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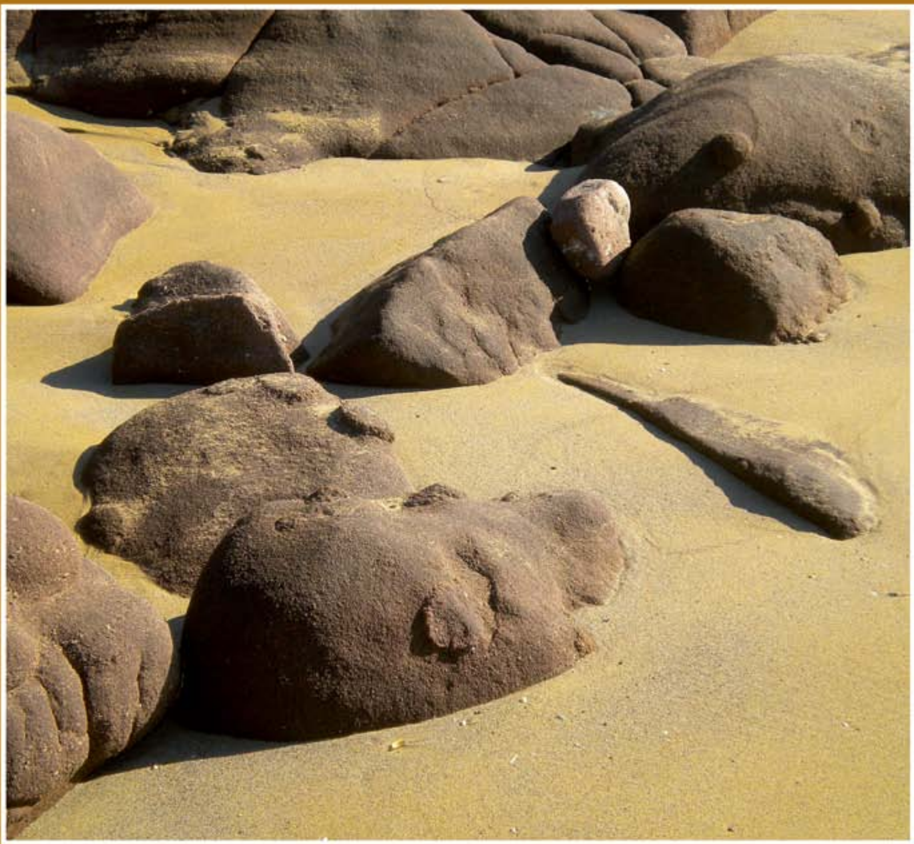

International Association of Sedimentologists

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Link to **IAS National Correspondents:**

https://www.sedimentologists.org/society/correspondents

CONTENTS

EDITORIAL

Since the last issue of the year reports on some activities sponsored/promoted by IAS during the year. In the second part are published the Post Graduate Grant reports received during the 2016. I personally congratulate with the students for the good job they have done. Because of the great number of these reports, the second part of the Newsletter is considered issue 266.

Since Newsletter 256, a new session named “Frames from the World” is launched. Anybody is welcome to contribute to it.

Please note that a new research grant has been launched: the Early Career Scientists Research Grants.

On behalf of the work carried by Early Career Scientists Committee IAS is on Facebook.

Student Grant applications guidelines close the Newsletter.

IAS has restyled the webpage (www.sedimentologists.org): please have a look at it, log in and fill the spaces under your profile, and renew your membership for 2017. Remember that being an IAS member gives you the following benefits:

- access to the online versions of Sedimentology and Basin Research, including all issues ever published;
- access to the printed versions of Sedimentology and Basin Research at very favourable rates;
- access to the IAS Member Directory;
- the Friendship Scheme which gives free membership to people in less-developed countries;
- the electronic Newsletter;
- a network of National Correspondents, which report on the activities in their countries;
- International Sedimentological Congress every four years at reduced fees;
- annual Regional Meeting and meetings sponsored by the IAS at reduced fees;
- special lecturer tours allowing sedimentology groups to invite a well-known teacher to give talks and short courses in their

country;

- travel grants for PhD student members to attend IAS sponsored meetings;
- research grants for PhD student members (maximum 1.000 Euros);
- institutional grants for capacity building in 'Least Developed Countries' (LDC), (maximum 10.000 Euros)
- biannual Summer Schools focused on cutting edge topics for PhD student members.

I would like to remind all IAS members that:

- the IAS Newsletter 264 is published on-line and is available at: http://www.sedimentologists.org/publications/newsletter
- the next IAS Meeting will be held in Toulouse (France) from 10 to 12 October 2017. For details, please click: https://www.sedimentologists.org/ims2017

The Electronic Newsletter (ENIAS), started in November 2011, continues to bring monthly information to members. For information on ENIAS contact ias-office@ugent.be

Check the new Announcements and Calendar. Meetings and events shown in CAPITAL LETTERS and/or with * are fully or partially sponsored by IAS. For all of these meetings, IAS Student Member travel grants are available. Students can apply through the IAS web site. To receive the travel grant, potential candidates must present the abstract of the sedimentological research they will present at the conference. More info @ www.sedimentologists.org

Vincenzo Pascucci
(IAS General Secretary)

IAS FINANCIAL REPORT 2016

Financial Statements - June the 30th, 2016

1. BALANCE SHEET

		As at June 30, 2016		As at June 30, 2015	
ASSETS	Note	EUR	EUR	EUR	EUR
NON-CURRENT ASSETS					
Property, plant and equipment	4		0,00		1.442,29
CURRENT ASSETS					
Inventories	5		21.134,15		29.170,63
Receivables	6				
Prepayments		8.455,46		8.790,21	
Other receivables		62.310,86		9.383,03	
			70.766,32		18.173,24
Cash and cash equivalents	7		3.344.858,84		3.346.746,26
TOTAL ASSETS			3.436.759,31		3.395.532,42

		As at June 30, 2016		As at June 30, 2015	
		EUR	EUR	EUR	EUR
EQUITY					
Reserves		3.241.060,82		3.227.969,31	
Surplus for the year		135.715,00		13.091,51	
			3.376.775,82		3.241.060,82
CURRENT LIABILITIES					
Invoices to be received			0,00		82158,65
Other debts and prepayments received	8		59.983,49		72.312,95
TOTAL EQUITY AND LIABILITIES			3.436.759,31		3.395.532,42

IAS become an INPO

As Decided during the ISC Geneva 2014 the International Association of Sedimentologists has become an International no-profit Association (INPO). On the 14th June 2016 in front of a Belgian Notary, Adrian Immenhauser, Judith McKenzie, Marc De Batist (in person) and Poppe de Boer Poppe and Vincenzo Pascucci (by proxy) have signed the incorporation deed of IAS International Non-Profit Organization. Below are reported some pictures of this important event.

Figure 1. The IAS President Adrian Immenhauser signing;

2. The past IAS President Judith McKenzie signing;

Figure 3. The IAS Treasurer Marc De Batist signing

REPORT

7TH QUATERNARY SYMPOSIUM OF TURKEY (TURQUA-2016)

08-11 MAY 2016, ISTANBUL- TURKEY:

On May 08-11, 2016, Quaternary Symposium of Turkey-TURQUA was held in Istanbul Technical University (ITU), Süleyman Demirel Congress Center. It has been organized by the Eurasia Institute of Earth Sciences of Istanbul Technical University. The organizing committee of the Symposium was composed of ITU members; Attila Çiner and Nüzhet Dalfes (Co-Chairs), M. Akif Sarıkaya (Secretary), Cengiz Yıldırım, Bülent Arıkan, Nazlı Olgun Kıyak, Yasemin Ezber and Orkan Özcan.

The scientific committee of the symposium was selected from several national and international institutions; A.M. Celal Şengör (ITU), Ahmet Evren Erginal (Ardahan U.), Aslıhan Yener (Koç U.), Catherine KuzucuoŞu (CNRS, France), Emin Özsoy (METU), Eric Fouache (Paris-Sorbonne U., Abu Dhabi), Erkan Aydar (Terra R&D, Turkey), Faruk OcakoŞu (Osmangazi U.), Hülya Caner (Şstanbul U.), Şhan Kayan (Ege U.), Joel Guiot (CNRS, France), Meral Avcı (Şstanbul U.), Meryem BeklioŞu (METU), Mustafa KarabıyıkoŞu (Ardahan U.), Naki Akçar (U. of Bern, Switzerland), Namık ÇaŞatay (ITU), Neil Roberts (Plymouth U., UK), Nizamettin Kazancı (Ankara U.), Okan Tüysüz (ITU), Ömer L. Şen (ITU), RaŞt Bilgin (BoŞaziçi U.), Selim Kapur (Çukurova U.), Serdar Bayarı (Hacettepe U.), Suzanne Leroy (Brunel U., UK), Tolga Görüm (Istanbul U.), UŞur DoŞan (Ankara U.), Ünal Akkemik (Şstanbul U.).

The aim of this symposium was to bring Quaternary scientists all around the world to discuss the latest developments in Quaternary sciences, to organize workshops for young researchers and propose invited talks in order to exchange ideas on first hand.

TURQUA meetings were first held at TUBITAK-MAM in 1988 as workshops. Later, ITU hosted TURQUA meetings in 1993, 2001, 2003, 2005 and finally in 2007. Nearly 300 registered participants attended the 7th TURQUA meeting from different parts of Turkey and also from the other countries. Totally, 106 presentations among

Figure 1.- The participants in the conference hall

which 78 oral and 28 posters were presented.

The presented talks and posters were organized into 19 thematic sets:

- Lake
- Tectonic geomorphology
- Coast-marine
- Glacial
- Sedimentology-tectonics
- General Geomorphology
- Karst
- Volcanic Geomorphology
- Fluvial
- Palaeoclimatology-Biogeography
- Hydroclimatology
- Palynology
- Active tectonic
- Speleothems
- Remote sensing
- Archeology
- Palaeoanthropology
- Mammalian fauna
- Anthropocene

In addition, the organization also carried out a Panel on “The session of Turkish Scientists who attended in the first Turkish Antarctic Science Excursion”.

This symposium carried out 4 days and the first day was organized into two ateliers workshops (morning and afternoon). The morning section entitled “The method of cosmogenic dating: Theory, sampling methods, laboratory processes and AMS physics” covered the theory of the Surface Exposure Dating, a methodology now widely used in geomorphological applications. In the afternoon section “The application areas of cosmogenic isotopes in the earth sciences and case studies: Glacial, tectonic and fluvial geomorphology” were presented.

The second day, after the opening talks, as an invited speaker Prof. Dr. Şhan KAYAN gave a presentation on “The contributions of coast geomorphology in earth sciences”.

Figure 2.- Serdar Yeşilyurt and Cansu Demirel (with their awards) together with the organizing committee

After coffee break, the second invited speaker, Dr. Catherine KUZUCUOGLU gave a thematic keynote lecture entitled “The climate records in Turkey after the last glacial period: The compilation of the focus on Holocene and human communities”.

After the invited speakers, the first session started which composed of 4 thematic talks. After the lunch break the symposium started with Poster 1 session which related with fluvial, glacial, general geomorphology and coast-marine. After poster session, oral presentations started in related sessions.

The end of the first day of the symposium gala dinner was given in Bosphorus Boat Tour and all participants had unforgettable time in Istanbul, something unique. During the cruise on the Bosphorus they had the opportunity to admire a splendid panorama of the city; many monuments are fully visible only by boat, like the great palaces of Dolmabahce and Beylerbeyi, the University of Galatasaray and many more ...

The third day of the symposium started with very remarkable oral and poster presentations. The topics of the Poster 2: Lake, Karst, Coast-marine and Tectonic geomorphology. At the end of the day 7 Turkish scientists from different scientific backgrounds shared their views about the first Turkish Antarctica Expedition that was held in April 2016.

The last day started with Tectonic geomorphology 2 and Palaeoclimatology-Biogeography sessions. The topics of the Poster 3: Hydroclimatology, lake, palaeoclimatology, biogeography and sedimentology-tectonism. All presentations were given successfully and participants shared their remarkable results with the audience.

At the end of the symposium, Serdar YeŞlyurt was granted the “Sırrı Erinç best oral presentation award” and Cansu Demirel “Oguz Erol best poster presentation award”. The next symposium date (8th Quaternary Symposium of Turkey -TURQUA2018-) will be held between 14 -17 May 2018.

Figure 3.- The participants of the 7th Quaternary Symposium of Turkey (TURQUA-2016)

Thanks to all people who attended this symposium. It was a great pleasure to have all participants in the 7th Quaternary Symposium of Turkey (TURQUA-2016).

Hope to see you in next meeting.

Dr. Ezher TOKER
IAS National Correspondent of Turkey

CONFERENCE REPORT

6^{th} International Maar Conference - Maar and Environment

CHANGE 28TH JULY AND 7TH AUGUST, 2016, CHANGCHUN, CHINA

Between 30st July and 3rd August, 2016, the 6th International Maar Conference was held in Yifu Teaching Building, Nanling Campus, Jilin University, Nanguan District, Changchun City, China. It has been organized on behalf of the Institute of Geology and Geophysics, Chinese Academy of Sciences. The organizing committee of the conference: Jiaqi Liu (Chair), Fengyue Sun (Co-Chair), Fuyuan Wu (Co-Chair), Karoly Nemeth (Co-Chair), Bo Zhou (Co-Chair), Jule Xiao (Member), Qiang Liu (Member), Wenliang Xu (Member), Yongwei Zhao (Member), Zhengfu Guo (Member), Zhongxia Zhou (Member). The scientific committee of the conference: Jiaqi Liu (Institute of Geology and Geophysics, CAS, China), Jörg Negendank (GFZ, Potsdam, Germany), Gerardo Carrasco Núñez (UNAM Juriquilla, Mexico),

Figure 1.- 6th International maar conference participants

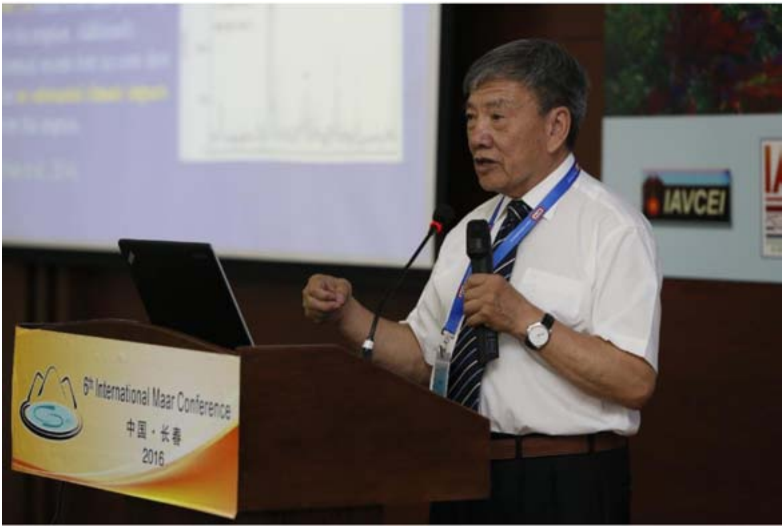

Figure 2.- Prof. Jiaqi Liu give a keynote lecture

Joan Marti (Institut de Ciències de la Terra JaumeAlmera, Spain), Yigang Xu (Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, China), Benjamin van Wyk de Vries (Université Blaise Pascal-Clermont-Ferrand, France), Bernd Zimanowski (University of Wuerzburg, Germany), Bernd Zolitschka (University of Bremen, Germany), Fraser Goff (The University of New Mexico, USA), Greg Valentine (University of Buffalo, USA), Guoqiang Chu (Institute of Geology and Geophysics, CAS, China), Hiroyuki Kitagawa (Institute for Hydrospheric -Atmospheric Sciences, Nagoya University, Japan), Ian Smith (University of Auckland, New Zealand), Jingtai Han (Institute of Geology and Geophysics, CAS, China), Karoly Nemeth (Massey University, Palmerston North), Marie-Noëlle Guilbaud (Ciudad Universitaria, México), Martin Koziol (Maarmuseum, Germany), Michael Ort (Northern Arizona University, USA), Mordechai Stein (the Geological Survey of Israel, Israel), Patrick Rioual (Institute of Geology and Geophysics, CAS, China), Ray Cas (Monash University, Australia), Sergei Rasskazov (Institute of the Earth, Russian Acadimy of Sciences, Russian), Suzanne Leroy (Department of Geography and Earth Sciences, Brunel University, UK), Yigal Erel (Geochemist, Institute of Earth Sciences, the Hebrew University of Jerusalem, Israel), Youn Soo Lee (Geological Research Division, Korea Institute of Geoscience and Mineral Resources, Korea), Young Kwan Sohn (Gyeongsang National University, South Korea), Youxue Zhang (the University of Michigan, Ann Arbor, USA).

The conference was attended by nearly 100 participants from different part of China and also from Australia, Costa Rica, Germany, France, Israel, Italy, Japan, Korea, South Korea, Mexico, New Zealand, Spain, Romania, Russia and the United Kingdom (Fig. 1). The conference has 3 days of themed oral and poster sessions and three field trips. The sessions of the conference focus on Maar and Environment Change, covering a wide spectrum of very interesting topics including 1) Monogenetic volcanoes: growth, geomorphology and degradation; 2) Sedimentary sequence and paleoclimate record of Maar; 3) Experiment and modeling of physical and chemical phenomena of volcanic eruption; 4) Monitoring and prevention of volcanic hazards; 5) Resources of Maars and volcanoes and 6) Maar volcano geopark: A spectacular engine for research and geotourism development. During the conference a strong focus will also be given on researches and advances in Maar and Environment Change. Participants contributed 32 oral and 29 poster presentations.

The conference was introduced by three excellent keynote lectures given by Jiaqi Liu, Bernd Zolitschka and Youn Soo Lee in the first day. Professor Jiaqi Liu gave a review of study on volcanoes and maars in China (Fig. 2). Bernd Zolitschka introduced Maar lake sediments and their potential forenvironmental and climate reconstruction. Youn Soo Lee reviewed the late Cenozoic tectonics of the Northeast Asia.

After the lunch break, Karoly Nemeth gave a keynote presentation titled “Monogenetic volcanoes: a useful term for smallvolcanoes” at the beginning of session 1. The second day of conference startedwith keynote lecture “The Geochemistry of small scale basaltic systems” and “Paleo-environmental and geological controls on Late Pleistocene phreatomagmatism in the lacustrine Zacapu basin (Michoacán, Mexico)” given by Ian Smith and Claus Siebe, respectively. At the end of second day, we had a pleasant gala party at Clear Moon Villa of the South Lake Hotel of Jilin Province. We had an intra-conference field trip in the Longgang volcanic field in the third day. After

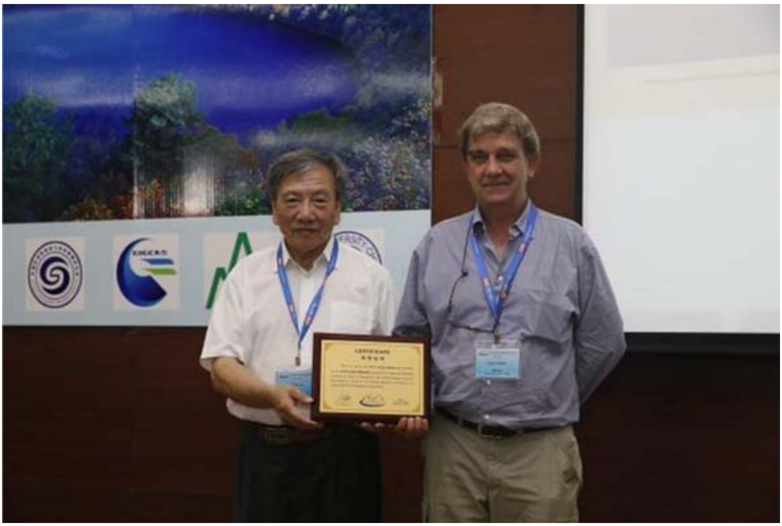

Figure 3.- Prof. Jiaqi Liu award Claus Siebe the Jim Luhr Award

the field trip, the conference continued in the fourth day and started by a presentation titled "Fluxes and genesis of greenhouse gases emissionsfrom typical volcanic-geothermal fields in China" given by Zhengfu Guo. After the conference, Prof. Jiaqi Liu awarded Claus Siebe the Jim Luhr Award for

Figure 4.- Pre-conference field trip participants

Figure 5.- Base surge deposits on the nonfreezing river near Tianchi Town

Figure 6.- Moon lake is a circular crater lake.

his lifetime research contribution to understand monogenetic volcanism (Fig. 3).

The conference has a pre-conference field trip on July 28-30 dedicated to Arxan-Chaihe volcanic field (Fig. 4) guided by Prof. Jingtai Han from the Institute of Geology and Geophysics, CAS. The first stop on July 28 was base surge deposits on the nonfreezing river near Tianchi town. At this stop we saw a well exposed phreatomagmatic/ base-surge pyroclastic deposit. Abundant thin parallel beddings and cross-bedding layers occur in the section, and a dense lava layer topped these sediments. These deposits are commonly supposed to be originated from eruption of the Lake Wusulangzi, a late-Cenozoic volcanic lake or a residue of an ancient maar, but it is still in debate about the location of the maar vent. (Fig. 5)

The second stop was Tumuli/lava hillocks.Among the scoria lava sea/ stony land forest, bunches of tumuli formed another wonderful scene of lava surface, and are easily accessed along a recently constructed tourist track. They are commonly in a round mound shape, a few meters high and 5-10 meters in diameter.

Next stop was “Turtle-back” lava/ pahoehoe land surface near Xing’an Town. “Turtle-back” lava surface structure and pahoehoe features are well-preserved and can be observed near the Xing’an (Hinggan) Town. They commonly appear with a smooth surface and with a diameter of 2 to

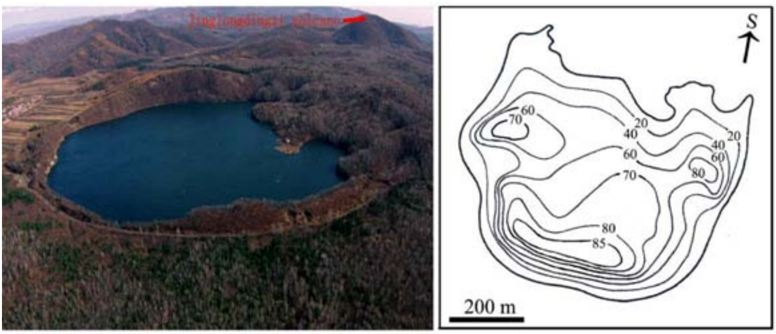

Figure 7.- Photograph showing Lake Dalongwan (left) and its bathymetric map (right)

Figure 8.- The participants visit the pyroclastic phreatomagmatic sequence of Maar Lake Dalongwan

3 meters. Together with pahoehoe feature, these surface textures indicate low viscosity of the lava.

Lake Dujuan, a lava dammed lake along the Halaha River, was the fourth stop. On the western side of the Lake Dujuan, a number of hornitos can be observed. They are commonly 1.5-3m in diameter and about tens of centimeter to 1.5m in height.

The fifth stop in this day was Tuofengling volcano, a maar/crater lake. The Tuofengling volcano is an elongated scoria cone. The maar/crater lake makes it a well-known scenic spot for the region. The base of the cone is made up of cinders and tuffs but on the top is a spatter cone composed of welded agglomerate. Abundant peridotite xenoliths (a few to tenscm in diameter) are exposed in the agglomerate, showing the fast magma ascending. The Tuofengling crater has a basement of 1000 m in diameter and a tephra ring wall with a maximal height of 204m. The tephra ring around the crater is in a horse-shoe shape with steep wall in the north side and an opening northwestward. The crater finally evolved into the lake, about 800m long and 450m wide.

After a short coffee break, we visited the great volcanic canyonŞhelast stop in the first day. The Great (volcanic) Canyon is located on the headstream of the Chaihe River, it is about 11km long and 30-130m deep. At the end of the first day all participants enjoyed the traditional Chinese foods for dinner in Chaihe Town.

The second day of the pre-conference field trip started with visiting the Woniupao volcano and base surge deposit. It is a late-Cenozoic volcanic lake. The pre-Quaternary volcanism made a large crater with a diameter about 2500m. The latest volcanism in the Quaternary was dominated by phreatomagmatic eruptions in the crater lake. The base-surge deposits covered the area west of the volcano. A series of base-surge sections with different characteristics was observed, showing the transition from proximal-facies to distal-facies tuff deposits sections.

The second stop was Lake Moon (Fig. 6). Lake Moon, a small closed crater lake, is 40 km away from Chaihe Town. The volcanic cone was formed in Middle Quaternary. The diameter of the lake is 220m with a maximum

Figure 9.- The participants listen to the introduction of Lake Sihailongwan

water depth of 6.5m. At present, its surroundings are vegetated with dense conifer-deciduous broadleaf mixed forests. With these characteristics, Lake Moon maintained a highly quiescent environment under which a laminated sedimentary sequence developed with little disturbance, thus provides a high resolution record of climate change for the northern margin of the East Asian monsoon regime.

The last stop of the second day's trip was columnar jointed basalt on the valley cliff of the Chaoer River. On a cliff wall of the Chaoer River valley near Chaihe Town, the Cenozoic basalt with well-developed columnar joints is exposed by fluvial erosion. The jagged relief of the exposure sculptured by the fluvial processes incorporated with the distorted columnar structure of the basalt coupling its mixed colors due to differential alterations of ferrous minerals presents a distant artistic vision of mural painting.

The conference also has an intra-conference field trip to Longgang Volcanic Field on August 2, 2016 guided by Prof. Jiaqi Liu and Guoqiang Chu from the Institute of Geology and Geophysics, CAS. The main stops and viewing sites of this field trip were Lake Dalongwan, with a focus on a pyroclastic phreatomagmatic sequence, lava tree moulds and the tephra from the Jinglongdingzi volcano. Maar Lake Dalongwan (42º26ŞN, 126º 31ŞE) is located in the central part of the Longgang Volcanic Field. The dimensions of the lake are 1250 m from east to west and 1000 m from north to south. The maximum water depth is about 88 m (Fig. 7). The lake was formed by alkali basaltic phreatomagmatic eruptions. Phreatomagmatic pyroclastic sequence is well-exposed in this site. Three types of transportation, pyroclastic flow, pyroclastic surge, and pyroclastic fall can be observed in the tephra ring (Fig. 8). Lava moulds of standing trees are found on the surfaces of lava flows. In total, at least 23 tree mould holes

Figure 10.- Post-conference field trip participants

Figure 11.- The pumices of various colors produced by the Tianchi volcano at Tianwen-feng

were found in the area. A black tephra layer is widely distributed to the east of Jinlongdingzi volcano. The thickness of the tephra layer varies from more than two meters at the eastern foot of Jinlongdingzi volcano to just a few millimeters at a distance of 20 km from the volcano.

The next stop was Maar Lake Sihailongwan. Maar Lake Sihailongwan (42°17´N, 126°36´E, altitude: 791 m asl) is located in the central part of the Longgang Volcanic Field. The lake is nearly circular with a surface area of 0.39 km2 and a maximum depth of 50 m (Fig. 9). The tephra ring is 10-119 m above the lake surface and consists of pyroclastics. The lake was formed by alkali basaltic phreatomagmatic eruptions. K-Ar dating of basalt rocks from the top of the ring yielded an age of 1.07 ± 0.03 Ma. Annually laminated sediments are well preserved in the Lake Sihailongwan and provide a high resolution record of past climatic and environmental changes.

The conference has a post-conference field trip to Mt. Changbai Volcano (Fig. 10) on August 4th to 7th, 2016 guided by Prof. Zhengfu Guo from the Institute of Geology and Geophysics, CAS. The main stops and viewing sites of this field trip were Northern slope and Western slope of Mt. Changbai volcano.

Mt. Changbai volcano lies in the uplifted area between the Japan Sea back-arc basin and the Songliao basin in NE China. The volcano covers an area of 12,000 km2 and is characterized by the presence of three main eruptive cones (Tianchi, Wangtian'e, and Namphothe), with the elevation gradually decreasing from crater to surrounding area.

The northern slope of Mt. Changbai includes 1) Holocene volcanic eruptive rock on the Tianwenfeng profile; 2) pantellerite near the meteorological station; 3) Tianchi caldera lake; 4) Tianchi waterfall trachyte; 5) Julong hot spring; 6) Tianchi Grand Valley and 7) Volcano station. The western slope of Mt. Changbai includes 1) trachytic lava flow; 2) Tianchi caldera lake; 3) upper unit of trachyte and tephra and 4) Jinjiang Grand Valley.

Tianwenfeng is the highest peak of Tianchi crater rim. It's also the typical profile for the historically recorded Tianchi eruptions, directly covering the Tianchi trachyte cone. From the top to the bottom, the eruption deposits consist of black pumice (~50 cm in thickness), grey pumice (~200 cm), yellow pumice (~1000 cm) and dark grey pumice (~1000 cm) (Fig. 11).

The eruption deposits of the western slope of Tianchi volcano are much like the northern slope, with trachyte unit outcropping at the bottom overlaid by volcanic ash deposits generated by historically recorded eruptions. The difference of volcanic sequence between the northern slope and the western slope is that typical comenditic lava flows are not found here. When arriving at the western top of Mt. Changbai volcano, all the participants see the Tianchi caldera lake (Fig. 12).

We want to express thanks to all people that help us in the organization and special thanks to all the Sponsors (IAVCEI; IAS; National Natural Science Foundation of China; Chinese Academy of Sciences; Institute of Geology and Geophysics, Chinese Academy of Sciences; State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences; Jilin University). Financial support from the IAS, particularly in the form of student travel grants for 3 IAS student members from the Costa Rica (1), the United Kingdom (1) and China (1) who

Figure 12.- The participants discuss the formation of the Tianchi caldera lake

actively presented their researches as a poster or oral presentation. Thanks the IAS very much!!!

The 7th International Maar Conference has been decided to hold in Olot City, Spain in May of 2018. It is a great pleasure to have all participants in the 6th International Maar Conference and look forward to meet again next conference.

Dr. Jinliang Gao and Jing Wu
Secretary of the 6th International Maar Conference

IAS POST GRADUATE GRANT SCHEME REPORT

2ND SESSION 2014

Stratigraphic architecture of shoal-water deltas developed in high accommodation settings

ELISA AMBROSETTI UNIVERSITY OF SIENA, ITALY (AELISA87@HOTMAIL.IT)

1. Introduction

This study is part of my PhD project at the University of Siena, Italy. The main goal of this work is to investigate the stratigraphic architecture of shoal-water deltas developed in high-accommodation settings. Deltas have been largely investigated in tectonically active and high subsiding basins, in particular in relation to extensional rift basins. In these settings, normal fault systems produce topographies suitable for the development of Gilbert-type deltas and the high availability of accommodation space promotes the formation of thick deltaic successions. On the contrary, shoal-water deltas are less commonly reported in tectonically active settings and, where present, they typically evolve rapidly into stepped-inclined Gilbert- type deltas (c.f. García-García et al., 2006; Ambrosetti et al., 2013; Gobo et al., 2014) or are deposited during stages characterized by low-accommodation conditions (c.f. García-García et al., 2006; Ghinassi, 2007). The lacustrine Valimi Formation (Gulf of Corinth, Greece) provides an opportunity to investigate the facies assemblage and architectural style of shoal-water deltaic systems developed in high-accommodation settings.

2. Methods

The study stems from conventional geological field methods, including mapping, bed- by-bed sedimentological logging and architecture line-drawings of some selected outcrops, excellently exposed in natural cliffs. Other unwalkable outcrops have been investigated at distance through line drawings in photomosaics and rock packages have been measured thanks to calibration with the freeware software “ImageJ”.

The sedimentological analysis is based on the facies association concept. Facies associations consist of assemblages of spatially and genetically related facies that are the expression of different sedimentary environments (Walker & James, 1992). The descriptive sedimentological terminology

used is from Harms et al. (1975, 1982) and Collinson et al. (2006). The

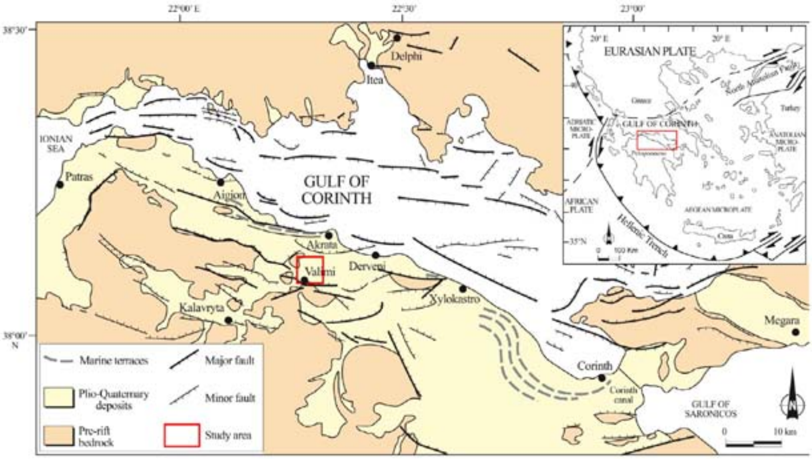

Figure 1: Schematic map of the Gulf of Corinth and location of the investigated area. The inset map shows the geographic location of the Gulf of Corinth in the Aegean region. (From Ambrosetti et al. 2016)

regional stratigraphic nomenclature is according to Rohais et al. (2007a,b).

3. Results

The Valimi Formation consists in a fluvio- lacustrine syn-rift succession accumulated in the Pliocene/ Pleistocene, during the early Gulf of Corinth opening (Fig.1).

Six facies associations, each described in terms of depositional processes and geometries, have been identified and interpreted to represent a range of proximal to distal deltaic sub-environments: delta plain, distributary channel, mouth-bar; delta front; prodelta and open lake. The facies associations and their architectural elements reveal characteristics which are not common in traditionally described shoal- water deltas that can be attributable to the effects of high-accommodation during the Valimi Fm. deposition. In particular, two of these peculiar characteristics such as i) the single-storey fluvial channels embedded within abundant delta plain fines and ii) the multi-storey distributary channels aggrading within mouth-bar, allowed to propose a new model for shoal-water deltas developed in high-accommodation settings (Fig. 2).

4. Conclusion

In conclusion, the new depositional model (Fig.2) proposed in this study for shoal-water deltas developed in high-accommodation settings document, for the first time, that shoal- water delta deposits can form a substantial part of stratigraphic successions that accumulate in these settings. The proposed depositional model provides new criteria for the recognition and interpretation of these deposits; the results of this study have applied significance for reservoir characterization.

5. Budget justification

The 1000 euros allocated to this project has supported one month of field work in

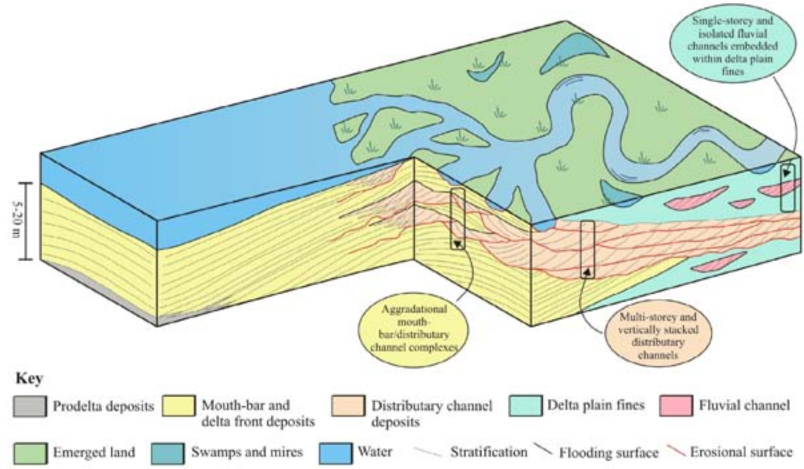

Figure 2: Facies model proposed for shoal-water deltas developed in high-accommodation settings (not to scale) (From Ambrosetti et al. 2016).

the Gulf of Corinth. The data collected during the IAS supported field work and synthetized in this report have been presented in the paper:

Ambrosetti, E., Martini, I. and Sandrelli, F. (2016) Shoal-water deltas in highaccommodation settings: insights from the lacustrine Valimi Formation (Gulf of Corinth, Greece). Sedimentology, DOI: 10.1111/ sed.12309.

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Mineral dust from African source to Caribbean sink

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Introduction

Every year, 182 million tons of mineral dust are transported from the Sahara westward over the Atlantic Ocean, of which bout 140 million tons is deposited between 15 and 75˚W (Yu et al., 2015). This dust can influence regional and global climate, by scattering and absorbing solar and reflected radiation, by changing cloud properties, and by affecting the Earth's albedo. This depends on particle characteristics including size, shape, composition and mineralogy (Shao et al., 2011). In addition, transportation and deposition of Saharan dust can show distinct seasonal differences (Prospero et al., 2014), which can be the result of several factors including different dust-transporting air layers, differences in source areas, seasonal migration of the high-intensity dust cloud, or changes in depositional processes (Grini and Zender, 2004).

Research objectives

So far I have investigated Saharan-dust samples from seven subsurface sediment-traps along a unique transect in the Atlantic Ocean at 12˚N, right under the high-intensity dust plume originating from the African continent (Prospero, 1981). A study by Stuut et al. (2005) shows that dust collected from sediment-traps and ocean-floor sediments are a very good representation of dust from the atmosphere.

Grain-size distributions have been measured for the sediment-trap samples, spanning the sampling period from October 2012 to November 2013, using a laser particle-size analyzer (Coulter LS13 320, at NIOZ, The Netherlands). In the first year of monitoring I observed a lateral decrease in grain size from source to sink, and also seasonal variations (van der Does et al., in prep).

At a research station on the easternmost coast of Barbados (13˚10'N, 59˚30'W), samples of trade-wind aerosols have almost continuously been collected since 1965 (Prospero and Lamb, 2003). Grain sizes of the last years of sampling have been measured with a Coulter Counter (Coulter Multisizer 3, at RSMAS, Miami, USA; unpublished data). For this study I proposed to extend our existing transect in the Atlantic Ocean with this Caribbean research station. The goal was to compare the different methods of measuring grain-size with the Coulter Counter and the laser particle-size analyzer, by measuring both trans-Atlantic and Barbados dust samples on both particle-size analyzers.

Besides particle-size analysis, I performed geochemical analyses (Sr, Nd, Hf and REE) on five of the sediment-trap samples, in order to gain insights into different source regions of the dust, and especially to investigate if there is a possible influence of Amazon sediments to the samples. The samples chosen for these analyses have shown very high sediment fluxes, raising the question of a possible input of Amazon river particles. They represent two of the five stations along the trans-Atlantic transect: at 12°N 23°W (Station M1), and 12°N 49°W (station M4). Also three soil sediment samples from

Mauritania were analyzed as potential source sediments.

Methods

Particle-size standard sediments were analyzed on the Coulter Multisizer 3 (MS3) at RSMAS (Rosenstiel School for Marine and Atmospheric Science at the University of Miami, Miami, USA) to be compared to standards measured on the Coulter LS 13 320 at NIOZ (Royal Netherlands Institute for Sea Research, Texel, The Netherlands). Tests were performed with different stirring speeds and background measurements on the MS3, using the 100 µm aperture tube. Three standards were measured: a 15µm garnet standard from Coulter, Ballotini A (median: 39.09 µm, mode: 41.68 µm) and Ballotini B (median: 61.47 µm, mode: 72.94 µm) glass-bead made at NIOZ.

The geochemical analyses were performed in the Neptune Isotope Lab at RSMAS, with the help of Dr. Ali Pourmand. First, the marine sediment-trap samples had to be treated to remove all biogenic constituents (biogenic carbonates, organic matter, biogenic opals and Fe- and Mn-oxides) and isolate the 'lithogenic' fraction. The two largest sediment-trap samples were split in half, of which one the bulk sample and the other half the lithogenic fraction was analyzed.

The samples were then prepared following the method described by Pourmand et al. (2014): The samples were fused with LiBO2 alkali flux to ensure complete dissolution of refractory minerals. Sr, Nd, Hf and REE's were separated by three-stage extraction chromatography, for high-precision isotope and elemental analysis on a Thermofisher Scientific Neptune Plus multi-collection inductively coupled plasma mass spectrometer (MC-ICP-MS). To check for possible contaminations, procedural blanks were processed and analyzed.

Preliminary results / implications / ongoing work

Grain-size measurements show a good reproducibility between both methods for the 15 µm garnet standard (Fig. 1A). The slight offset is expected for different methods, and if this offset is consistent it can be used to normalize the dust grain-size data. However, the Coulter Counter was unable to properly measure the Ballotini A and B standards (Fig. 1B). In theory, the 100 µm aperture tube of the MS3 should be able to measure particles up to 60 µm. It became clear that the method is not suited to measure particles larger than 42 µm. The Coulter Counter registers all particles above this threshold in the 42 µm size bin, resulting in the extremely high peak at this grain size. This makes it impossible to compare the two grain-size analyzing methods for these standard sediments. It also means that the sediment-trap samples that should be used for this comparison study won't yield usable results on the Coulter Counter, since the modal grain-size of these samples ranges between 5 and 35 µm (depending on the sample location and season), thus having a significant amount of particles coarser than 42 µm (van der Does et al.,in prep).

Alternatively, Barbados samples will be measured on the Laser particle sizer (LS 13 320) at NIOZ, to allow a one-way comparison of the two grain-size analyzing methods. This way hopefully the two methods can be normalized against each other, so that the two datasets can be combined and the trans-Atlantic transect expanded. A main difference between the two types of samples is that the trans-Atlantic samples are a combination of both dry- and wet-deposited dust, and the

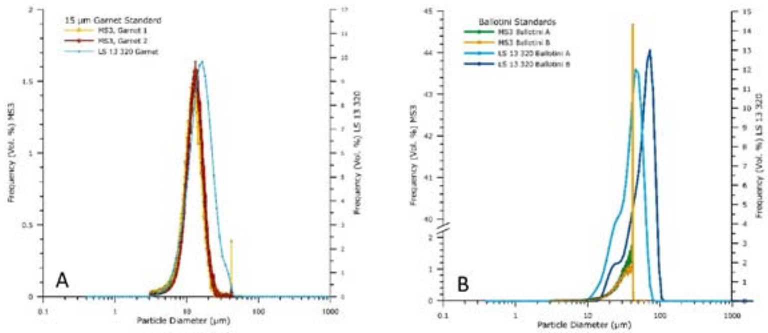

Figure 1.Particle-size distributions of 15 µm garnet Coulter-standard (A) and Ballotini A & B NIOZ standards (B), measured on Coulter Multisizer 3 (MS3; RSMAS) and Coulter LS 13 320 (NIOZ).

Barbados samples only contain dry-deposited dust, which could result in a difference in grain size for similar periods. These analyses still have to be performed.

The Sr, Nd and Hf isotopes and REE concentrations of five sediment-trap samples and three soil sediments from Mauritania were analyzed at RSMAS. The sediment-trap samples show many similarities to dust isotope data from the literature, as published by Pourmand et al. (2014), which showed Sr-Nd-Hf isotopic composition of Saharan dust collected at Barbados. Strontium isotope ratios (87/86Sr) show a grain-size effect (finer particles have higher 87/86Sr), as has been previously demonstrated in literature

(Meyer et al., 2011). Other features shown by the isotope data are differences between the samples of two different locations of the sediment traps, suggesting a sorting effect over greater distances, influences on the dust during transportation or depositional processes, or different sources for proximal and distal dust.

REE concentrations from the sediment-trap samples show distinct differences from Amazon River sediments (Abouchami et al., 2013). Based on these results, we feel confident to reject the hypothesis of Amazon river sediments arriving at the sampling station. Two of the soil samples from Mauritania fall within the same isotopic range as dust collected at other source regions, as shown by Scheuvens et al. (2013). One of the soil samples is outside of this range, and needs further investigation to draw any conclusions about it. However, soil sediments from possible source areas are not necessarily the same material as the aerosols that are deflated as dust for trans-Atlantic transport (Pourmand et al., 2014).

Ongoing work

Samples from Barbados will be measured on the Coulter LS 13 320 at NIOZ, which will result in a one- way comparison between the two grain-size analyzing techniques. A possible difficulty is that the Barbados-samples are small (47 mm) filters, and are of a one-day resolution. This means that they yield very little material, which might be hard to detect with the laser particle sizer. More samples will be analyzed on Sr, Nd, Hf isotopes and

REE concentrations, to give better insight in seasonal and spatial trends. Also atmospheric samples collected offshore Africa will be analyzed, to compare to the samples from Barbados samples by Pourmand et al. (2014) of the same time period (2005). This IAS grant fueled the collaboration with Prof. Prospero and Dr. Ali Pourmand and their groups, which will continue in the future and result in joint papers.

Acknowledgements

The grant money of Ş1000 was used for the flight ticket Amsterdam–Miami (Ş554) and housing for 4 weeks (Ş903). The geochemical data will be presented during an oral presentation at the DUST2016 conference in Castellaneta Marina, Italy, in June 2016.

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IAS POST GRADUATE GRANT SCHEME REPORT

1ST SESSION 2015

Palaeoenvironments of Galway Bay: implications for post- glacial sea level and environmental changes in the west of Ireland.

MCCULLAGH, DENISE ULSTER UNIVERSITY

Introduction

The present is a time of environmental change occurring at an unprecedented rate, and the knowledge of past climates can inform our predictions of future environmental changes. This project is a multi-disciplinary investigation into the factors that have shaped Galway Bay (Fig. 1) since the last glacial maximum to present day. The period following the Last Glacial Maximum (LGM) in western Ireland was characterised by rapid and abrupt changes in both ice mass and relative sea level (RSL) (Greenwood et al, 2009a; Brooks et al, 2011; Bradley el al, 2012). Due to the position of Galway Bay and its relatively sheltered location, the bay has the potential to provide a sediment record that will reflect both the terrestrial and marine processes since the LGM. This makes it a valuable site for the study of Irish environmental changes.

Methods

This research is a multidisciplinary investigation including micropaleontology, sedimentology and geochronology. Sedimentary analyses include lithofacies descriptions, multi-sensor core logger measurements (wet/dry bulk density, porosity, p-wave velocity, and magnetic susceptibility), and analysis of core X-radiographs, shear strength measurements where appropriate and grain size analysis. Micropaleontological analyses, in particular foraminifera and ostracod assemblages, and radiocarbon dating on calcareous fauna/microfauna sampled from significant sediment strata are also been carried out. Additionally the geomorphology and sub-bottom stratigraphy of the bay will obtained from high-resolution multibeam bathymetry and backscatter data, as well as 3.5 kH pinger seismic data, provided by the Marine Institute of Ireland.

IAS Grant use/results

The IAS awarded 1000 euro to this research in order to carry out multi-sensor core logging (MSCL) at the British ocean sediment core research facility (BOSCORF) in Southampton

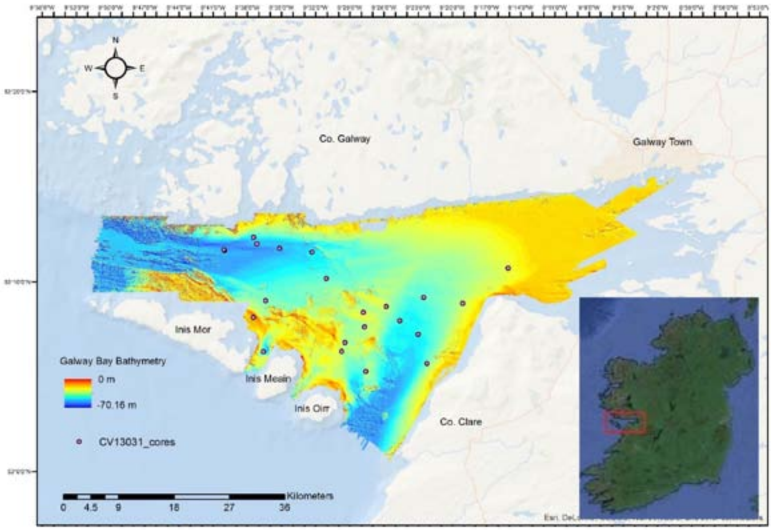

Figure 1. Bathymetric and topographic map of Galway Bay created from INFOMAR data, showing the location of the sediment cores used in this study, collected during Ulster University's research cruise CV13031, in 2013.

on 10 of the longest cores available from the study area at 1cm intervals. This technique allowed investigation of the physical properties of the cores, specifically the P-wave velocity, bulk density and magnetic susceptibility (an example is shown in Fig. 2).

The MSCL analysis below shows the properties of 13VC. The P-wave velocity is relatively constant throughout the core between 1600-1800m/s, with the exception of an increase at 226cm to 1975m/s. Since P-wave velocity varies with different sediment compositions this shows an unconsolidated, uniform lithology, with the exception of the turritella layer from 84-113cm which does not yield any data for any of the measurements. The spike at 226cm is interpreted to have been caused by a change in the pore fill as there is no obvious lithology change visible and Galway bay is not an area known for the presence of gas hydrate. The magnetic susceptibility shows a distinct decreasing trend as we move downcore ending at 181cm due to insufficient data with an overall weak positive value for the core. This could imply a slight change in grain size through detrital input or may be due to the high level of calcium carbonate in the core. Magnetic susceptibility can show changes in the depositional environment (Ghilardi et al, 2008) and will be used together with grain size analysis to identify changes in sea level. The bulk density shows an increase in each core section and an overall increasing downcore value ending at 181cm, once again due to insufficient data. Changes in density can yield information on grain size and mineralogy (St-Onge et al, 2007) and therefore lithology changes. The P-wave velocity and bulk density results have been used to calculate acoustic impedance which

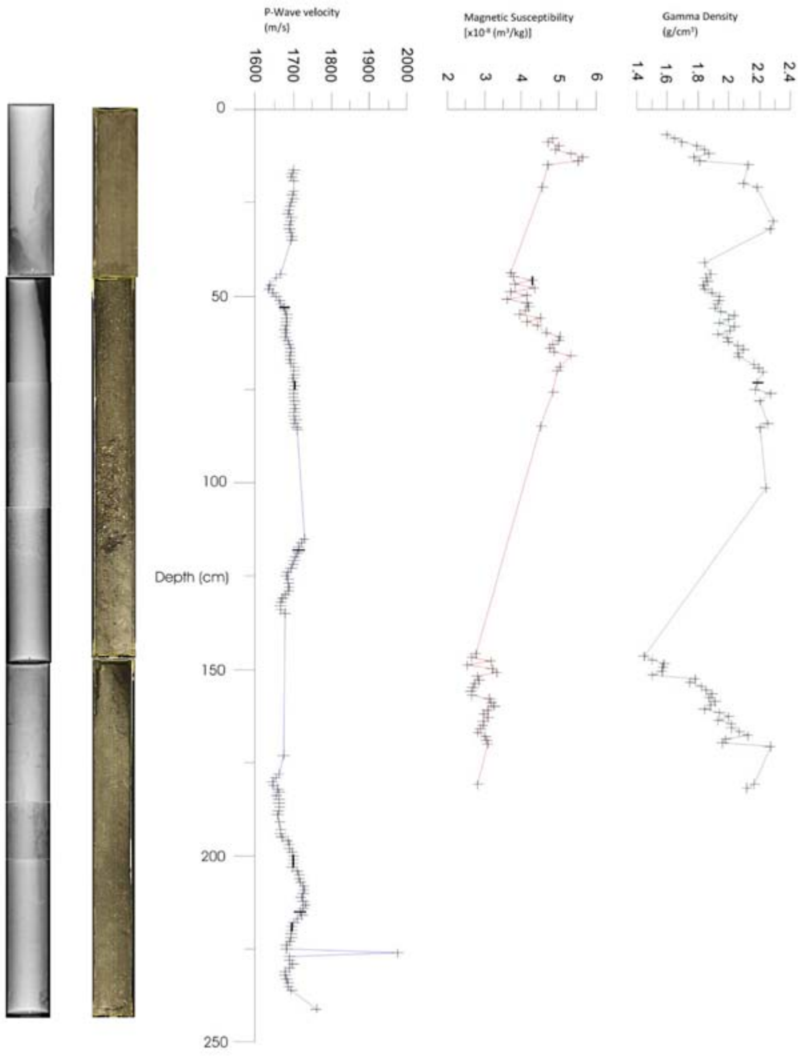

Figure 2. A graph showing the P-wave velocity, magnetic susceptibility and bulk density of vibro-core 13 alongside an image and x-ray image of the same core(Funded by IAS 2015).

was compared with the high resolution seismic stratigraphy created for Galway Bay in order to link important seismic horizons.

The information gathered from the MSCL data is being used in conjunction with recently acquired X- ray fluorescence (XRF), micropalaentological and sedimentological data in order to reconstruct the palaeoenvironment of Galway bay and how it has changed over time and place it within the wider frame of the environmental evolution of the North Atlantic region since the end of the last glacial maximum.

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Water chemistry related with microbial mats and carbonate microbialites in high-altitude hypersaline Andean lake

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The Laguna Negra is part of the Laguna Verde Complex (Puna region, Catamarca, Argentina, Fig. 1 A) which consists of high-altitude lakes that are evaporating due to increasing aridity since the last glacial maximum. Under extreme environmental conditions (hypersalintiy, temperature and high-UV influx), an extensive microbial mat system develops where carbonate precipitation also takes place. Three carbonate macroscopic morphologies are distinguished (Fig. 1 B-C-D). Cm- to dm-scale mega- oncoids closely related to stratified pink color microbial mats are broadly distributed within the southwest coast of the Laguna Negra. Lamination is composed of alternating micritic and botryoidal laminae. Stromatolites are cm to dm size and are usually covered by a dark green to dark grey thin microbial

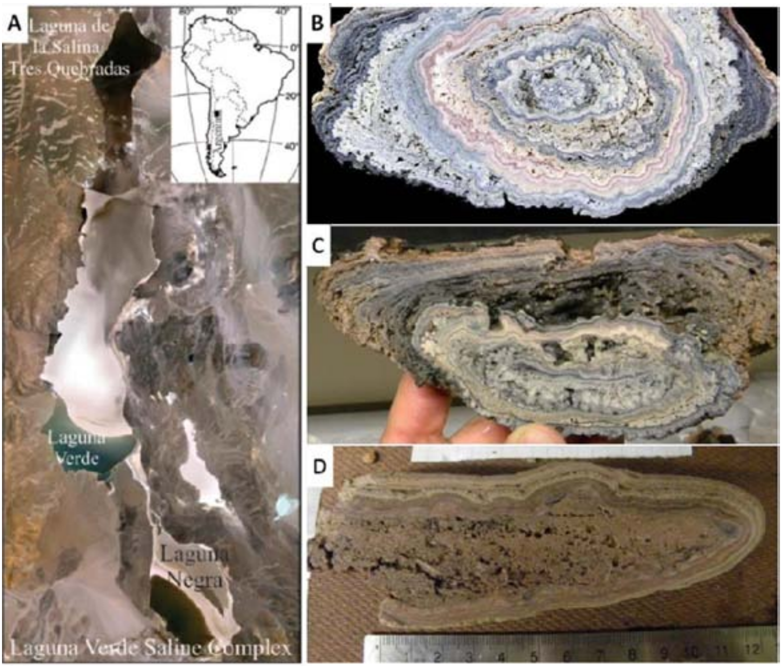

Figure 1: A) The Laguna Negra location in South America, and satellite image of the Laguna Verde Saline Complex. B-C-D) Carbonate structures slab sections. Mega- oncoid, stromatolite and laminar crust, respectively.

mat atop. Lamination is made up of stacked, irregular micritic lamina occasionally with abundant organic material. Laminar crusts (composed of stacked isopachous lamina) lack associated microbial mats, are mm to cm thick and form patchy to laterally extensive pavements in the regions better connected with the lake.

It is our aim to unravel the biotic controls on the microbialites formation and the biosignatures recorded in these three distinct carbonate structures. Here we started by comparing the water chemistry of the three sites under study, and we will continue by studying the trace element distribution within microbial mats, lake water and carbonates in the future.

ICP-OES and ion chromatography were carried out to characterize the chemistry of the lake water sampled above microbial mats or sediment in the three sites. Major cations and anions are presented in Table 1, also including Mn, As, V and Co. Many trace elements, Ni, Mo, Se, Cu, Fe, W and Zn, fell below the detection limit.

In general, water from the stromatolites and the laminar-crusts sites are more similar to each other than with the mega-oncoids water, particularly in terms of conductivity, Na+, Cl- and SO4-2. The mega-oncoids water shows the lowest conductivity, and the lowest concentrations of most of the elements detected, with the exceptions of Mn, As, V and Co. Ca+2 is remarkably higher in the laminar-crusts site, and this is the only site that presents detectable NO3-.

This study shows chemical differences between the three sites that go along with the textural variance observed in the carbonates and the microbial diversity associated with them. Considering that the mega-oncoids are related with thick and well stratified microbial mats developing in the least saline water, and the irregular micritic and botryoidal textures that predominates in the lamination, this suggests that the influence of microbial activity in carbonate precipitation might be stronger in this site than in others, and that further studies could provide us with recognizable biosignatures. Both, laminar crusts and stromatolites are associated with more saline water, restringing life to those well adapted to high salt content. Stromatolites are usually related to thinner microbial mats and irregular micritic lamina with visible microbial remains. Laminar crusts, instead, lack visible microbial mats, which is consistent with the regular isopachous stacked lamina mostly controlled by physiochemical processes than biological.

We expect to count with biologically significant elements data from

Water Sampling Site	pH	Conductivity (mS/cm)	K^{+} (mg/l)	Mg^{+2} (mg/l)	Ca^{+2} (mg/l)	Na^{+} (mg/l)	Mn^{+2} (mg/l)	As (mg/l)	V (mg/l)	Co (mg/l)	Cl^{-} (mg/l)	SO_4^{-2} (mg/l)	NO_3^{-} (mg/l)
Mega-oncoids	7.44	75.7	814	755	2285	15023	1.8	0.33	0.49	0.05	31180	456	-
Stromatolites	7.3	197	1174	1050	3664	24110	1.73	0.2	0.39	0.03	92161	1001	-
Laminar-crusts	7.2	177	1891	1431	7308	20704	1.53	0.33	0.38	0.03	77756	1022	290

Table 1. Water chemistry from the three sites sampled for comparison.

the precipitates and the mats in the future, in order to assess the elements partition and biosignature preservation in modern environments and in the geological record. That would also help to distinguish abiotically versus biotically controlled mineral precipitates to have a better understanding of the early biosphere record.

Ocean temperature and pH estimates from the enigmatic late Paleocene greenhouse; new data from the Indian Ocean

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1.0. Introduction and scientific background

Generating paired sea-surface temperature (SST) and marine pH records from past greenhouse worlds, is vitally important if we are to better understand the sensitivity of climate and the carbon-cycle to changes in internal and external forcing in high pCO2 regimes. In recent years, many studies have attempted to reconstruct the greenhouse climate and oceanic chemistry of the mid–late Paleocene (~59–55.5 Ma) using novel trace metal proxies (e.g. Babila et al., 2016; Penman et al., 2014; Zachos et al., 2003); however, much of this effort has focused on the flagship "hyperthermal" events, such as the Paleocene–Eocene Thermal Maximum (PETM), leaving a distinct lack of absolute temperature or pH estimates for the background greenhouse climate of the Paleocene–Eocene (Fig. 1). This project aims to address this gap in our knowledge by applying the Mg/Ca paleothermometer and B/Ca proxy to planktic, thermocline-dwelling and benthic foraminifera from the recently drilled (January 2015) International Ocean Discovery Program (IODP) Expedition 353 Site U1443. Calcium carbonate-rich sediments (predominantly nannofossil chalk) from this site, drilled on the Ninetyeast Ridge, Indian Ocean, represent an excellent opportunity to test these novel trace metal proxies, where the foraminifera were deposited at a shallow paleo-depth of ~2000m, well above the Paleocene lysocline and Calcite Compensation Depth, and are therefore exceptionally preserved (Fig. 2; Fig. 4). The initial plan involved examining changes in temperature and ocean chemistry on orbital (100 kyr and 400 kyr) timescales, however due to a coarser than anticipated sample resolution of 2–11 cm (~5–27 kyr) obtained from the biscuited Paleocene section of the U1443 core, only the 400 kyr cycles are clearly resolvable throughout the record. Once this issue was identified, the primary aim of the project migrated to identifying the longer term trends in temperature and chemistry of the Indian Ocean

during the late Paleocene, from the peak of the Paleocene Carbon Isotope Maximum (PCIM, ~57.7

Ma) to the end of the Paleocene (~55.5 Ma), providing a unique insight into how temperature and chemistry of this hitherto understudied ocean basin evolved in the run up to the PETM (Fig. 3).

The Mg/Ca paleothermometer has emerged as one of the most promising techniques for determining absolute temperatures in the deep past and is based on the strong temperature dependence on the substitution of Mg2+ into biogenic calcite, with secondary effects exerted by salinity and pH of the ocean waters. An exponential positive relationship between Mg/Ca ratios and calcification temperature in foraminiferal calcite has become well established from multiple

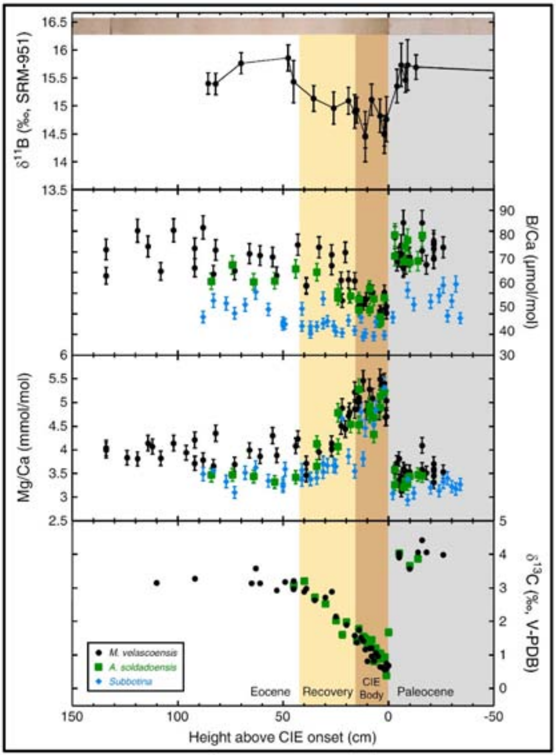

Figure 1. Application of the Mg/Ca and B/Ca proxies to suggest warming and acidification in the surface waters and at thermocline depths during the PETM (brown shaded interval) from the central Pacific ODP Site 1209 (Penman et al., 2014)

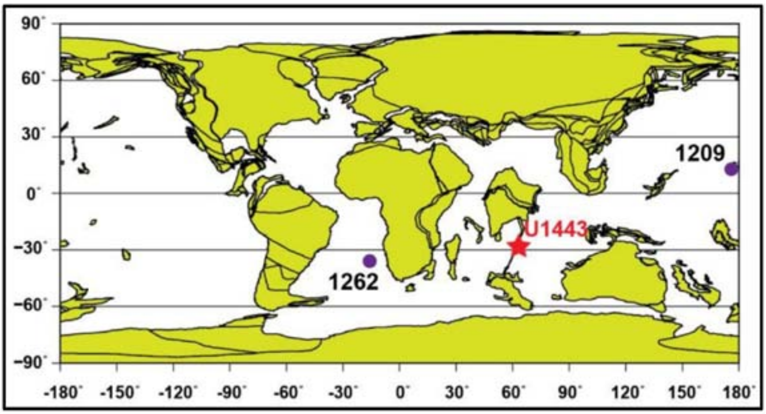

Figure 2. Location of IODP Site U1443 (Ninetyeast Ridge, Indian Ocean) on a late Paleocene (57 Ma) paleogeographic reconstruction (http://www.odsn.de/odsn/services/paleomap/paleomap.html). Locations of ODP Site 1209 and 1262 are also illustrated for reference.

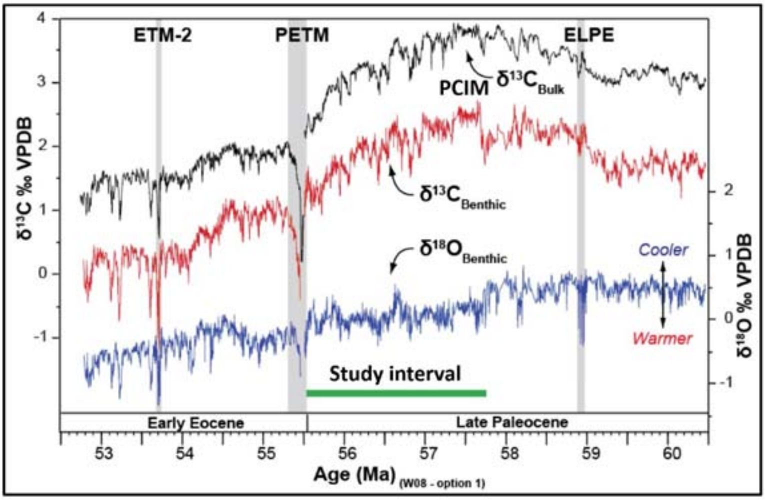

Figure 3. Benthic and bulk isotope data from ODP Site 1262, plotted against age (Westerhold et al., 2008; Option1), illustrating the long-term trends in climate and the carbon cycle during the late Paleocene to early Eocene (Littler et al., 2014)

cultivation experiments, sediment trap and core-top analyses (e.g. Elderfield & Ganssen, 2000; Rosenthal & Linsley, 2006). When applying this proxy to estimate longer term temperature trends in the deep past using extinct species, a number of problems must be overcome, including: species-specific variations in trace metal ratios due to marked vital effects and depth migration through the water column, the preferential dissolution of high-Mg calcite in undersaturated waters, and the evolving Mg/Ca ratio of ocean waters on million year timescales. These problems can be overcome by using a single species from a very narrow size fraction which is known to only occupy one part of the water column during its lifespan, selecting well preserved specimens with minimal recrystallization and no visible diagenetic overgrowths, and selecting a fossil species which has a closely related extant species with an established Mg/Ca-temperature calibration.

B/Ca ratios represent a novel method of estimating changes in ocean chemistry, closely related to pH. Empirical studies have revealed that abundance of the aqueous borate ion (B(OH)4)- correlates positively with seawater pH, and that (B(OH)4)- is the main species of B incorporated into foraminiferal carbonate (Hemming & Hanson, 1992). B/Ca ratios in foraminiferal carbonate should therefore correlate positively with pH, and negatively with dissolved CO2 content, of ocean waters. As with all new proxies, there are significant unknowns including the effects of temperature, salinity and carbonate dissolution on foraminiferal B/Ca ratios (Henehan et al., 2015; Coadic et al., 2013).

2.0. Methodology

165 samples (at 2–11 cm resolution) were collected from U1443A cores 35X and 36X (late

Paleocene) at the Kochi Core Centre in October 2015 by Dr. Kate Littler, and arrived at the Camborne School of Mines, University of Exeter in December 2015.

Firstly, δ13C analyses were performed on the entire sample batch at the NERC Isotope Geosciences Laboratory (NIGL), to determine the orbital stratigraphy and identify where the sample batch sits with respect to the "reference" high-resolution δ13C curve for the mid–late Paleocene from ODP Site 1262 (Littler et al., 2014; Fig. 3).

38 samples were then selected at each major peak and trough in the bulk Ş13C record for trace metal analyses. These samples were firstly freeze-dried and then disaggregated in a cold Calgon solution, before being washed through a 63 µm sieve to isolate the >63 µm coarse fraction, containing the foraminifera species of interest. The following species were picked at the Camborne School of Mines under the supervision of Dr. Kate Littler and Dr. Kirsty Edgar (illustrated in Fig. 4):

- The symbiont-bearing, mixed layer dwelling species Morozovella velascoensis was picked from the 250–300 µm fraction for sea surface Mg/Ca and B/Ca data. In the younger part of the dataset, M. velascoensis became scarce and was replaced by closely related 4- chambered species from the M. subbotinae-marginodentata plexus, with some overlap samples
- The thermocline dwelling species Subbotina velascoensis was picked from the 212–250 µm fraction for thermocline Mg/Ca and B/Ca data. In the younger part of the dataset, S. velascoensis became scarce and was replaced by the closely related coarsely-cancellate species S. hornibrooki, with some overlap samples
- The epifaunal benthic species Nuttallides truempyi was picked from the >150 µm fraction for bottom water B/Ca data
- The infaunal benthic species Oridorsalis umbonatus was picked from the >150 µm fraction for bottom water Mg/Ca data

Foraminifera crushing and strict cleaning protocol were carried out in the trace metal clean lab at the Department of Earth and Planetary Sciences, University of California Santa Cruz (UCSC), under the supervision of Mr. Dustin Harper and Prof. James Zachos during late April-May 2016. The specific cleaning protocol employed at UCSC follows a modified version of the Boyle & Keigwin (1985/86) method, involving: ultrasonic cleaning in boron-clean MilliQ water and methanol to remove clays and fine-grained carbonates, a reductive cleaning procedure in a hot hydrazine/ammonium citrate solution to remove surface ferromanganese contaminants, and a subsequent oxidative cleaning procedure in hot hydrogen peroxide to remove surface organics.

200-800 µg of samples were then dissolved in 350 µl of nitric acid (HNO3) and run on a Thermo Finnigan Element XR Inductively-Coupled Plasma-Mass Spectrometer at the University of California, Santa Cruz, using the methods of Brown et al. 2011. Larger Morozovella sp. samples (>600 µg) were divided into two and replicate runs were performed. The masses analysed for B/Ca were 11B and 43Ca, and for Mg/Ca were 24Mg, and 43Ca. Samples containing <40 ppm calcium were considered too small and excluded from the final results, whilst samples with Mn/Ca & Fe/Ca ratios of >100 µmol/mol and Ti/Ca & Zn/Ca ratios of >50 µmol/mol were excluded due to the likelihood of contamination from adsorbed clays, overgrowths or gloves. Solution standards with known elemental composition and blanks were routinely run between samples to check instrument precision, accuracy and consistency.

3.0. Preliminary results and discussion

Mg/Ca ratios within the tests of the Morozovella sp., Subbotina sp. and Oridorsalis umbonatus all increase

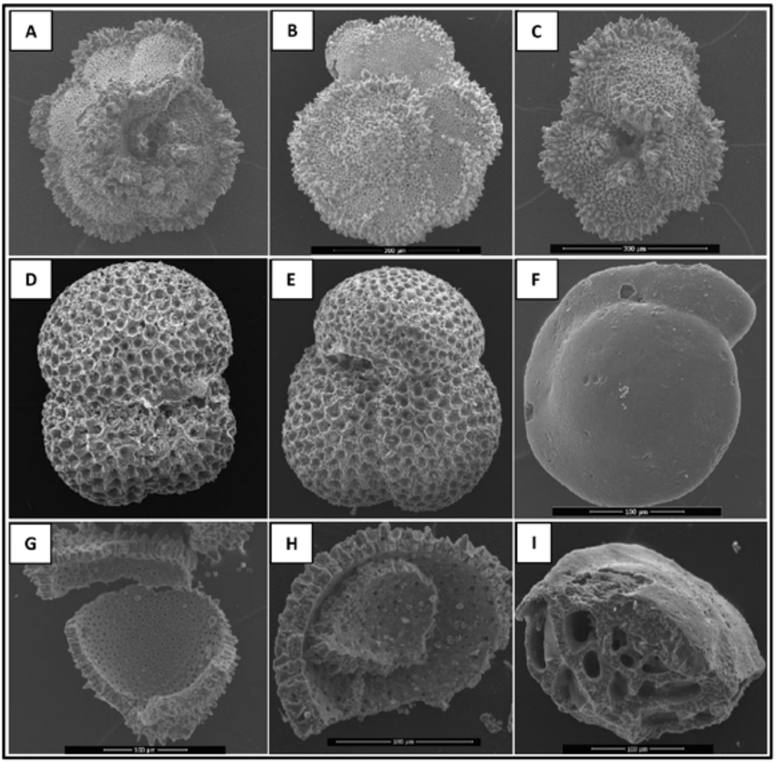

Figure 4. Scanning electron micrographs of representative specimens of the foraminifera species used in this study. Morozovella velascoensis, umbilical view (A) and spiral view (B), Morozovella subbotinae-marginodentata plexus (C), Subbotina velascoensis (D), Subbotina hornibrooki (E), Oridorsalis umbonatus (F), Morozovella subbotinae-marginodentata plexus cross section (G), Subbotina velascoensis cross section (H), and Nuttallides truempyi cross section (I)

from the PCIM towards the end of the Paleocene on the order of ~1 mmol/mol, suggesting a long-term warming trend within the surface waters, at thermocline depths and within the bottom waters respectively. These results are in agreement with high-resolution long-term stable oxygen isotope (Ş18O) records for this period, which suggest an overall trend towards progressively lighter isotopic values (e.g. Littler et al., 2014). The long 405 kyr eccentricity cycles, identified as the dominant forcing mechanism of the late Paleocene climate by Littler at al. (2014), can also be identified within the Mg/Ca record, along with a few of the more prominent short 100 kyr eccentricity cycles. Interestingly, there also appears to be a decoupling in the magnitude of warming recorded by the mixed layer and thermocline dwelling species, suggesting a shifting depth of the thermocline during the late Paleocene, changes in the source of thermocline waters towards the end of the Paleocene, or a previously unidentified depth migration of the species analysed.

B/Ca ratios within the tests of the Morozovella sp., and Nuttallides truempyi all decrease from the PCIM towards the end of the Paleocene on the order of ~25%, suggesting a relative decrease in pH of both the mixed layer and bottom waters over this period, although the magnitude of unit pH change cannot be quantified by this method. This is in agreement with long-term stable carbon isotope (Ş13C) records across the late Paleocene, which

display decreasing values interpreted to reflect increasing atmospheric CO2 concentrations. The second major episode of volcanism within the North Atlantic Igneous Province across east Greenland and the Rockall Plateau represents the most likely source of this increasing atmospheric CO2, a significant portion of which was subsequently absorbed into the oceans (Westerhold et al., 2011). A decoupling in the magnitude of decrease of the B/Ca ratios within the Morozovella sp. and Subbotina sp. tests towards the end of the Paleocene has also been recognised in the data, which may again be suggestive of a shifting thermocline, change in source, or depth migration of the analysed species.

This data therefore provides valuable new constraints on the evolution of temperature and pH of the Indian

Ocean during the late Paleocene, in the build-up to being pushed over equilibrium states during the PETM.

4.0. Acknowledgements

I would firstly like to thank the IAS Postgraduate Grant Scheme for their financial support, without which this work would not have been possible. I would also like to thank Dr. Kirsty Edgar for providing a training course on

picking the Morozovella and Subbotina species of interest at the University of Birmingham, Prof. Melanie Leng for generating the bulk Ş13C data at NIGL at short notice, along with Mr. Dustin Harper, Dr. Tali Babila and Prof. James Zachos for their insightful help, support, guidance and scientific discussions during sample preparation and analysis at the University of California, Santa Cruz.

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IAS POST GRADUATE GRANT SCHEME REPORT – 2ND SESSION 2015

The role of Jurassic inherited structures on the post-rift Early Cretaceous extensional faults. Comparison between the “Mt. Cosce Breccia” and the “Ballino Breccia”

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Introduction

The tectono-stratigraphic evolution of Mesozoic sedimentary successions in the Alpine Tethys was influenced by Early Jurassic rift-related extension. Evidence for this normal faulting are in the Alps and in the Apennines, where huge Hettangian carbonate platforms (Calcari Grigi Fm. and Calcare Massiccio Fm., respectively) were dismembered into fault-bounded blocks causing a characteristic horst-and-graben/semigraben setting (e.g. Castellarin 1972; Bertotti et al. 1993; Santantonio 1993,

1994). This is highlighted by facies and thickness variations in the syn- and post-rift Jurassic pelagites. While the occurrence and the effects of the Early Jurassic rifting stage is a well-known theme, evidence for an Early Cretaceous extensional tectonic phase is far more sparse. Direct and indirect evidence for this phase is described for several paleogeographic domains, and includes i) the back-stepping of carbonate platform- and pelagic carbonate platform- (PCP sensu Santantonio

1994) margins, ii) the areal reduction or –locally- drowning of carbonate platforms (e.g. Bièvre & Quesne 2004; Santantonio et al. 2013), iii) the deposition of clastic bodies (e.g. Castellarin 1972; Cipriani 2016; Fabbi et al. 2016), iv) the occurrence of neptunian dykes (e.g. Bertok et al. 2012), v) the development of angular unconformities (e.g. Menichetti 2016).

In the Narni-Amelia Ridge (central Apennines), a Cretaceous megaclastic deposit, called the “Mt. Cosce Breccia” (Cipriani, 2016), was recently identified during a geological mapping project. Due to the stratigraphic, sedimentological and paleotectonic similarities with the “Ballino Breccia” outcropping in the Southern Alps (Castellarin 1972), the two sectors were compared. The aim of this work is to

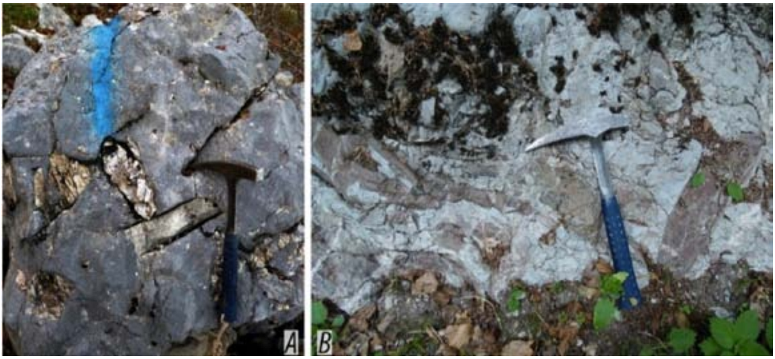

Figure 1: field view of the Lower Cretaceous clastic deposits. A) "Mt. Cosce Breccia"; B) "Ballino Breccia".

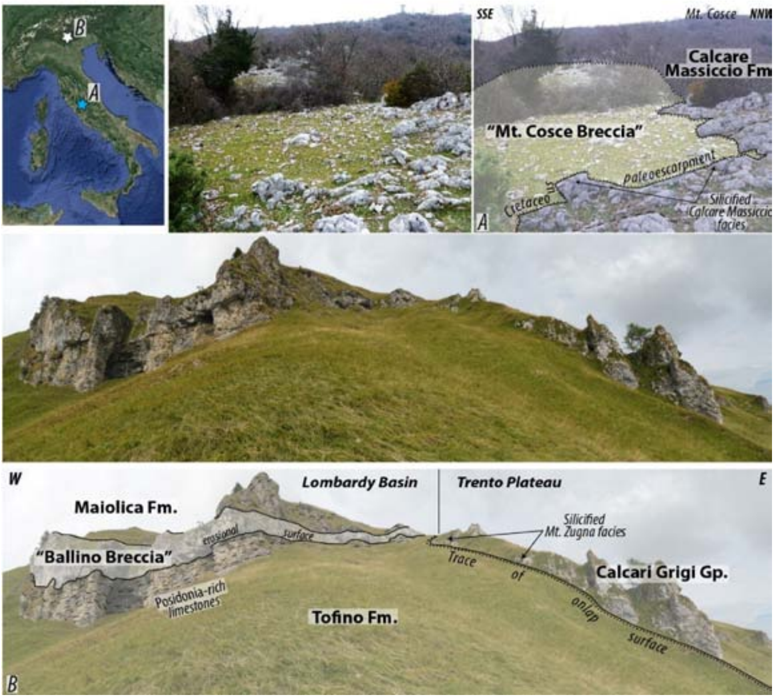

Figure 2: A) panoramic view of the "Mt. Cosce Breccia" unconformably resting on the Calcare Massiccio; B) outcrop visualization of the "Ballino Breccia", resting through an erosional surface on Middle Jurassic pelagites and onlapping the western margin of the Trento Plateau.

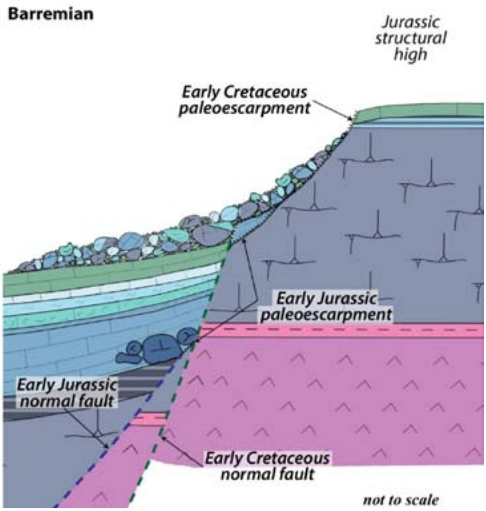

Figure 3: attempted reconstruction of the relationship existing between Early Jurassic and Early Cretaceous structures in a PCP/basin system during post-rift extensions (modified from Cipriani, 2016).

understand the influence on inherited Jurassic structures on the development of Early Cretaceous extensional faults in two different paleogeographic domains of Italy, albeit with a comparable tectono-sedimentary evolution.

Methods

A field work based on a detailed geological mapping project (1:10.000 scale) was performed in the Ballino/ Garda area (Southern Alps). Several stratigraphic sections were measured and correlated in order to describe facies and thickness variations of the "Ballino Breccia". Samples collection for the production of thin sections allowed for a microfacies comparison with the "Mt. Cosce Breccia".

Preliminary results

The "Mt. Cosce Breccia" is a polygenic breccia characterized by clasts of lithologies not younger than the Early Cretaceous, dispersed in a matrix of Maiolica-type facies (white Calpionellid-rich limestone) (fig. 1a). This deposit unconformably rests, through an erosional surface, on the horst- block Calcare Massiccio (Mt. Cosce structural high – Cipriani 2016) and, locally, on Lower Jurassic pelagites lapping onto it (fig. 2a). The arresting feature of the "Mt. Cosce Breccia" is the role played on the siting of Cretaceous faults by the inherited Jurassic structures. This deposit can be interpreted as related to the reactivation of an Early Jurassic normal fault during the Cretaceous, as faulting caused the exhumation of a Jurassic structural high and rejuvenation of an inherited tectonic margin (fig. 3).

Impressive similarities were recognized along the Jurassic western margin (Ballino escarpment) of the Trento Plateau, albeit with a larger scale. The Trento Plateau is a huge morpho-structural high formed during the Early Jurassic extensional stage. Polyphasic extension affected the Ballino paleoescarpment during the Mesozoic (mainly Early Jurassic, Early and Late Cretaceous), as testified by conspicuous megaclastic

deposits embedded in the western basinal succession (Lombardy Basin - Castellarin 1972). The attention was focused on the "Ballino Breccia", a Lower Cretaceous polygenic breccia characterized by heterometric (sometimes >20 m in diameter) blocks made of shallow-water carbonates (Calcari Grigi Group), chert-rich basinal deposits (Lombardy Basin succession) and horst block-top condensed facies (Venetian Succession). The clasts are associated with pebbles of Maiolica-type facies (with and without calpionellids), and the matrix of the ruditic deposit is a nannomicritic mudstone (Maiolica Fm.) (fig. 1b).
The ruditic deposit rests, through an erosive base, on

several Jurassic units of the Lombardy succession and, locally, directly on the Calcari Grigi facies, and is sealed by the top of the Maiolica Fm (fig. 2b).

As well as for the "Mt. Cosce Breccia", the "Ballino Breccia" was interpreted as a syn-tectonic deposit related to an Early Cretaceous extensional phase that caused (fig. 3): i) back-stepping and rejuvenation of an Early Jurassic submarine paleoescarpment (Ballino escarpment); ii) formation of neptunian dykes made of Maiolica-type deposits; iii) formation of erosional scars in the footwall-block, due to rock-falls, draped by the clastic deposits or the younger pelagites; iii) silicification of the footwall-block shallow-water carbonates related to the unconformable contact with cherty pelagites. This peculiar diagenetic feature is commonly used in the Apennines to describe PCP/basin systems (Santantonio et al. 1996), but has never been previously described in the Southern Alps.

Budget justification

The € 972,00 of the IAS Grants awarded to me were spent to cover: a) the cost of travel and of accommodation during the field work; b) the cost of the laboratory for the production of thin sections.

Predicted expenses	€ 220,00 travel	€ 602,00 accommodation	€ 150,00 thin sections
Actual costs	€ 194,10 travel	€ 652,00 accommodation	€ 183,00 thin sections

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Depositional conditions, diagenesis and provenance of sedimentary rocks of the Nakhlak Group, northeast of Naein area, Central Iran.

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Below I provide a brief report about my research that has been done during six months at Göttingen University:

The samples were crushed with a jaw-crusher and then powdered using of planetary agate mill. Glass discs of 30 powdered samples (sandstone and shale) were prepared for analyses of major and selected trace elements with X-Ray Fluorescence (XRF) method. Total carbon, organic and inorganic carbon contents of the same 30 samples were measured with a LECO elemental analyser in order to clarify how much CaO comes from alumina-silicates or calcium carbonates. This information is important, for example, for calculation of the Chemical Index of Alteration (CIA). Powder tablets prepared from 15 powdered samples (sandstone and shale) were used for determination of bulk mineralogy using the X-Ray Diffraction (XRD) method. Six shale samples were suspended on ceramic disc and prepared for clay mineral analysis using the XRD method. Liquid solutions of 30 powdered sandstone and shale samples were prepared using the acid digestion method (HF-HNO3-HCl) prior to the analyses of Rare Earth Elements (REE) and trace elements with the ICP-MS method. The 63-125 Şm size grain size fraction of sieved samples was used for heavy mineral analysis. Light and heavy fractions were separated by immersion in heavy liquid (sodium polytungstate). Heavy fractions were studied by binocular microscope. Originally, it was planned to determine the chemical composition of specific heavy minerals such as rutile, garnet, tourmaline and/or amphibole. This however had to be changed after I had a preliminary examination of the heavy mineral concentrates because garnet and amphibole are almost absent in the samples, and also the amount of rutile and tourmaline grains is not sufficient for mineral chemical analyses. Fortunately, the samples contain well-preserved (even euhedral) detrital zircon grains. I therefore selected six sandstone samples from which zircon grains were picked by hand and epoxy mounts were prepared for follow-up analyses. Cathodoluminescence (CL) images were obtained from the detrital zircon grains with a JEOL JXA 8900 RL electron microprobe equipped with a CL detector to study the internal structure (e.g., core-rim relations) of the zircon grains for better placing the analyses spots. Detrital zircon U-Pb ages were determined using the LA-ICP-MS method. The results from U-Pb age dating show mainly 225-1078 Ma old grains and only a few grains are in the age range between 1710 and 3148 Ma. The youngest zircon age population is Triassic that is consistent with the fossil record of the formations. The geochemical data (major, trace and rare earth elements) were used to reconstruct source-rock lithologies and the paleo-tectonic setting. The latter was likely related to arc activities in an active margin setting. Besides the geochemical and zircon age dating studies, 500 thin sections were studied by polarized light microscopy and 50 sandstone samples were counted using the Gazzi-Dickinson method. The petrographic data are in good agreement with the geochemical results, but interpreting the data in detail is still ongoing. Heavy minerals slides were prepared and will be studied in July. A first manuscript about the petrographic and geochemical data is currently written up and should be ready for submission by the end of September. Overall, the obtained data during my six month's stay at Göttingen University reveal new insights into the age, composition and palaeotectonic evolution of central Iran within the Tethyan realm.

The impact of isotopic events on the Central Mediterranean carbonate successions between the late Eocene and late Miocene.

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Introduction

The late Eocene-late Miocene is the key interval for understanding the modern ice-house climate started at the Eocene-Oligocene boundary (Lear et al., 2008). The Cenozoic oxygen isotope record shows two major positive peaks, referred to as Oi-1 (33,55 Ma) and Mi-1 (24-23.5 Ma). These events are interpreted as glacial maxima and moments of rapid expansion of the Antarctica Ice Cap. Conversely, the early Miocene is characterised by a warming trend which led to the Mid-Miocene Climatic Optimum (MMCO) (Zachos et al., 2001). The carbon isotope record shows three major positive peaks. The first two occurred during the Oi-1 and Mi-1, the latter during the MMCO, and known in literature as Monterey Carbon Isotope Excursion (Zachos et al., 2001; Holbourn et al.,

2007). These shifts are interpreted as C-cycle perturbations that produced an increased primary productivity of surface waters, thus being a limiting factor for carbonate production. The influence of C–cycle perturbations on the carbonate-producing biota is now widely accepted (Weissert & Erba, 2004). Moreover, in platform settings such perturbations may produce drowning events (Wortmann & Weissert, 2000).

Furthermore, the study of Central Mediterranean successions provides an opportunity to understand the relationships between global and regional factors controlling carbonate production. For example, the intense volcanism, developed within the Western Mediterranean from the Eocene to Miocene (Lustrino et al., 2011) must have affected sea-water chemistry and, in turn, carbonate pro-duction. Moreover, Mediterranean water circulation patterns changed through time due to the open-ing and closure of the passages with the surrounding oceans (Kocsis et al., 2008), but also due to the development of several sub-basins (as the proto-Adriatic one), with respect to the larger Mediter-ranean water body. This complex evolution may have controlled carbonate production changes and platforms evolution within the interval of interest.

Outline

Climate and trophic changes controlled carbonate production: the Eocene is characterised by the spread of larger benthic foraminifera, followed by their decline during the Oligocene, while z-corals proliferated and diversified as well as sea-grass associations (Brandano et al., 2009; Nebelsick et al.,

2013; Pomar et al., 2014). While long-term trends are assessed, little is known about the Mediterra-nean carbonate successions response to the greenhouse-icehouse transition occurred in the earliest Oligocene. The Oi-1 event has been analysed, so far, in the Umbria-Marche pelagic domain (Massignano stratigraphic section, GSSP for the Eocene-Oligocene transition) (Bodiselitsch et al., 2004), and there is only limited published literature on shallow-water environments response to this event (Jaramillo-Vogel et al., 2013).

Successively, during early to middle Miocene corals declined as red algae spread (Brandano & Corda, 2002). The impact of the Monterey Carbon Isotope Excursion has been recently identified in Central Apennine carbonate platforms. They record a major positive carbon isotope shift, which coin-cides with the spread of bryozoans in middle to outer ramp environments (Brandano et al., 2016a; Brandano et al., 2017). After this major C-cycle perturbation, oligo- to mesotrophic conditions reestablished within the large Mediterranean water body, and lasted until early Messinian. During the Tortonian-early Messinian time interval, in fact, several reef-rimmed plat-forms developed (Esteban, 1996; Pomar et al., 1996; Pedley, 1996). This interval, in Central Apen-nines, is represented by the Lithothamnion Limestone unit of the Bolognano Formation (Majella Mountain) (Brandano et al., 2016b). In contrast with the other contemporary platforms of the Mediterranean area, the Lithothamnion ramp records a progressive decay of the trophic condition. In this ramp, in fact, coralline algae spread, associated with typical low-oxygen foraminif-eral taxa (Bulimina spp. and Bolivina/Brizalina spp.) tolerating abundant organic matter accumula-tion in dysoxic to anoxic conditions.

The purpose of my PhD project is to identify the impact on Central Mediterranean carbonate successions of the trophic and climatic events recorded within the late Eocene to late Miocene. My aims are: 1) to identify their stratigraphic response to the isotopic events; 2) to frame these carbonate production shifts within the geodynamic and oceanographic evolution of the Central- Western Mediterranean. The case studies I am working on are the Santo Spirito Formation (Danian- Rupelian) and the Bolognano Formation (Rupelian-Messinian) of the Majella Mountain (Central Apennines), as representative of shallow-water carbonate systems, and the late Eocene-late Mi-ocene pelagic succession of the Umbria-Marche domain (from the Conero region and the Northern Apennines).

These different successions will be correlated on the basis o f stratigraphic analysis.

Specific objectives reached thanks to the IAS Postgraduate Grant Scheme

The Postagraduate Grant Scheme funds have been used for two different objectives, both framed within my PhD project.

1. Measure the carbon isotope signature on the total organic matter fraction of the marls of the Scaglia Variegata and Scaglia Cinerea Formations cropping out in the Massignano stratigraphic section (GSSP of the Eocene-Oligocene transition). The analysis of the $\delta^{13}C_{TOC}$ trend will be compared and correlated with the $\delta^{13}C_{Carb}$ record of the same stratigraphic section, to provide new insights on the C-cycle across the greenhouse-icehouse transition, allowing also to correlate the Mediterranean carbon isotope record with the global one, to discriminate the role of global

versus regional controlling factors that could have affected the C-cycle.

2. Sample and provide a diagenetic screening on different specimens of bivalves and brachiopods belonging to the Lithothamnion Limestone unit of the Bolognano Formation, to measure, then, their Sr isotope ratios. Marginal basins, such as the proto-Adriatic one, may show a different Sr isotope record in comparison to the coeval ocean one due to sea level variations, continental runoff and restricted water exchanges (Flecker & Ellam 2006; Topper et al., 2011, Schildgen et al., 2014). Thus, the comparison of the Lithothamnion Limestone Sr isotope ratios with the larger Mediterranean water body signal, and the global reference line, allow to draw inferences on the water circulation patterns, and on the local controlling factors which affected sea water chemistry, and consequently carbonate production, during the Lithothamnion Limestone ramp development.

Methods and preliminary results

To reach the first objective, 50 samples belonging to the Massignano stratigraphic section (Central Italy) were analysed for Ş3CTOC. Samples were crushed in an agate mortar. To remove the carbonate fraction, the powder has been dissolved in HCl 1M. The residual powder was, then, rinsed in de-ionized water, dried in the oven at 40°C and then measured with A FINNIGAN Delta Plus mass- spectrometer connected with an Elemental Analyzer.

Preliminary results show, as expected, a mixed origin of the organic matter in this hemipelagic suc-cession, both continental and marine. Overall, the curve, shows a positive trend, with the Ş3CTOC shifting towards less negative values. This trend seems to mirror the contemporary Ş3CCarb curve, not only of the same stratigraphic section (Bodiselitsch et al., 2004), but also of the upper Eocene-lower Oligocene portion of the Santo Spirito Formation. Previous carbon isotope analyses conducted on the Santo Spirito Formation prove that the Ş3CCarb record (measured on bulk samples) for the Priabonian, shows a significant negative trend, punctuated with, at least, a major, sharp nega-tive peak. This trend can be fully correlated with the Massignano Ş3CCarb record (Bodiselitsch et al., 2004), and with the global carbon isotope record (Cramer et al., 2009). This negative shift could be linked with two different causes, which are currently being examined. The first one is volcanism, which brings isotopically light CO_2 to the atmosphere-hydrosphere system; the second one is the release of gas hydrates, which are isotopically light, and which could have triggered (or at least fa-voured) the successive positive carbon isotope shift recorded in the early Oligocene, contemporary to the Oi-1 event. The comparison of the Ş3CTOC and Ş3CCarb will provide new insights to the complex C-cycle dynamic at the Eocene-Oligocene transition, and will help discriminating the role of these two possible controlling factors on the negative shift during the late Eocene.

Secondly, the IAS PGS funds have been used to sample, and provide a diagenetic screening on different specimens of bivalves and brachiopods belonging to the Lithothamnion

Limestone unit of the Bolognano Formation. A sampling campaign, on three different stratigraphic sections, previously logged, has been conducted on the Majella Mountain with the aim to collect samples for both micropaleontological sieves and different specimens of bivalves and brachiopods to apply Strontium Isotope Stratigraphy. Ten different specimens of bivalves and brachiopods have been analysed. A complete diagenetic screening (trace element concentrations and stable isotope ratios) has been performed on the sampled shells. Mg, Mn, Fe, Sr and Ba concentrations have been measured on polished thin sections using the CAMECA electron microprobe of the Istituto di Geologia Ambientale e Geoingegneria (IGAG-CNR) at Sapienza, University of Rome. The same specimens have been powered with a hand-operated microdrill, using 0.5 mm Ø tungsten drill bits, avoiding the external and evidently altered portions, for both stable C and O and radiogenic Sr isotope ratios measures. Five samples belonging to the upper portion of the Lithothamnion Limestone have been analysed to identify their microfossil content for biostratigraphic purposes. Bio-stratigraphic constrains associated with Strontium Isotope Stratigraphy indicate a late Tortonian to early Messinian age for the Lithothamnion Limestone ramp. However, this succession evidences a failure of Strontium Isotope Stratigraphy during latemost Tortonian and early Messinian because of a regional deviation of Sr isotope ratios from the global reference line of McArthur et al. (2001). In this time interval, in fact, the Lithothamnion Limestone Sr isotope record mismatches with the global one, being overall lower. These results have been interpreted as a hint of the progressive onset of restricted water exchanges between the Adriatic basin and the larger Mediterranean water body due to the local tectonic evolution, the narrow physiography of the proto-Adriatic basin and its shallow water column. In this framework, the enhanced freshwater input and continental runoff due to the migration of the accretionary wedge of the Apennine orogeny controlled the Sr isotope com-position of this marginal basin, even if there is no evidence of salinity changes or major sea- level changes.

Outcome

The latter results merged in an original article titled "Strontium Stratigraphy of upper Miocene Lithothamnion Limestone in the Majella Mountain (Central Italy) and paleoenvironmental implica-tions" Authors: Irene Cornacchia, Per Andersson, Samuele Agostini, Marco Brandano, Letizia Di Bella; currently submitted to Lethaia.

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Early Career Scientists Research Grants

Post-Doctoral Research Grants are intended as a seed to assist early-career post-doctoral researchers in either establishing a proof of concept, in order to support applications to national research funding bodies, or to fund areas of a project that were not included in the original project scope.

Up to 4 grants, each to a maximum of Ş2,500, are awarded twice per year to Early Career IAS members – those that have secured their Ph.D. within the previous 7 years.

Applicants should apply for a Post-Doctoral Research Grant via the IAS website. The application requires submission of a research proposal with budget and CV (template provided on the submission webpage), and a letter of support from the researcher's supervisor, line manager or Head of School.

Eligibility:

- Applicants must be full members of the IAS.
- Applicants must have secured their Ph.D. within the previous 7 years.
- Applicants can only benefit from a Post-Doctoral grant on one occasion.

Proposals will be ranked on the following criteria:

- Scientific quality of research, novelty and timeliness, likely output.
- Feasibility.
- Cost effectiveness.
- The scientific and publication track record of the investigator.
- Demonstration that the proposed work cannot be conducted without a grant.
- Researchers that are not supported by substantial funding.
- Preference is given to applications for a single purpose (rather than top-ups of other grant applications).

Application requirements:

Applications must be made via the IAS web site.

- Research Proposal, maximum 3 pages A4, including:
  - →Rationale and scientific hypothesis to be addressed
  - →Specific objectives of the research
  - →Anticipated achievements and outputs
  - →Methodology and approach
  - →Research plan

→ A list of pending and previous applications for funds to support this or related research.
- CV of the applicant, maximum 2 pages A4.
- Justification of the proposed expenditure, up to 1 page of A4. If other individuals are to be involved with the project, this document must include a clear explanation of their role and costs.

Examples of funding

- Direct costs of fieldwork.
- Laboratory analysis.
- Specialist equipment (not computers).

Funding exclusions

The IAS does not offer funding for the following costs:

- Investigator's salary costs.
- Travel to attend a scientific conference, workshop or exhibition.
- Core funding or overheads for institutions.
- Student tuition fees and summer research bursaries.

Deliverables

- The IAS should be acknowledged in all reports, presentations and publications produced as a result of the awarded grant.
- A report should be submitted to the IAS detailing the outcomes of the research.
- Where a publication is produced then this may be submitted in lieu of a report.

INSTITUTIONAL IAS GRANT SCHEME (IIGS)

IIGS Guidelines

Special IAS Grants or Institutional IAS Grants are meant for capacity building in third world countries. There exists a list of 'Least Developed Countries' (LDC) by the UN. This list categorizes countries according to income per capita and is yearly updated.

Grants are allocated to allow Geology Departments in LDC to acquire durable sedimentological equipment for teaching and research (like sieves, calcimeters, auger drilling tools, etc.) or tools that can be used by all geology students (like general geology/sedimentology textbooks, IAS Special Publications (SP), memory sticks with back issues of Sedimentology or SP, etc). Therefore, the grant application should clearly demonstrate to increase the recipient's capacity to teach sedimentology at the undergraduate level (Bachelor) in a durable way. It should also indicate in what way it would enable to support sedimentological research at the graduate level (Master).

Applicants should have a permanent position at their University and should be IAS Full Members. Applications should be submitted by email to the Office of the Treasurer (ias-office@ugent.be) and contain the following information (not exhaustive list):

- the mission statement of the University/Geology Department
- the approval of the University Authorities to accept the grant
- a list of permanent teaching and technical staff members of the Geology Department (with indication of their area of research)
- the structure of the geology undergraduate and graduate courses (Bachelor/Master programme with indication of courses and theoretical and practical lecture hours)
- the number of geology students
- the actual facilities for geology/sedimentology students
- a motivation of application
- a budget with justification
- the CV of the applicant, including a sedimentology research plan

The institutional grant scheme consists each year of 2 sessions of 1 grant of 10.000 Euro. Applications run in parallel with the PhD research grant scheme (same deadline for application and recipient notification). The IAS Grant Committee will seek recommendations from relevant National Correspondents and Council Members (eventually including visitation) before advising the IAS Bureau for final decision. Additional funds made available by the recipient's University are considered as a plus.

Items listed in the application will be bought through the Office of the IAS Treasurer and shipped to the successful applicant. By no means money will be transferred to the grant recipient.

POSTGRADUATE GRANT SCHEME (PGS)

PG Guidelines

IAS has established a grant scheme designed to help PhD students with their studies by offering financial support for fieldwork, data acquisition and analysis, visits to other institutes to use specialized facilities, or participation in field excursions directly related to the PhD research subject.

Up to 10 grants, each of about 1,000 Euro are awarded, twice a year. These grants are available for IAS Student Members only. Students enrolled in MSc programs are not eligible for funding and research grants are not given for travel to attend a scientific conference, nor for the acquisition of equipment.

Applicants should apply for a postgraduate grant via the IAS website. The application requires submitting a research proposal with budget and CV (template provided on the submission webpage) and a letter of support from the student's supervisor. After the deadline has passed, the IAS Bureau evaluates the submitted applications and makes a final selection. Applicants are personally informed by the Office of the Treasurer about their grant. The grants are transferred to the applicants' bank account upon submission of a short scientific and financial report.

Eligibility and selection criteria:

- Applicants must be enrolled as a PhD student;
- Applicants can only benefit from a postgraduate grant once during their PhD;
- In the evaluation process preference will be given to those applications that i) can convincingly demonstrate that the proposed work cannot be conducted without the grant, and ii) are not supported by substantial industry funding.

Application

The application should be concise and informative, and contains the following information (limit your application to 1250 words max.):

- Research proposal (including Introduction, Proposal, Motivation and Methods, Facilities) – max. 750 words
- Bibliography – max. 125 words
- Budget – max. 125 words
- Curriculum Vitae – max. 250 words

Your research proposal must be submitted via the Postgraduate Grant Scheme application form on the IAS website before the application deadline. The form contains additional assistance details for completing the request. Please read carefully all instructions before completing and submitting your application. Prepare your application in ‘Word’ and use ‘Word count’ before pasting your application in the appropriate fields.

A recommendation letter from the PhD supervisor supporting the applicant is mandatory, as well as a recommendation letter from the Head of Department/Laboratory of guest institution in case of laboratory visit. The letter needs to be uploaded by the candidate, when submitting his/her application, and not be sent separately to the Office of the Treasurer.

Please make sure to adequately answer all questions.

Deadlines and notifications

Application deadline 1st session: 31 March.

Application deadline 2nd session: 30 September.

Recipient notification 1st session: before 30 June.

Recipient notification 2nd session: before 31 December.

NOTE: Students who got a grant in a past session need to wait 2 sessions (1 year) before submitting a Postgraduate Grant Scheme grant application again.

Students whose application was rejected in one session can apply again after the notification deadline of the rejected grant application

Application Form

- Research Proposal (max. 750 words)
- Title: ....
- Introduction (max. 250 words): .....

Introduce briefly the subject of your PhD and provide relevant background information; summarise previous work by you or others (provide max. 5 relevant references, to be detailed in the ‘Bibliography’ field). Provide the context for your PhD study in terms of geography, geology, and/or scientific discipline.

- Proposal (max. 250 words): ...

Describe clearly your research proposal and indicate in what way your proposal will contribute to the successful achievement of your PhD. Your application should have a clearly written hypothesis or a well-explained research problem of geologic significance. It should explain why it is important. Simply collecting data without an objective is not considered wise use of resources.

- Methods (max. 125 words): ....

Outline the research strategy (methods) that you plan to use to solve the problem in the field and/or in the laboratory. Please include information on data collection, data analyses, and data interpretation. Justify why you need to undertake this research.

- Facilities (max. 125 words): ....

Briefly list research and study facilities available to you, such as field and laboratory equipment, computers, library.

- Bibliography (max. 125 words)

Provide a list of 5 key publications that are relevant to your proposed research, listed in your ‘Introduction’. The list should show that you have done adequate background research on your project and are assured that your methodology is solid and the project has not been done already. Limit your bibliography to the essential references. Each publication should be preceded by a ‘*’-character (e.g. *Surlyk et al., Sedimentology 42, 323-354, 1995).

- Budget (max. 125 words)

Provide a brief summary of the total cost of the research. Clearly indicate the amount (in Euro) being requested. State specifically what the IAS grant funds will be used for. Please list only expenses to be covered by the IAS grant. The IAS will support field activities (to collect data and samples, etc.) and laboratory activities/analyses. Laboratory activities/analyses that consist of training by performing the activities/analyses yourself will be considered a plus for your application as they will contribute to your formation and to the capacity building of your home institution. In this case, the agreement of the Head of your Guest Department/Laboratory will be solicited by automated e-mail.

- Curriculum Vitae (max. 250 words)

Name, postal address, e-mail address, university education (degrees & dates), work experience, awards and scholarships (max. 5, considered to be representative), independent research projects, citations of your abstracts and publications (max. 5, considered to be representative).

- Advise of Supervisor and Head of Guest Department/Laboratory

The recommendation letter from the supervisor should provide an evaluation of the capability of the applicant to carry out the proposed research, the significance and necessity of the research, and reasonableness of the budget request. The recommendation letter must be uploaded by the applicant together with the rest of the application content. Applications without letter of support will be rejected. It will be considered as a plus for your application if your PhD supervisor is also a member of IAS.

If you apply for laboratory analyses/activities, please carefully check analysis prices and compare charges of various academic and private laboratories as prices per unit might differ considerably. Please first check whether analyses can be performed within your own University. If your University is not in a position to provide you with the adequate analysis tools, visiting another lab to conduct the analyses yourself strengthens your application considerably as it contributes to your formation and to capacity building of your home University. Please check with the Head of Department/ Laboratory of your guest lab to assure its assistance during your visit. You should add a letter of support from him/her with your application.

Finally, before submitting your application, you will be asked to answer a few informative questions by ticking the appropriate boxes.

- is your supervisor a member of IAS
- was this application your own initiative
- did you discuss your application with your Supervisor
- did you already have contact in the past with the Head of the Guest Department/Laboratory (if appropriate)

CALENDAR

Flügel-Course 2017*

6th-17th March 2017
Erlangen, Germany

Axel Munnecke
axel.munnecke@fau.de
https://www.gzn.fau.de/en/palaeontology/events/fluegel-course/

XRF Core Scanning 2017*

20th-24th March 2017
Taipei, Taiwan

http://b00302249.wixsite.com/mxcs

EGU 2017 General Assembly*

23th-28th April 2017
Vienna, Austria

http://egu2017.eu/home.html

14th International Ichnofabric Workshop*

29th April - 7th May 2017
Taipei, Taiwan

Ludvig Löwemark ludvig@ntu.edu.tw
http://homepage.ntu.edu.tw/~ludvig/styled-12/index.html

11th International Conference on Fluvial Sedimentology*

17th-21th July 2017
Calgary, Canada

Stephen Hubbard
shubbard@ucalgary.ca
http://www.icfscalgary.com/

10th International Symposium on the Cretaceous*

21th-26th August 2017
Vienna, Austria

Michael Wagreich
michael.wagreich@univie.ac.at
https://10cretsymp.univie.ac.at/

Summer School on Speleothem Science 2017*

21th-26th August 2017
Burgos, Spain

https://summerschoolspeleothemscience.wordpress.com/

Deep-Water Circulation Conference 2017*

14th-16th September 2017
Wuhan, China

Xinong XIE and Tao JIANG
3dwc2017@cug.edu.cn
http://www.3dwc2017.org/

2nd International Conference of Continental Ichnology* ICCI 2017

2th-8th October 2017
Western Cape, South Africa

ICCI_2017@yahoo.com
https://sites.google.com/site/icci2017conference/home

33rd IAS MEETING OF SEDIMENTOLOGISTS*

10th-12th October 2017
Toulouse
France

Delphine Rouby
ims2017@scienceconf.org
http://ims2017.sciencesconf.org/

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