. **Isabel Trigo** gave an overview on the relations between cyclonic activity over the North Atlantic and within the Mediterranean area. Besides characterizing the main areas of cyclogenesis in the Mediterranean she presented an inter-annual analysis of cyclone frequency and intensity for the whole Euro-Atlantic region, using both ERA-40 and NCEP/NCAR reanalysis datasets. On the other hand **Marcelo Fragoso** focused on the synoptic scale patterns affecting intense precipitation in southern Portugal, namely on how each pattern (obtained with PCA and cluster analysis) can be associated with specific intense precipitation pattern over a relatively small area.

After the coffee break **Andreas Paxian** gave an interesting modeling talk analyzing the regional characteristics of climate change in the Mediterranean Basin using the high-resolution (0.5°) regional climate model REMO nested in the global climate model ECHAM5/MPI-OM for the time period 1960-2050. He proved that significant differences between models can be attributed to their intrinsic distinct ability to simulate the NAO mode and associated climatic impacts. The last presentation devoted to atmospheric sciences was given by **David Barriopedro** that presented his novel approach to identify blocking patterns. Results from two forced simulations of the ECHO-G model for the 1000-1989 period were described confirming the predominance of Atlantic blocking events during the 17th and 18th centuries as compared to the industrial period. These results support that the extremely cold conditions that affected Europe during the Maunder Minimum (1650–1715), may be partially attributed to an enhanced blocking activity over the eastern Atlantic. **Pinhas Alpert** (Tuesday

morning presentation) gave a particularly interesting talk on the ability of the capacity of the MRI-global climate models to simulate the wet season moisture field (1979-2002) over the eastern Mediterranean/ Middle East. This high resolution (20 km) GCM runs in the Earth Machine supercomputer and provides a much better representation of the precipitation field over the Middle East area (when compared to ERA-40 and CRU datasets). Climate change scenarios foresee a significant decrease of precipitation in the famous “Fertile Crescent” strip and an increase of precipitation is projected over Iraq and part of Iran.

The last presentation of the workshop was a solicited talk given by **Ana Iglesias** on the Economic value attributable to Climatic information in general and to Seasonal forecasts and Climate Change studies in particular. This allowed to end a physical sciences meeting on a different tone and gave the participants an interesting perception of the state-of-the-art in the field of socio-economics.

Note: With the exception of the talks which authors requested not to be included, all presentations are available in the MedCLIVAR website.

3. Results and Impacts

The 4th ESF-MedCLIVAR fulfilled the prospects and objectives of the organizers with respect to their expected outcome. The main objective of this workshop was to promote a multi-disciplinary debate among climatologists, oceanographers and paleoclimatologists. This is often difficult to achieve among different earth science communities because of the intrinsically different temporal and spatial scales involved.

While diagnostic studies are still dominant, constant developments in Atmospheric and Oceanographic modeling capabilities were associated with some of the most novel results. This was the case with the modeling of the Strait of Gibraltar exchange where idealized traditional two-layer idealizations of the Strait of Gibraltar cannot account for the complexity involved implying the use of more sophisticated models, which allow intermediate layer representation and cross-channel variations. Similarly, new in situ and satellite studies on the relevance of Eddies and Meddies contribute to understand how these structures contribute to the propagation of the Mediterranean water salt tongue in the Atlantic. However, if one wants to fully address the present and future role of these patterns in the Atlantic (including the seasonal cycle and interannual variability) then long term modeling strategies are required. Preliminary results presented in the workshop confirm the reliability of such scenarios. From the climatological perspective the robust modeling of the water cycle components (precipitation, water transport, evapo-transpiration) over the Mediterranean requires extremely sophisticated models running in some of the largest super computers in the world. This effort is of paramount relevance if one wants to address properly climate change scenarios in drought prone areas such as southern Iberia, northern Africa or the Middle East.

The results presented in the paleo session point to a different impact of the Mediterranean outflow into the north Atlantic in the late Pliocene and later during the late Pleistocene phase of rapid and extreme climate variability, with apparent no influence during the Pliocene but a clear impact during the cold phases, the stadials, of the late Pleistocene. This differences call for more and more detailed studies of the Pliocene. Furthermore, the numerical modeling presented confirme wetter conditions in the early warm phase of the Holocene and helped

revealing the importance of the Atlantic water inflow into the determination of the Mediterranean circulation and oxygenation conditions during the early Holocene.

With just a small number of exceptions all presentations given in this workshop are available at the MedCLIVAR website (<http://www.medclivar.eu/>) in the “Ongoing and Planned Activities/Annual Workshops”. A summary of the workshop contents and achievements will be submitted to a general circulation journal such as EOS.

Lisbon, 2nd November 2009

4. Final Program of the Meeting

Monday 28 (morning)

8.30 – 8.50	R. Trigo and P.Lionello: Welcome and introduction to the workshop
8:50 - 9:30	Isabel Ambar: One century of research on MW in the Atlantic (Solicited)
9:30 – 9:50	Emma Heslop: Heat Content Budgets and the Mediterranean Basin
9:50 – 10:10	Katrin Schroeder: Transfer of internal changes from the Mediterranean Sea to the Outflow at Gibraltar
10:10 – 10:30	Sanchez-Roman: Five year-long time series of the Mediterranean Outflow at the Western exit of the Strait of Gibraltar
10:30 – 11:10	Posters & Coffee Break
11:10 – 11:30	Gianmaria Sannino: Hydraulic criticality of the exchange flow through the Strait of Gibraltar
11:30 – 11:50	Sanchez Leal: Pathways of the Mediterranean outflow in the Western Gulf of Cadiz
11:50 – 12:30	James Price: A comparison of major Atlantic overflows (Solicited)

Conveners: Mikis Tsimplis and Alvaro Peliz

Monday 28 (afternoon)

14:20 - 15:00	Mikis Tsimplis: Sea Level change patterns in the Mediterranean and Atlantic (Solicited)
15:00 – 15:20	Uwe Ulbrich: The Influence of Large-scale Teleconnection Patterns on Cyclone and Wind
15:20 – 15:40	Elke Hertig: Links of extreme events in the Mediterranean area to large-scale atmospheric predictors
15:40 – 16:40	Posters & Coffee Break (Posters attendance A)
16:40 – 17:00	Simon Josey: The Influence of Large Scale Atmospheric Modes on Air-Sea Interaction in the Mediterranean Sea
17:00 – 17:20	David Gallego: A westerly circulation index based on marine data between 1650 to 2008: Implications for the atmospheric variability in the Mediterranean
17:20 – 18:00	Laurent Li: The influence of the Mediterranean sea in the NH large-scale atmospheric circulation (Solicited)

Conveners: Piero Lionello and Ricardo Trigo

Tuesday 29 (morning)

08:40 - 9:20	Alan Haywood: Regional climate of Europe and the Mediterranean during Earth's last great period of sustained global warmth (Solicited)
9:20 – 9:40	Nabil Khélifi: Potential links between changes in Mediterranean outflow water and north Atlantic deep water formation, 3.6 – 2.6 ma ago
9:40 – 10:00	Pinhas Alpert: The atmospheric moisture budget over the eastern Mediterranean based on a high resolution global model – past and Future
10:00 – 10:20	Bjoern Machalett: Long Term Seasonality Changes and Short Term Climate Variability Recorded in Highly Resolved Dust/Loess Sequences in SE Europe and the Black Sea Region
10:20 – 10:40	David Brayshaw: Changes in the Atmospheric circulation over the Mediterranean region during the last 12,000 years
10:40 – 11:20	Posters & Coffee Break
11:20 – 11:40	Antje Voelker See-Saw Patterns between North Atlantic deep water circulation and Mediterranean outflow strength and depth (Solicited)
11:40 – 12:00	Roland Stumpf: Late Quaternary Variability of Mediterranean Outflow Water (MOW) based on Neodymium and Lead Isotopes
12:00-12:20	Uwe Mikolajewicz: Modelling the effect of large-scale climate changes on the ventilation of the deep water in the eastern Mediterranean in the early Holocene

Conveners: Antje Voelker and Fatima Abrantes

Tuesday 29 (afternoon)

14:20 - 15:00	Xavier Carton: Coherent Structures in the Mediterranean Water outflow (Solicited)
15:00 – 15:20	Igor Bashmachnikov: Tracking surface signatures of Mediterranean Waters eddies
15:20 – 15:40	Manuel Ruíz: Are northern Meddies ubiquitous?
15:40 – 16:00	Alvaro Peliz: Modeling inflow/outflow coupling and Meddies.
16:00 – 17:00	Posters & Coffee Break (Posters attendance O and P)
17:00 – 17:20	Alexandra Bozec: Impact of an Interannual atmospheric forcing on the Mediterranean outflow Water variability
17:20 – 18:00	Alicia Lavin: Variability of Mediterranean Water circulation and hydrography around North-west Iberia for the last two decades (Solicited)

Conveners: Gianmaria Sannino and Alexander Theocharis

18:30 – Drinks and regional delicacies tasting at the Fortress

Wednesday 30 (morning)

08:40 - 9:20	Vincenzo Artale: A regional System for Climate change assessment in the Mediterranean Region (Solicited)
9:20 – 9:40	Raquel Nieto: Contribution of the Mediterranean Sea in the atmospheric moisture of adjacent and remote regions from a Lagrangian approach
9:40 – 10:00	Isabel Trigo: Impact of Euro-Atlantic weather systems on the Mediterranean
10:00 – 10:20	Marcelo Fragoso: Daily abundant rainfall patterns in Southern Portugal and large-scale atmospheric circulation
11:00 – 11:20	Posters & Coffee Break
11:20 – 11:40	Andreas Paxian: Validation and post-processing of Mediterranean climate change results from an ensemble of regional climate model simulations
11:40 – 12:00	David Barriopedro: The impact of Atlantic and European blocking episodes in the Mediterranean basin during the last millennium
12:00– 12:40	Ana Iglesias: On the economic impacts of climate change: Towards adaptation of agriculture to climate change in the Mediterranean (Solicited)

Conveners: Laurent Li and Uwe Ulbrich

POSTERS

Aziz Abouabdillah	Statistical downscaling of future climate change scenarios on a Mediterranean catchment (Merguellil, Tunisia)	A1
Javier Acero	Trends in extreme rainfall over the Iberian Peninsula by peak over threshold extreme value analysis	A2
Avi Luvchik	Evaluation of sea-salt aerosol forecasts over the Mediterranean Sea	A3
Tamara Salameh	Regional modeling of present and future wind and evaluation of uncertainties	A4
Gernot Vogt	Future Climate change in the Mediterranean region in a multi-model ensemble of global climate simulations	A5
Ons Oueslati	Trend detection in river runoff across Mediterranean river basins: evaluation of results from Moroccan case studies	A6
Fabio Raicich	Teleconnections between Mediterranean atmospheric and marine parameters and global climate indicators	A7
Margarida Liberato	Cyclogenesis events over the Mediterranean basin in the era-interim reanalysis	A8
Sven Ulbrich	The role of moisture advection from the north Atlantic basin to extreme precipitation events over the western Mediterranean	A9
Pedro Sousa	Impact of large-scale circulation patterns in the variability of Mediterranean drought events	A10
Domingo Alvarez	Circulation patterns and storms along the coast of the Iberian Peninsula	A11
Alexandre Ramos	Are the relationship between atmospheric teleconnection patterns and local circulation regimes in NW Iberian Peninsula Stationary?	A12
Themis Chronis	Global lightning activity from the ENSO perspective	A13
Jacopo Primicerio	Seasonal forecasting Precipitation in the Mediterranean using atmospheric and oceanic teleconnections	A14
Paulo Oliveira	The role of the Azores Current system on MW spreading	O1
Angela Nascimento	Observations on the Mediterranean water pathways in the gulf of Cadiz shelf and upper slope	O2
Luisa Lamas	Evidence of cyclonic recirculation induced by Mediterranean outflow off SW Iberia	O3
Dmitri Boutov	Temperature and salinity increase of Mediterranean Water in the NE Atlantic: an isopycnal analysis using Argo data	O4
Jesus Dubert	Interaction between the Mediterranean undercurrent and the surface circulation off western Iberia	O5
Ana Pires	Changes in the Mediterranean Undercurrent in a future climate scenario	O6
Dionysios Raitzos	Phytoplankton variability in relation to environmental conditions at Rhodes Gyre, Eastern Mediterranean	O7
Teresa Moita	Can the history of harmful algal blooms reveal exchange processes between the Atlantic basin and the Mediterranean Sea?	O8
Mike Rogerson	Towards quantitative reconstruction of the Gibraltar Strait exchange system	P1
Genna Patton	Mg/Ca Paleothermometry in the Central Gulf of Cadiz and the Iberian Margin during Heinrich events	P2
Teresa Rodrigues	The Last Glacial-interglacial Transition (LGIT) in the Western Mid-latitudes of the North Atlantic: Abrupt Sea Surface Temperature change and Sea Level Implications	P3
Marie-Alexandrine Sicre	The PALEOMEX Project	P4
Javier Hernandez	Environmental Significance of the Mediterranean Outflow Water and its Global Implications ("Gucadrill"- IODP Full Proposal-644	P5
Javier Hernandez	Contouriber: Contourite Depositional Systems generated by the Mediterranean Water Masses around Iberia: Evolution and Global Implications	P6
Emilia Salgueiro	The Mediterranean water record along the southwestern Portuguese margin during the Late Holocene: Multi-proxy study	P7

Authors attendance schedule: **A 28 Sept. 15:40;** **O/P 29 Sept. 16:00**

5. List of participants

	Name	Institution
1	Alexander Theocharis	HCMR, Greece
2	Fatima Abrantes	UGM-LNEG, Portugal
3	Laurent Li	IPSL, France
4	Mikis Simplis	NOC, UK
5	Pinhas Alpert	Tel-Aviv University, Israel
6	Piero Lionello	University of Lecce, Italy
7	Ricardo Trigo	FCUL-IDL, Portugal
8	Uwe Ulbrich	Freie Univ. Berlin, Germany
9	Alan Haywood	University of Leeds, UK
10	Alexandra Bozec	COAPS/ FSU, USA
11	Alicia Lavin	IEO-Santander, Spain
12	Alvaro Peliz	FCUL-IO, Portugal
13	Ana Iglesias	UPM, Madrid, Spain
14	Ana Machado	CIMAR, Portugal
15	Andreas Paxian	Univ. Würzburg, Germany
16	Anita Drumond	University of Vigo, Spain
17	Antje Voelker	UGM-LNEG, Portugal
18	Antonio Román	University of Malaga, Spain
19	Avi Luvchik	Tel-Aviv University, Israel
20	Aziz Abouabdillah	IRSA-CNR, Italy
21	Bjoern Machalett	Humboldt University, Germany
22	Célia Gouveia	FCUL-IDL, Portugal
23	David Brayshaw	University of Reading, UK
24	David Barriopedro	FCUL-IDL, Portugal
25	David Gallego	Univ. Pablo Olavide, Seville, Spain
26	Dionysios Raitsos	HCMR, Greece
27	Dmitri Boutov	FCUL-IO, Portugal
28	Domingo Alvarez	Univ. of Cantabria, Spain
29	Elke Hertig	Univ. Augsburg, Germany
30	Emília Salgueiro	CIMAR, Portugal
31	Emma Heslop	Univ. of Southampton, UK
32	Fabio Raicich	CNR, Italy
33	Genna Patton	University of Chicago, USA
34	Gianmaria Sannino	ENEA, Italy
35	Igor Bashmachnikov	FCUL-IO, Portugal
36	Isabel Ambar	FCUL-IO, Portugal
37	Isabel Nascimento	IPIMAR, Portugal
38	James Price	Woods Hole Oce. Inst, USA
39	Javier Acero	Univ. of Extremadura, Badajoz, Spain
40	Javier Hernandez	University of Vigo, Spain
41	Jesus Dubert	CESAM, Portugal
42	Katrin Schroeder	CNR
43	Luisa Lamas	FCUL-IO, Portugal
44	Manolo Ruiz-Villarreal	IEO-Coruña, Spain

45	Marcelo Fragoso	CEG, Lisbon, Portugal
46	Margarida Liberato	UTAD-IDL, Portugal
47	Maria Manuel Angélico	INRB/IPIMAR, Portugal
48	Marie-Alexandrine Sicre	LSCE/CNRS, France
49	Nabil Khélifi	University of Kiel, Germany
50	Ons Oueslati	IRSA-CNR, Italy
51	Paulo Oliveira	IPIMAR, Portugal
52	Pedro Sousa	FCUL-IDL, Portugal
53	Ricardo Sanchez Leal	IEO-Cadiz, Spain
54	Simon Josey	NOC, Southampton, UK
55	Sofia Leal	ISA, Lisbon, Portugal
56	Stumpf Roland	IFM-GEOMAR
57	Tamara Salameh	LSCE/CNRS, France
58	Teresa Rodrigues	UGM-LNEG, Portugal
59	Teresa Moita	IPIMAR, Portugal
60	Uwe Mikolajewicz	Max-Planck Inst., Germany
61	Vincenzo Artale	ENEA, Italy
62	Vogt Gernot	Univ. Würzburg, Germany
63	Xavier Carton	Univ. Bret. Occid, France
64	Jacopo Primicerio	CNR Firenze, Italy