ECORD/ICDP

Magellan Plus Workshop Series Program

Workshop

Deep-sea Record of Mediterranean Messinian events (DREAM)

Brisighella (Ravenna) Italy
5-8 May 2013

REPORT to ESSAC

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October 14th 2013

Co-sponsors of the Workshop:

OUTLINE

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1. SUMMARY

The Workshop was attended by 37 scientists and 13 students/young post docs. The program was fulfilled in a friendly atmosphere, informal though dominated by intense constructive discussion. The field trip was held in rainy weather, which did not prevent the detailed observation of the outcrop. After a first day characterized by invited speeches on key scientific aspects of the Messinian Salinity Crisis (MSC), the second day was dedicated to the review of the existing knowledge, primarily from seismic data sets at a regional level in the light of the identification of realistic drilling targets. The last day of the Workshop was devoted to the planning of future actions.

The outcome of the Workshop is the willingness to proceed with the submission to IODP of a **Multi-phase Drilling Project** including several drilling proposals addressing specific drilling objectives, all linked to the driving objectives of the MSC drilling. A series of critical drilling targets were identified to address the still open questions related to the MSC event. Several proposal ideas also emerged to support the Multi-phase drilling project concept: Salt tectonics and fluids, Deep stratigraphic and crustal drilling in the Gulf of Lion (deriving from the GOLD drilling project), Deep stratigraphic and crustal drilling in the Ionian Sea, Deep Biosphere, Sapropels, and the Red Sea. The “umbrella proposal” for the Multi-phase Drilling Project and a preliminary drilling proposal could be ready for submission by April 1st 2014.

In order to focus future actions to specific objectives it was decided to establish thematic working groups initially formed by DREAM Workshop participants and to be expanded later by including additional experts according to the DREAM MSC initiative and the 6 potential complementary drilling proposals.

A list of future actions was approved, including the proposition of a second Magellan+ Workshop focussing strictly to the pre-proposal writing, and a COST Action for long-term scientific networking.

2. MOTIVATION AND OBJECTIVES OF THE WORKSHOP

About 6 million years ago the Mediterranean Sea was transformed into a giant saline basin, one of the largest in the Earth's history and surely the youngest. This event, commonly referred to as the Messinian Salinity Crisis (MSC), **changed the chemistry of the global ocean and had a permanent impact on both the terrestrial and marine ecosystems of a huge area surrounding the Mediterranean area.**

The first fascinating and successful **MSC scenario proposed following DSDP Leg XIII in 1970** envisaged an almost desiccated deep Mediterranean basin with a dramatic sea level drop of ≈1,500 m, the incision of deep canyons by rivers extending on dried-up continental margins, and a final catastrophic flooding event when the connections between the Mediterranean Sea and the Atlantic were re-established in the early Pliocene, 5.33 Ma. The analysis of the onshore sedimentary record, the seismic record in the deep Mediterranean Basin, the scattered samples from DSDP and ODP cores, and a substantial effort of climate, chemical and geophysical modelling during the 42 years that have passed since the formulation of the first scenario, have not been able provide a unified conclusive interpretation of the Messinian event. More than 1800 scientific publications have been produced, about 900 of which only in the last 10 years, but **the Messinian event remains one of the longest-living controversies in Earth Science.**

The purpose of this workshop was to gather three generations of scientists (those who participated in the discovery, those who are presently actively involved in research, and the next generation) in order to **identify locations for multiple-site drilling (including riser-drilling) in the Mediterranean Sea** that would contribute to solve the several open questions still existing about the causes, processes, timing and consequence at local and planetary scale of an outstanding case of natural environmental change in the recent Earth history: the Messinian Salinity Crisis.

The product of the workshop is the **identification of the structure of an experimental design of site characterization, riser-less and riser drilling, sampling, measurements, and down-hole analyses** that will be the core for at least one compelling and feasible multiple phase drilling proposal. Particular focus has been given to reviewing **seismic site survey data available from different research groups at pan-Mediterranean basin scale, and to the assessment of additional site survey activity including 3D seismics**.

3. PARTICIPANTS

Participation in the workshop has been designed in order to ensure balanced representativeness of the key disciplines with a special attention to seismics. It was decided to reserve 20% of the participants to PhD and young post docs.

Invitations to participants were sent out at the time of the writing of the proposal (early summer 2012) in order to include a preliminary list of participants in the proposal. Most of the invited participants confirmed their attendance promptly, while some had to be replaced due to intervening conflicts with the date of the workshop.

Several invitations were sent to representatives of oil & gas industry (ENI, Shell, Total, Statoil, ENEL, NobleGas, Petrobras). Several expressions of interest were received, but nobody from the Industry attended the workshop. The issue was addressed extensively during the workshop and a specific subgroup was created with the task of ensuring the proper communication with oil & gas private enterprises (see below).

Participants (bold characters: DREAM Workshop proponents)

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Interested parties from industry/Administrations

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Figure 1. DREAM Participants: 1 Dirk Simon, 2 Alastair Fraser, 3 Marina Rabineau, 4 Gert DeLange, 5 Stefano Lugli, 6 Axel Ehrhardt, 7 Luc Lourens, 8 Marco Taviani, 9 Patrick Grunert, 10 Daniel Garcia-Castellanos, 11 Estelle Leroux, 12 Junichiro Kuroda, 13 Andrea Argnani, 14 Vinicio Manzi, 15 Francisco Javier Sierro, 16 Jean Pierre Suc, 17 Judith McKenzie, 18 Dave Hoddell, 19 Wout Krijgsman, 20 Christian Gorini, 21 Werner Hieke, 22 Bill Ryan, 23 Maria Bianca Cita, 24 Giovanni Aloisi, 25 Abdulaziz Al-Balushi, 26 Fabiano Gamberi, 27 Ken Hsu, 28 Marco Roveri, 29 Terry McGenity, 30 Giuliana Panieri, 31 Riccardo Geletti, 32 Simone Ziegenbalg, 33 Marlies van der Schee, 34 Anna Del Ben, 35 Christian Hübscher, 37 Johanna Lofi, 38 Marcello Natalicchio, 39 Nobu Eguchi, 40 Roger Urgeles, 41 Rachel Flecker, 42 Hayley Allen, 43 Chiara Sauli, 44 Angelo Camerlenghi, 45 Romain Pellen, 46 Diana Ochoa Lozano, 47 Oliver Driussi, 48 Alejandra Lago Cameselle, 49 Arianna Mocnik, 50 Stefano Marabini.

4. PROGRAM

SUNDAY MAY 5

Early afternoon

Arrival of Participants from Bologna Airport. Shuttle buses transfer of participants from the Bologna Airport/Train Station to Brisighella.

Afternoon

17:00. Field trip to the Geological Park Museum of the ex-gypsum quarry of Monticino, led by G.B. Vai.

Evening

20:00 Dinner

21:00 Dinner Conference: Historical perspectives of Messinian research (*W.B. Ryan*).

MONDAY MAY 6

08:30

- Welcome, logistics, and introduction to the workshop (*Host and A. Camerlenghi*)
- Remembering G. Clauzon (*J.P. Suc*)
- Open questions in Messinian research (*W. Krijgsman*)
- Mediterranean-scale overview of what is really known about long-term Messinian climate change (*R. Flecker*).
- Building from the experience of the GOLD drilling proposal (*M. Rabineau*)
- D/V Chikyu capabilities (*N. Eguchi*)
- Industry experience in deep sub-salt drilling (*A. Fraser*)

Discussion

12:30 Lunch

14:30

- The Red Sea as additional drilling target (*E. Bonatti*)
- Overview of the seismic expression of the Messinian markers (*J. Lofi*)
- Review of DSDP-ODP findings (*V. Manzi, S. Lugli*)
- Brief summary of the Chikyu+10 Workshop, Tokyo 21-23 April 2013 (*J. Kuroda*)
- Scientific drilling of Messinian events in the Levant Basin (*N. Waldman*).
- A chronologic framework for DREAM (*F.J. Sierro*)
- Report of the ILP panel meeting (*A. Moscariello*)
- Discussion

19:00 end of session

20:00 Dinner

21:00 Dinner Conference: Future ECORD (*L. Lourens*)

TUESDAY MAY 7

08:30

- Microbialites: Reservoir rock below the salt in Santos Basin. It is a microbialite. (Cretaceous). (*J. McKenzie*)
- Microbiology of the deep subsurface (*T. McGenity*)
- Global Look at Salt Giants: Tectonics, Fluids and Deep Biosphere (*C. Huebscher*)
- Correlation between evaporates of the deep Levant Basin and evaporates of the continental margin: is it possible? (*V. Manzi speaks for Z. Gvirtzman*)
- GeoNORM Geophysical Survey Cruise MSM14-2 (*A. Ehrhardt*)

Discussion

12:30 Lunch
14:30

- Review of geophysical structure of the Ionian Basin (*W. Hieke*)
- Review of high resolution seismic profiles in the Tyrrhenian Sea (*F. Gamberi*)
- West Sardinia Margin (*A. Del Ben, R. Geletti*)
- Salt deformation and pre-salt fluids in the Algero-Balearic basin (*A. Camerlenghi*)

Discussion

- The Messinian Ebro River continental margin (*R. Urgeles*)
- Messinian clastic deposits in the Valencia margin (*A. Lago Cameselle*)
- The MSC markers in the Valencia Basin (*R. Pellen*)
- The MSC perched deposits in the Balearic promontory (*O. Driussi*)

Discussion

19:00 end of session (performance of local traditional music)

20:00 Dinner
21:00 Dinner Conference: Cultural heritage and Messinian evaporites in the Apennines (*G.B. Vai*)

WEDNESDAY MAY 8
08:30

- Seismic data analysis in the Levant Basin (*A. Al-Balushi*)
- Seismic data analysis in the Levant Basin (*H. Allen*)
- West to East transects across the Mediterranean (*C. Gorini*)
- Messinian clastic wedges in the Western Mediterranean (*J. Lofi*)
- Gulf of Sirte (*A. Fraser*)

Discussion

- What drilling proposal to write: Group forming, outline drafting.
- Site survey needs. Possibility to perform joint site surveys.
- Report Writing for ECORD
- Future actions

12:00 End of Meeting
12:30 Lunch
14:00 **Departure.** Transfer of participants from Brisighella to Bologna Airport/Train Station with Shuttle buses.

5. DRILLING STRATEGY AND LOCATIONS FOR MULTIPLE-SITE DRILLING

The scientific objectives of the DREAM initiative with regards to the Messinian Salinity Crisis (MSC) are summarized with the answers to the following major open questions:

- MSC chronology and shallow to deep-water correlations
- Timing and modalities of evaporite deposition in the deep Mediterranean deep
- Distribution and characterization of evaporite facies and associated siliciclastics: implications for the MSC paleoceanography
- Water depth at the beginning and end of halite deposition and definition of the main sea level relative variation during the different stages of the MSC
- Evolution of eastern versus western Mediterranean Basins: synchronous or diachronous?
- Location, timing and geometry of the Atlantic gateways.
- Connections between the Paratethys (Black Sea) and the Mediterranean
- Evaporite facies
- MSC modelling (climate, tectonic, hydrological)

Following the intense and constructive discussion that accompanied the works, the participants agreed that given the complexities of the distribution of the Messinian seismic markers in the Mediterranean, and because of the differences in the paleoceanographic conditions in the Mediterranean between the Western and Eastern basins, the drilling strategy must include **multiple sites covering representative locations of both Western and Eastern Mediterranean basins**.

An exercise was carried out on Wednesday morning in order to locate Type-sites locations that were considered pivotal to drill in order to achieve the MSC drilling objective (Figure 2).

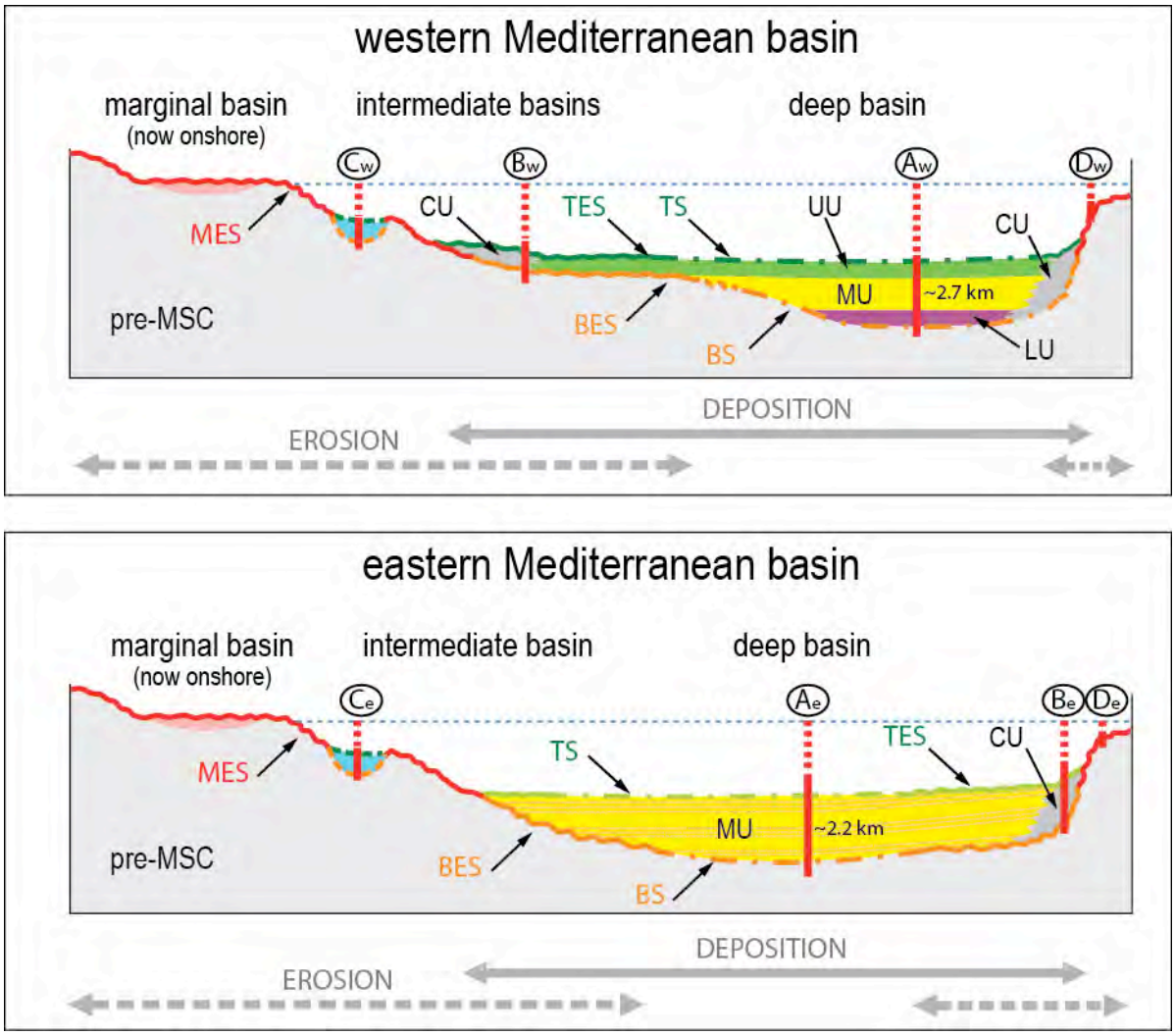

Figure 2. Type-sections across the western and eastern Mediterranean basins showing the distribution of Messinian seismic markers according to Lofi et al. (2011). Drilling targets are identified uniquely with capital letters A to D; e: eastern basin site; w: western basin site) on each type-section. Notes: Seismic units are UU – Upper Unit, MU – Mobile Unit, LU – Lower Unit, CU – Complex Unit (clastics); Key surfaces are MES – Margin Erosional Surface, BES – Basal Erosional Surface, BS – Basal Surface (non-erosional), TES – Top Erosional Surface, TS – Top Surface (non-erosional).

Drilling Sites

Deep basin Sites (Ae, Aw). These drilling sites will be located in deep water (2500 m or deeper) and aim at the recovery of the entire undeformed Messinian sequence in the deep basins, *i.e.* including both the Tortonian-Messinian and the Messinian-Zanclean boundaries, to compare the Eastern and Western deep depocentres in term of timing and modalities of evaporite deposition and to frame the deep events in the MSC stratigraphic framework.. It is understood that continuous core recovery in the salt body will be practically impossible to achieve due to salt mobility, especially if under stress. Strategies for ensuring core recovery in Messinian lithologies were discussed. The Pio-Quaternary sequence overlying the Messinian sequence will not be a target except for the lowermost Pliocene.

Mediterranean margin Sites (Be, Bw, Ce, Cw).. These drilling sites will be located in water depth shallower than 2500 m and will be aimed at the recovery of the Messinian clastic wedges contemporaneous with or preceding the evaporite deposition in the deep basins. Another target will be the MSC salt bodies identified in topographic lows at intermediate depths between the land and the deep basins.

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Erosional surface Site (De, Dw). This drilling sites will be located in water depth ranging from shallow (less than 1000 m) to deep (lower continental slope) and will be aimed at the Messinian Erosional Surface and the deposits directly overlying the surface in order to test the hypothesis of the subaerial nature of the erosion.

The multiple-site drilling design will need **multiple-platform drilling**. It is foreseen that any IODP Drilling platform (D/V Chikyu, D/V JOIDES Resolution, Mission Specific Platforms and possibly even ICDP drilling rigs) may concur in the implementation of the DREAM drilling strategy.

Riser drilling will be mandatory for deep basin sites (Ae and Aw), in particular to sample the base of the salt , the stratigraphic interval encompassing the onset of the MSC, and to obtain stratigraphic constraints for the seismic dataset. In the eastern basin, sites will be located where the more complete Mobile Unit (salt), including all the 6 sub units, has been identified in seismics.

Riserless drilling can be considered for drilling on Mediterranean margin sites and Erosional surface sites and to recover as continuous a core through the deep basinal evaporite sequences as possible, without penetrating the base of the salt layer, provided the safety conditions are met (especially considering the presence of gas, possibly in the clastic wedge units)

MSP drilling ore continental drilling rigs could become necessary in the case of Erosional surface sites are identified in very shallow water or to drill the MSC series onshore at the present time..

The proponents acknowledge particularly the **hazard to drilling** represented by stress in the salt rock inducing rapid deformation, and possible overpressure in the pre-salt formations. **Logging while drilling** (LWD) and **downhole logging** will be considered of primary importance in order to compensate for the likely limited core recovery in salt. Also, **side-wall coring** will be considered in salt.

Water depth has been discussed as a limiting factor for the Deep basin sites. Tabular (undeformed) salt sequences have been identified in both western and eastern basins in water depths that exceed the present maximum length of the Chikyu riser. However, it is understood that it is in the plans of JAMESTEC to extend the length of the riser in the next years. Because DREAM drilling is aiming at drilling in the middle term (5 years?), ideal sites for deep water drilling will be adjusted accordingly. Other parameters such as the thickness of the Plio-Quaternary sedimentary cover, that can impact the drilling operations in term of duration or riser implementation, will be taken into consideration for the choice of site locations.

Links with **oil and gas industry** are considered of primary importance for the success of DREAM. This is because of the knowledge and technological transfer opportunities from drilling and logging companies that have already performed salt and sub salt drilling before both in the Mediterranean region (Levant Basin) and in the Western Atlantic (Offshore Brazil and Gulf of Mexico). Secondarily, limited to the use of the Chikyu, it is understood that industries may retain interests in scientific drilling in the Mediterranean both for the expected intrinsic scientific results and for the opportunity of hiring the drilling vessels for commercial drilling operations. An working group has been established to strengthen the links with industries and to explore the possibility to access 3D industry data in the Levant basin.

A **proposal-writing strategy** has been drafted during the workshop. DREAM should be presented to IODP as a **Multi-phase Drilling Project**, including several drilling proposals addressing specific drilling objectives, all linked to the driving objectives of the MSC drilling (DREAM *sensu strictu*). In addition, during the workshop, several proposal ideas emerged to support the Multi-phase drilling project concept (See side objectives and Working Groups chapters below):

- Salt tectonics and fluids
- Deep stratigraphic and crustal drilling in the Gulf of Lion (deriving from the GOLD drilling project)

- Deep stratigraphic and crustal drilling in the Ionian Sea
- Deep Biosphere
- Sapropels
- Red Sea

The “umbrella proposal” for the Multi-phase Drilling Project and its preliminary drilling proposals could be ready for submission by April 1st 2014.

6. COMPLEMENTARY DRILLING PROPOSALS

The extensive discussion that dominated the works in Brisighella made several new drilling objectives emerge. Such objectives are linked to the DREAM scientific objectives not only because of the geographical location (Mediterranean and adjacent areas) but also because objectives can be met at least in part by adding complementary objectives to DREAM drilling sites. Some of these objectives will be addressed directly by the DREAM set of proposals; some others could be addressed independently by drilling proposals having transversal scientific connexions to DREAM.

1) Salt tectonics and fluids

The objectives derive from a previous initiative, namely the Magellan Workshop *Capturing a salt giant*, Hamburg (Germany), 13-15 October 2006, convened by Christian Hübscher. The workshop was not followed by the submission of a drilling proposal. However, the intense exploration for oil and gas in the area of the Levantine basin, has caused an increasing interest in understanding the modes of deformation of the young Messinian salt in the Mediterranean as a model for understanding early deformation of Mesozoic and older Cenozoic salt deposit. In addition, during the Chikyu+10 Workshop in (Tokyo April 21-23 2013) the White Paper Unlocking the Secrets of Subsalt Sedimentary Environments proposed by Hugh Daigle (Department of Petroleum and Geosystems Engineering, University of Texas at Austin, Austin, Texas, USA) and Brandon Dugan (Department of Earth Science, Rice University, Houston, Texas, USA) provided a strong support to the objectives of such planned proposal

The scientific objectives of the DREAM initiative with regards to Salt tectonics and fluids are summarized with the answers to the following major open questions:

- What is the role of salt tectonics in post-Messinian basin evolution?
- What are the effects of deep sea halite deposition and continental margin erosion on formation fluids?

2) Crust and Sub-salt basin stratigraphy in the Gulf of Lion

This objectives include the original objectives of the GOLD project that was submitted to IODP by Marineau et al as *Miocene desiccation history of the Mediterranean (geodynamic, environmental and deep biospheric consequences): proposal for a Riser Multi-phase Drilling in the Gulf of Lion* (MDP-798) to reveal the lithology of the crust in the Gulf of Lion (thinned and/or intruded continental crust, exhumed mantle or lower crust) and to reconstruct the paleoenvironmental evolution of the Western Mediterranean the subsidence and thermal history of the margin. The crustal target of this proposal implies drilling through the deep basin MSC sequence, which could bring additional information to answer the still open scientific questions addressed by DREAM.

3) Crust and Sub-salt basin stratigraphy in the Ionian Sea

Recent investigations suggest that the Ionian Abyssal Plain of the Eastern Mediterranean might be the oldest in situ ocean fragment of the world, with ocean crust of Late Triassic age. Here, the TOIS (Tethys Ocean In Situ) project proposes to sample a Cretaceous- Jurassic and Upper Triassic section uncontaminated by the Alpine orogeny and subsequent tectonics. The uppermost sedimentary sequence includes a deep basin Messinian sequence. The current water depth of the Ionian Abyssal Plain is ~4000 m, and the sedimentary section is estimated to be ~ 7000 m thick. Such a project idea was launched by E. Erba (University of Milano, Italy) in the White Paper *Challenges in Mesozoic Paleoceanography* presented in the CHikyu+10 Workshop in (Tokyo April 21-23 2013). This project idea was regarded as very interesting during the Workshop in Brisighella. However, it has been recognized that a scientific community ready to support a drilling proposal on this subject still has to be identified.

4) Deep Biosphere

Sub-seafloor sampling at large depths in the Mediterranean and the crossing of a thick salt body, with an influence on the salinity of pore water in the sediments above and below it offer a unique opportunity for microbiologists to address the distribution of microbial life in the thick sedimentary sequences and in extreme environments. In addition, there is no known modern analogue for deep non-stratified hypersaline basin. The scientific objectives related to the deep biosphere (in part derived from those presented in the GOLD Project) could be grouped into a scientific drilling proposal refereeing specifically to the drilling sites proposed to achieve the DREAM objectives.
The scientific objectives of the DREAM initiative with regards to the Deep Biosphere are summarized with the answers to the following major open question:

- What is the potential of preservation of ancient microbial life and the role of microbial life in evaporite deposition?

5) Sapropels

During the discussion on the MSC, it was pointed out by various participants that the DREAM proposal provides an opportunity to drill a limited number of short sites in the Pliocene and Quaternary sequence in order to address further (with respect to ODP legs 160 and 161) the causes and paleoceanographic significance of Sapropels. It must be noted that scientific objectives on Sapropels must be addressed with riser-less drilling and continuous Piston coring, and most likely will be regarded within an Ancillary Drilling Proposal.

6) Red Sea

It has been suggested that a group of scientists investigate the feasibility to identify drill sites location in the Red Sea with the double objective to investigate the salt deposition over a hot oceanic basement, and the tectonic history of the Red Sea Rift. A further objective would be comparing the Red Sea upper Miocene evaporites with the Mediterranean one and investigating their possible relationships Such project idea was proposed by E. Bonatti, with the support of M.B. Cita and M. Taviani and was regarded as very interesting during the Workshop in Brisighella. However, it has been recognized that as scientific community ready to support a drilling proposal on this subject still has to be identified.

7. WORKING GROUPS

In order to focus future actions (see next chapter) to specific objectives it was decided to establish thematic working groups initially formed by DREAM Workshop participants and to be expanded later by including additional experts according to the DREAM MSC initiative and the 6 potential complementary drilling proposals illustrated in the previous chapter:

- MSC
  All DREAM participants, including those who were not able to attend

- Salt tectonics and fluids

Al-Balushi
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Argnani
Camerlenghi
Cartwright
deLange
Del Ben
Driussi
Eguchi
Ehrhardt
Fraser
Geletti
Gorini
Grunert
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Hübscher
Kuroda
Lago Cameselle
Leroux
Lofi
Loncke
Maillard
Manzi
Mocnik
Montadert
Moscariello
Ochoa Lozano
Panieri
Pellen
Polonia
Rabineau
Roveri
Ryan
Urgeles
Waldman

- Deep stratigraphic and crustal drilling in the Gulf of Lyon (deriving from the GOLD drilling project)

Gorini
Hoddell
Krijgsman
Kuroda
Lofi
Lugli
Manzi
Rabineau
Roveri
Ryan
Sierro
Suc

- Deep stratigraphic and crustal drilling in the Ionian Sea

  Working Group to be created at a later stage

- Deep Biosphere

Aloisi
DeLange
Hoddell
Kuroda
Lugli
Manzi
McGenity
McKenzie
Negri
Natalicchio
Panieri
Rabineau
Roveri
Sierro
Suc
Taviani

- Sapropels

deLange
Negri

McKenzie
Cita

- Red Sea

Bonatti
Cita
Taviani Manzi Lugli Roveri

8. SITE SURVEY NEEDS

Before the DREAM Workshop, participants sent to the organizer at OGS the meta data available (either owned or accessible by each participant). The resulting map (Fig. 3) demonstrates the huge amount of seismic data available for the location of Drilling sites. However, the present day water depth limitation for Riser Drilling of the Chikyu (2500 m) limits considerably the usefulness of some of these seismic profiles, as to fully reach their scientific objectives, the deep basin sites (Aw and Ae, Fig.2) must be located where evaporitic sequences are undeformed, which is not very common in the Mediterranean basins, especially at water depths shallower than 2500 m. It is however expected that by the time of the drillings, the Chikyu should allows drillings in water depths exceeding 2500 m.
As a consequence, it has been recognized that:

1) in the Levantine Basin and possibly in the Sirte Basin and Nile Fan, the large coverage of industrial 3D seismic data, plus the 2D data owned by participants should allow the location of drilling sites with no need for further seismic profile acquisition;
2) in the Western Basin (Algero-Provençal and Algerian basins) it is likely that further data acquisition is necessary to identify an undeformed (tabular) deep basin Messinian sequence with appropriate characteristics to achieve the scientific objectives;
3) present-day seismic profiles on continental margins and erosional surfaces both in the Western and Eastern basins is likely to allow the identification of non-riser drilling sites (Bw, Be, Cw and Ce, Fig.2);
4) the participants acknowledge the fact that 3D seismic coverage is not going to be mandatory for locating riser drilling with the Chikyu, as reposted by N. Eguchi. However, riser drilling will require shallow gas surveys to ensure the safety conditions;
5) the participants acknowledged the fact that the infrastructures (seismic vessel, 2D and 3D seismic systems) and the capacities to plan, acquire, good quality large offset seismic profiles and the data processing exist within the group (specifically in the institutions CSIC Barcelona, OGS Trieste, BGR Hannover, University of Hannover), and additional site survey activity can be performed without the commissioning of expensive surveys to seismic exploration companies;
6) a seismic data base already exists for the Western Mediterranean basin (managed by University Pierre and Marie Curie, Paris). A similar data base can be arranged with similar format for the non industrial data of the Eastern Basin by OGS.

Due to the strategic importance of accessing industry data, primarily for the Eastern Basin, it is agreed to establish a DREAM industry liaison task force, composed of the following:

Camerlenghi
deLange
Eguchi
Ehrhardt
Fraser
Gorini
Gvirtzman
Hübscher
Lofi
Moscariello
Rabineau
Urgeles
Waldman

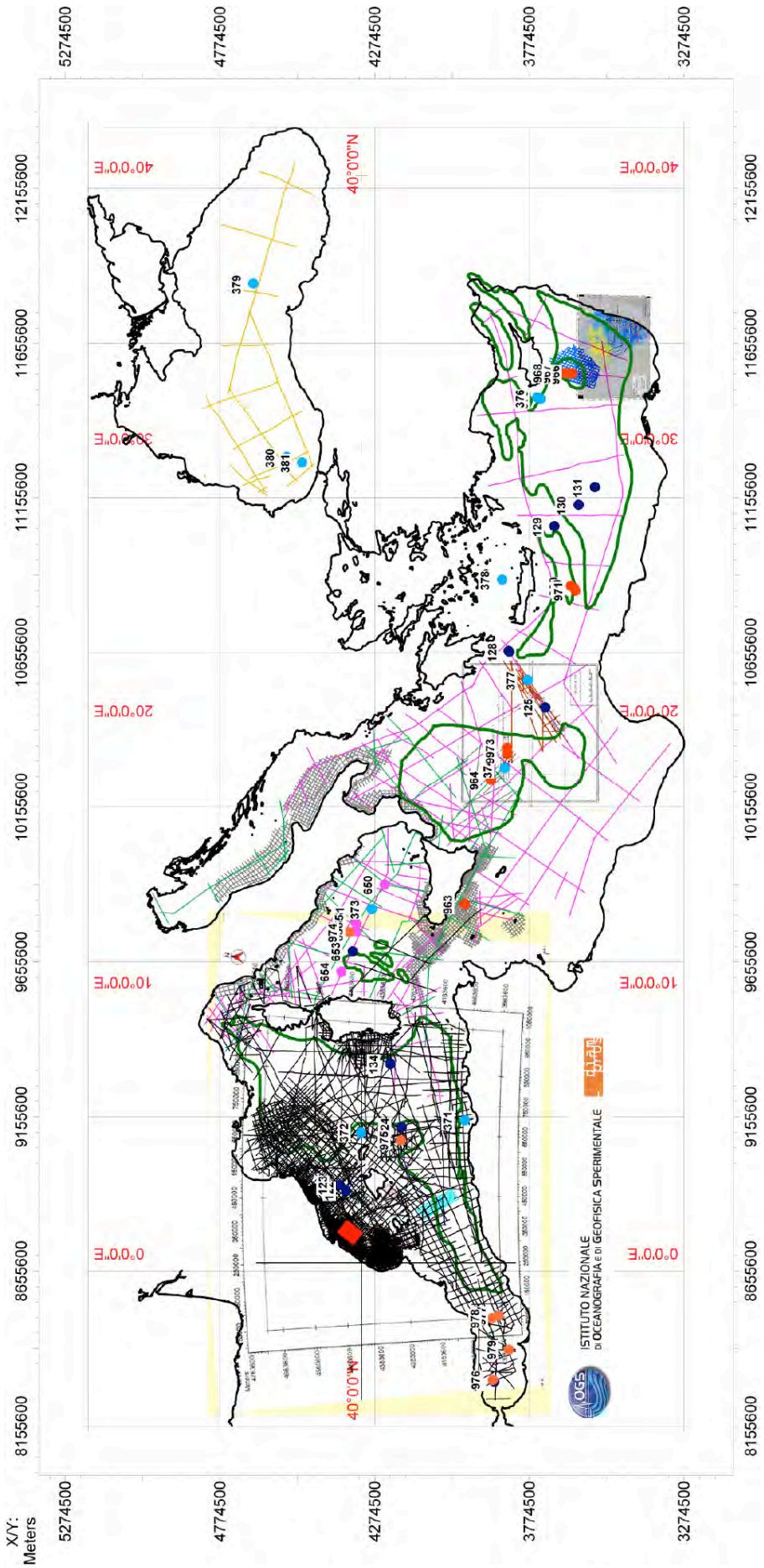

Figure 3. Collection of metadata of seismic profiles owed or accessible by participants to the DREAM Workshop. DSDP/IODP Sites are indicate with coloured dots and numbers. The green continuous line identifies the 2500 m isobaths that limits at present the water depth accessible by the R\V Chikyu in riser mode.

9. FUTURE ACTIONS

The following future actions were agreed during the workshop:

1) Sharing of all workshop presentations via internet (V. Manzi)

2) Report Writing to Magellan+ and ESSAC Newsletter (lead A. Camerlenghi)

3) Present the DREAM initiative at the following international meetings:

- AAPG GTW Beirut, Lebanon. Monday, May 27, 2013. Challenges of New Frontier Off-Shore Deep Water Hydrocarbon Basins: Focus on the Levant Basin and East Mediterranean (M. Rabneau).
- 14th Congress of Regional Committee on Mediterranean Neogene Stratigraphy, Istanbul, Turkey, 8- 12 September, 2013 (several participants will be present).
- 40th Mediterranean Science Commission (CIESM) Congress, Marseille, France, 28 October - 1 November 2013 (G. DeLange, A. Camerlenghi, J. Lofi) (note: session for the press)
- European Geosciences Union General Assembly 2014, Vienna, Austria, 27 April – 02 May 2014. Proposal discussed to convene a special session on MSC.

4) Proposals for DREAM networking

- Writing a new proposal to hold a Magellan+ Workshop in Paris, January 2014 to finalize drilling proposal writing, Deadline July 1st 2013. Lead Giovanni Aloisi.
- Writing a proposal for a EU - COST Action in the field of Earth System Science and Environmental Management (ESSEM). Deadline November 2014. Lead A. Camerlenghi.

5) Fund raising

Fund raising will be a task for the Working Groups. Particularly crucial will be Site Survey data and links with Industry. Other possibilities discussed were to apply for ship time to EUROFLEETS, explore possibility at national levels, and explore opportunities within Horizon 2020.

6) Drilling proposal writing

The earliest possible date for the submission of preliminary proposals is April 1st 2014. The proposal writing will be coordinated among Woking Groups and finalized at the Magellan+ Paris workshop, if funded.

10. REFERENCES

Lofi, J. Déverchère, J. Gaullier, V. Gillet, H. Gorini, C. Guennoc, P. Loncke, L. Maillard, A. Sage F. and Thinon I., 2011. Seismic atlas of the Messinian Salinity Crisis markers in the Mediterranean and Black Seas. 72 pages + CD © Société Géologie de France & CCGM 2011.