# IAS

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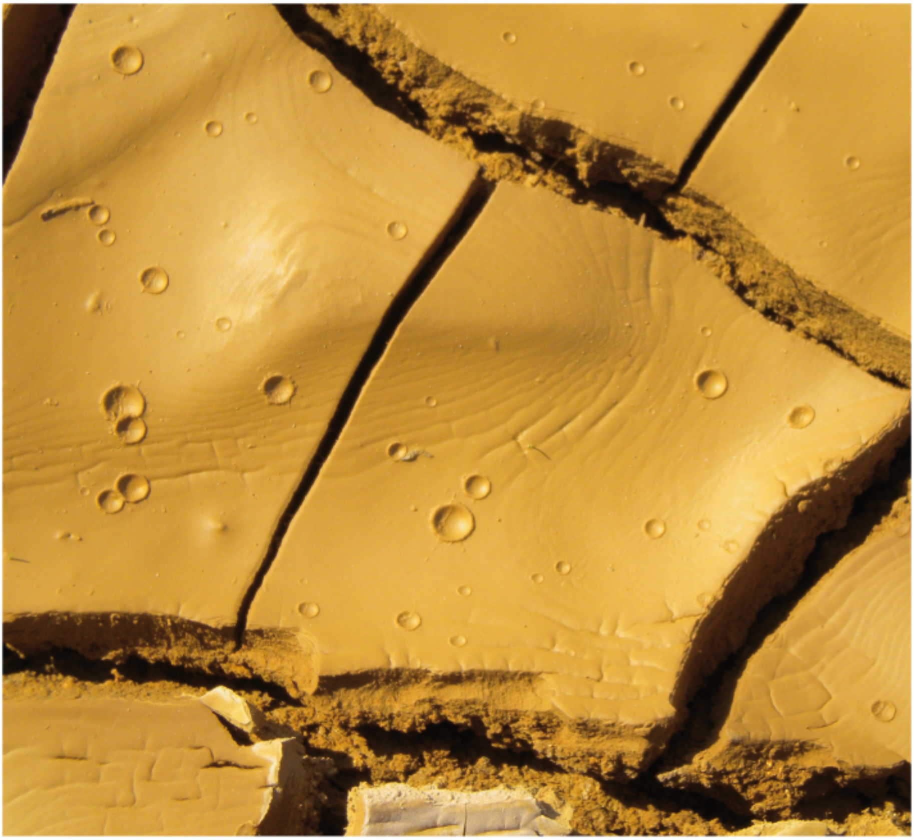

International Association of Sedimentologists

# IAS Bureau and Council

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# EDITORIAL

Super Sedimentological Outcrops are the core of Newsletter 240. Jose Pedro Calvo (here kindly thanked) presented a nice overview of the geology of the Milos Island, Aegean Sea, Greece.

The central part of the Newsletter is dedicated to the post graduated grant scheme report by Michael A. Salter of the School of Science and Environment of the Manchester Metropolitan University on «The short-term preservation potential of fish-derived carbonates in shallow tropical marine settings».

The final part of the Newsletter is dedicated to the review of the Special Publication N. 44 just published and available through the IAS website.

On 26 April Emiliano Mutti has received the 2012 Jean Baptiste Lamarck Medal for 'Sedimentology'. After Judith McKenzie (2006) and Maurice Tucker (2009), Emiliano Mutti is the third Lamarck Award medalist who is a 'lifelong' IAS member. Additional details of the event will be presented in the next Newsletter.

I would like to remember to all IAS students that Summer School of Sedimentology dead line is approaching and few places are still available. Goals of the school are: «Sedimentary Archives of Regional vs Global Change: Case Study of Neogene Basins of Southern Spain». It will be held in Carboneras (Spain) from 30 September until 7 October 2012. Check out the details by downloading the announcement from the IAS web site.

IAS will be present at the begging of August at the International Geological Conference in Brisbane. Please come and visit our booth there.

Electronic Newsletter (ENIAS) started in November 2011continues to bring short information to members. For info on ENIAS contact Nina Smeyers at nina.smeyers@ugent.be.

Check the new Announcements and remember that Meetings and events in CAPITAL and/or with * are fully or partially sponsored by IAS. For more info visit www.sedimentologists.org

Vincenzo Pascucci
(General Secretary)

# SUPER SEDIMENTOLOGICAL OUTCROPS

## Present and Plio - Pleistocene seas of Milos Island, Aegean Sea, Greece

### Geographic and geological location of Milos

The island of Milos belongs to the Cyclades. It is located in the active South Aegean Volcanic Arc (SAVA), which extends from Soussaki, near Athens, in the west to Nysiros Island in south-eastern Aegean Sea, Greece (Fig. 1). The volcanic arc is punctuated by several islands. The island of Santorini, situated **ca.** 100 km east of Milos, is the best known place of the arc because of the intense volcanic activity and its catastrophic consequences during the recent geological history of the region.

In Milos Island, the volcanic manifestations started during the late Pliocene (Fytikas **et al.**, 1986; Stewart & McPhie, 2006) and are currently represented by high heat flow rate, thermal springs and presence of hot soils in the SE part of the island (Fytikas, 1977; Fytikas **et al.**, 1986).

**How to get there –** There are daily airplane and ferries connections from Athens to Milos. Ferries leave Athens from Piraeus harbour. Both slow and fast ferry services can be used, the fast ferries reaching Milos in about 4 hours. Airplane flight takes about 40'.

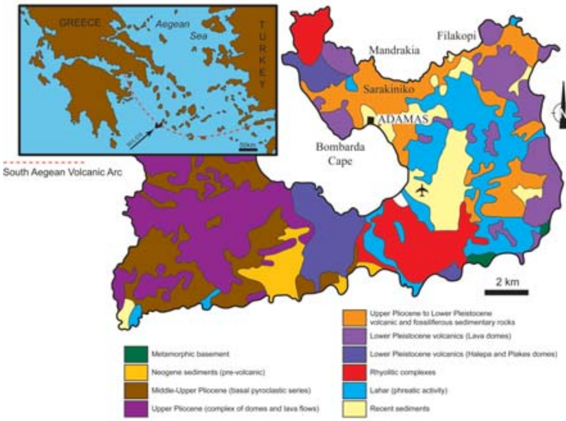


*Fig. 1. Geological map of Milos (simplified after Fytikas, 1977) and location of the island in the South Aegean Volcanic Arc.*

*Fig. 2. View of the volcanic rocks exposed at left side entering the bay of Adamas. The village of Tripiti can be seen at the uppermost part of the hill.*

## Geology of Milos

The oldest rocks in Milos consist of basement metamorphic rocks of Mesozoic to Palaeogene ages (Fig. 1) that are overlain unconformably by upper Miocene to lower Pliocene conglomeratic and calcareous sediments.

From the late Pliocene (~3.0 Ma), the island of Milos records a rather continuous history of extensive calc-alkaline volcanism, leading to a complex arrangement of volcanic and volcano-sedimentary deposits (Fytikas et al., 1986; Stewart & McPhie, 2006). The volcanic rocks of Milos are mainly rhyolite and

*Fig. 3. General view of the coastline in the northern part of Milos - looking from east (Sarakiniko beach) to west. Cliffs and small bays along the coast allow observation of a well-exposed upper Pliocene to lower Pleistocene succession formed of white volcaniclastic and fossiliferous, mainly diatomaceous, sedimentary rocks.*

*Fig. 4. E – W stretching, normal fault observed east of Sarakiniko. Sea is at left of the picture. Recent, grey, coarse clastic materials at right of the picture moved downwards. The sharp fault plane cuts lower Pleistocene volcaniclastic and diatomaceous deposits.*

dacite with subordinate andesite and basaltic andesite. These materials and their weathered products show an attractive colour variety that can be observed just arriving by ship to Adamas, the main town of the island (Fig. 2).

Felsic, pumice-rich flows and volcanic tuffs with interbedded fossiliferous sedimentary deposits form the lower volcano-sedimentary succession, which is widely exposed in the northern part of the island Fig. 3). These materials are overlain by domes and lava flows of rhyolitic to andesitic composition, accompanied by ejection of pyroclastic materials and ignimbrites. More recent periods of strong volcanic activity are recorded by rhyolite to rhyodacite lavas, pumice and cinders. Dating of the volcanic succession in Milos was summarised by Fytikas **et al.** (1986), Rinaldi & Campos Venuti (2003) and Stewart & McPhie (2006). The most recent eruptive phase in Milos has been dated at 0.48 Ma.

The tectonic structure of the island is characterised by a rather dense

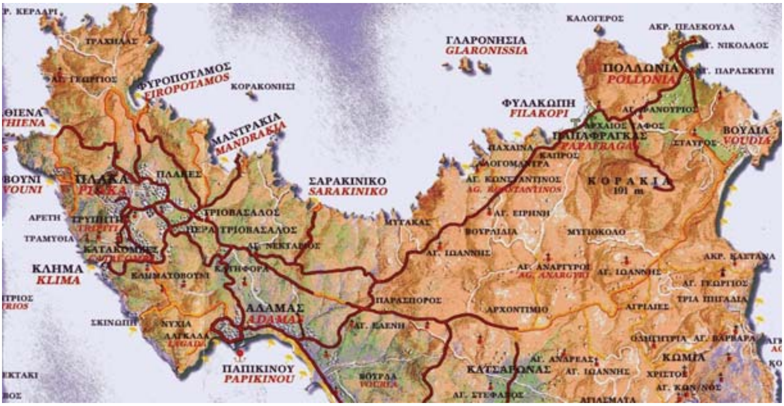


*Fig. 5. Schematic map of northern Milos. More relevant locations cited in this paper are indicated. Coastline from Mandrakia to Sarakiniko and Mytakas allows observation of the upper Pliocene – lower Pleistocene sequence. Filakopi, located 4 km east of Mytakas, is an interesting Minoan archaeological site and at the same time shows superb outcrops of coarse pumice breccia. The villages of Tripiti, Plaka and Pollonia are recommended for meals; Adamas is recommended for both accommodation and meals.*

network of normal faults oriented approximately N-S, E-W and SW-NE (Fig. 4).

## The upper Pliocene - lower Pleistocene succession of northern Milos

Along the coastline from the village of Mandrakia to Mytakas (Fig. 5), a continuous cliff exposure of dominantly white, relatively soft rocks allows observation of the upper Pliocene – lower Pleistocene succession in Milos showing particular features of volcaniclastic deposits and fossiliferous rocks.

The stratigraphic succession shows an alternation of packages of volcaniclastic rocks, mainly felsic pumice-rich grainy deposits, and fossiliferous sedimentary rocks where laminated diatomaceous sequences prevail. The succession is up to 300 m thick. Five volcaniclastic units and 4 diatomite units (written V.U. and D.U., respectively, in Fig. 6) can be recognized.

The accommodation space available for both development and distribution of the upper Pliocene – lower Pleistocene rocks of northern Milos resulted from the combined effect of submarine volcanism and sea-level changes (Fig. 7). The submarine volcanic activity dealt

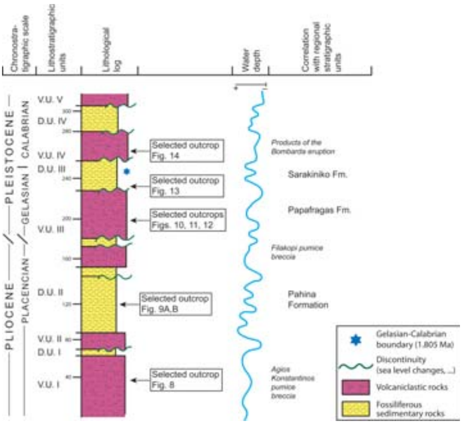


*Fig. 6. Summary sketch of the upper Pliocene - lower Pleistocene succession in northern Milos (after Calvo et al., 2012). Note that the Gelasian/Calabrian boundary (1.805 Ma) is located within the laminated diatomaceous marlstone deposits of Diatomite Unit III. The stratigraphic position of outcrops shown in figures 8 to 14 is indicated.*

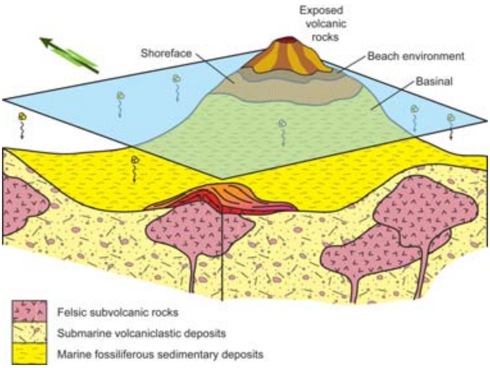


*Fig. 7. Idealised scenario of volcanic activity and associated volcanic products as well as sedimentation processes in Milos Island throughout the late Pliocene - early Pleistocene (for additional information see Calvo et al., 2012).*

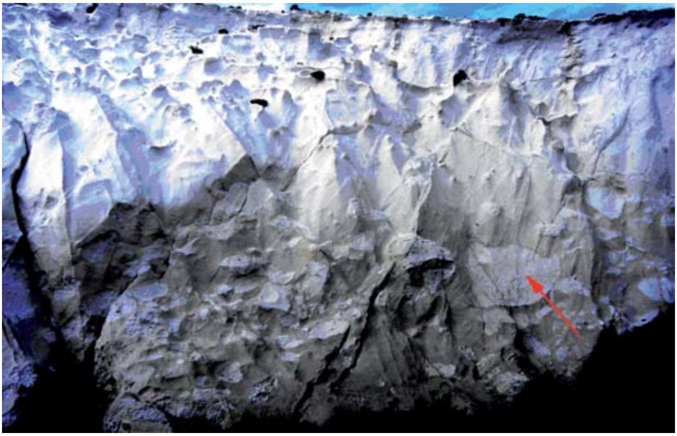

*Fig. 8. Coarse pumice breccia cropping out in coastal cliffs near Mandrakia. Pumice boulders included in fine-grained volcaniclastic matrix at the lower part of the cliff reach up to 4 m in size (arrowed boulder).*

mainly with the emplacement of cryptodome-pumice cone volcanoes (Stewart & McPhie, 2006). Extensive reworking of volcanic grains, mainly glass shards, by shallow marine currents and gravity flows accounted for the accumulation of volcaniclastic deposits. The resulting likely palaeogeography is a number of silled basins where laminated diatomaceous marlstone accumulated.

## Selected outcrops

Coarse pumice breccia deposits near Mandrakia

## Diatomaceous deposits


*Fig. 9. A) Outcrop of D.U. II, located between Mandrakia and Sarakiniko, showing an up to 9 m continuous thick sequence of laminated diatomaceous deposits. B) Large, isolated burrow patches (Ophiomorpha? sp.) producing local soft-sediment deformation within laminated diatomaceous marlstone. Occurrence of this feature can be observed in all diatomite units but especially in D.U. II.*

## Volcaniclastic deposits in Sarakiniko

*Fig. 10. General view of Sarakiniko. Excellent exposures of well-bedded, pumice-rich deposits can be observed in this location while bathing.*

*Fig. 11. Convolute bedding and flame soft-sediment deformation structure in very fine-grained pumice deposit overlain by well-bedded, coarser-grained volcaniclastics. Outcrop is located in one of the creeks entering the beach of Sarakiniko.*

*Fig. 12. Outcrop in Sarakiniko showing soft-sediment deformation structures due to loading of coarse-grained, lithic-rich volcaniclastics over fine-grained pumaceous deposits.*

## Big volcanic blocks aligned within the shallow marine deposits

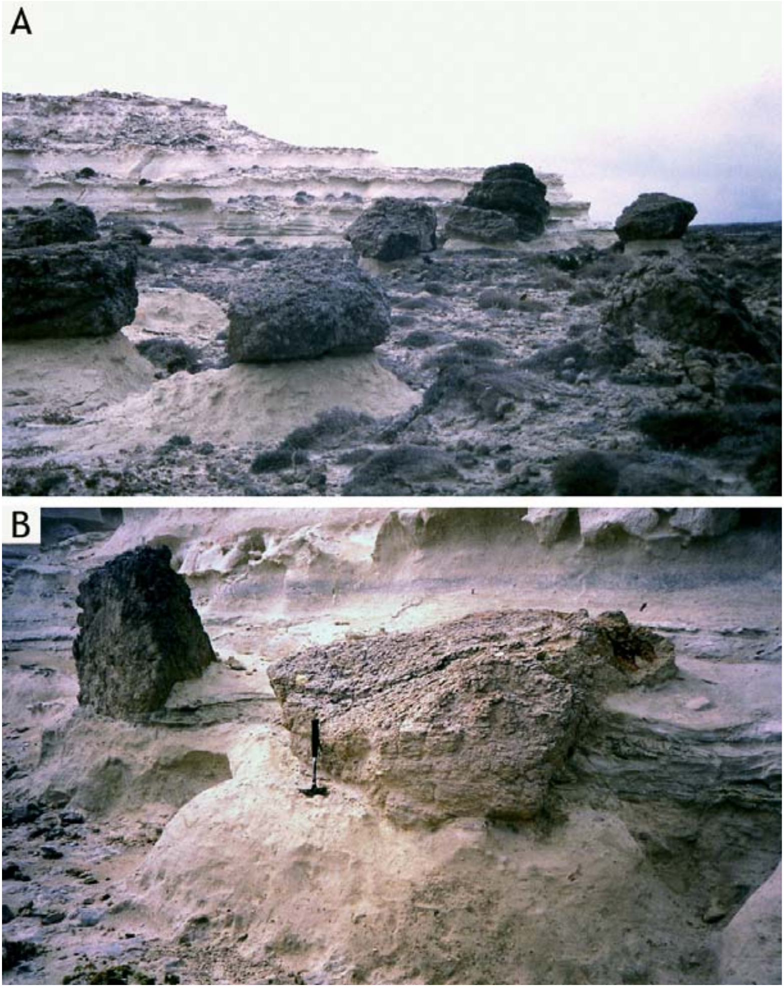


*Fig. 13. A) Aligned isolated blocks of volcanic rock cropping out east of Sarakiniko. Maximum size of the blocks is about 3 m. The blocks occur distributed at the same stratigraphic level formed of laminated sandstone and siltstone at the lowermost part of D.U. III. B) Detail of Fig. 13A: close-up view of big dacite-andesite volcanic blocks resting on wave-rippled sandstone and siltstone. Notice deformation of the underlying beds due to loading.*

## Stratified to laminated ash and pumice blocks

*Fig. 14. Thinly-bedded to laminated ash composed of pumice and glass shards passing upward into ash beds with pumice block (0.50 – 1.20 m in size) concentrations. Height of the outcrop is 7 m.*

## Mining in Milos – a view for geologists

The island of Milos hosts a quite diverse mineral inventory, especially dealing with industrial minerals (Stamatakis **et al.**, 1996). Bentonite, barite, kaolin, perlite, amorphous and crystalline silica, zeolite tuffs, pozzolanas, manganese, sulphur, obsisian and alum are the main mineral resources located in the island. However, only bentonite, perlite, pozzolanas abd crystalline silica are commercially exploited. Quarries of these minerals are locally very impressive because of their width and chromatic appearance (Fig. 15). Geologists visiting Milos will enjoy learning about formation of industrial minerals in a volcanic context. In addition, Milos offers a chance to know about how to make compatible mining activity with the island's flourishing tourist trade.

## Accommodation and meals

***Hotels*** in Adamas: Portiani, Captetan Georgandas, Lagada Beach Meltemi, Eleni

(http://www.globeholidays.net/Europe/Greece/Cyclades/Milos/Maps1.htm)

***Restaurants***: Apanemia, Gialos, Armenaki (**Pollonia**), Glaronisia (**Tripiti**), Alisachni (**Plaka**), Petrino (**Zefyria**), Spitiko, Kyma, Kynigos, Floisvos (**Adamas**)

*Fig. 15. View of a bentonite mine in Aggeria, south of Voudia (property of S&B Industrial Minerals SA). Bentonite operations are located at the east of Milos Island.*

## Acknowledgments

Maria Triantaphyllou (Nat. Kap. University of Athens) and Manuel Regueiro (Spanish Geological Survey) collaborated in the research project from which this article was based. Thanks are given to Pedro Castiñeiras (University Complutense, Madrid) for scientific suggestions and technical support.

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# STUDENT CORNER

## The short-term preservation potential of fish-derived carbonates in shallow tropical marine settings

*(IAS POSTGRADUATE GRANT SCHEME REPORT – 1ST SESSION 2011)*

### Introduction

Numerous studies during the last 40 years have documented the primary precipitation of calcium carbonate crystals within the intestines of all marine bony fish (Fig. 1; Shehadeh and Gordon, 1969; Walsh **et al.**, 1991; Wilson **et al.**, 2009). Recently it has been shown that, at least from 21 fish species in the Bahamas, these are subsequently excreted into the open water column as loosely aggregated, mucus-bound pellets of mud-grade low- and high-Mg calcite (Perry **et al.**, 2011; Salter **et al.**, In Review). Immediately at the point of excretion, crystals occur across a wide range of magnesium contents (<1–39 mol% $MgCO_3$) and are predominantly 0.5-2.0 µm in length. They display a diverse array of morphologies (including ellipsoids, dumbbells, spheres, and rhombohedra), many of which are unique in the shallow marine environment. By combining data on carbonate production rates and total fish biomass in the Bahamas, Perry **et al.** (2011) estimate that fish excrete $6x10^{-6}$ kg of $CaCO_3$ per year across the entire archipelago. Comparing this against production rates of other known carbonate mud producers, they propose that, in certain habitats, fish could be the source of up to 70 % of marine carbonate mud.

Fish are therefore a potentially significant, and previously unrecognised, source of marine carbonate mud in modern shallow tropical settings. However, in many cases the measured magnesium contents are exceptionally high for marine Mg calcites, and, indeed, they are significantly higher than the average $MgCO_3$ content of many modern high-Mg calcite mud samples (e.g. 10–13 mol% $MgCO_3$; Bosence, 1985; Reid **et al.**, 1992). Questions therefore arise about the ultimate fate of fish-derived carbonates. Numerous solubility studies of the common marine $CaCO_3$ polymorphs (calcite, aragonite, and Mg calcite) show that high-Mg calcites are the least stable of these in contemporary marine settings (Plummer and Mackenzie, 1974; Walter

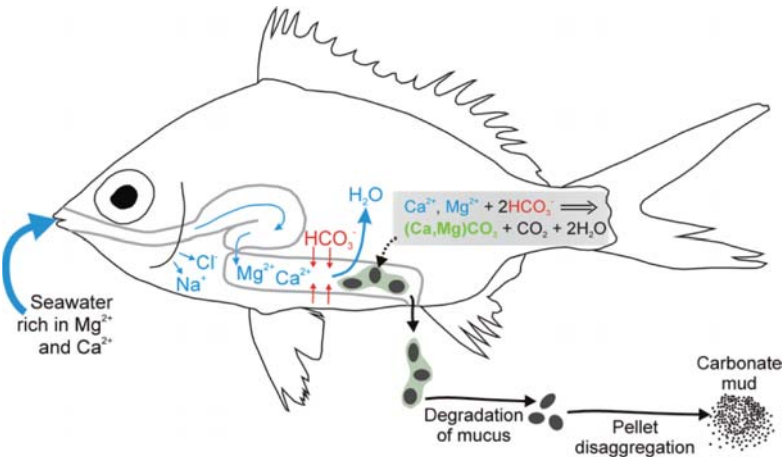


*Fig. 1.- Schematic diagram showing processes that lead to carbonate precipitation within the intestines of marine fish. Fish continuously imbibe seawater. $Na^+$ and $Cl^-$ ions are removed via the gills. $Mg^{2+}$ and $Ca^{2+}$ are removed via precipitation of Mg calcite within the intestine, which is facilitated by the secretion of $HCO_3^-$ into the intestine. Water is then absorbed into the bloodstream via the intestine walls, whilst Mg calcite is excreted into the open marine environment as mucus-bound pellets which readily disaggregate to release individual mud-grade Mg calcite crystals (see Wilson* et al. *2009 for further detail)*

and Morse, 1984; Bischoff **et al.**, 1987), and it is considered that the upper limit for stability in seawater at 25 °C is approximately 15–20 mol% $MgCO_3$ (Bertram **et al.**, 1991). It is therefore reasonable to speculate that, whilst some (particularly low-Mg calcite) fish-derived carbonates may be stable in shallow tropical marine settings, many could be subject to processes of rapid dissolution and/or recrystallization, particularly given their small grain size and associated large amounts of excess free energy.

The phase of work for which funding has been received from the IAS aims to determine the short-term preservation potential for a variety of fish-derived carbonates representing the full range of crystal morphologies and magnesium contents, by means of a series of simple experiments. Specific objectives include: i) the examination of the post-excretion interaction between carbonates and their organic mucus membranes; and ii) the influence of seawater and porewater solutions on the stability of these carbonates. The results of this study will improve understanding of the sedimentary significance of fish-derived carbonates and provide criteria for their identification in natural settings, thus facilitating the examination of sediment core samples in order to identify and quantify their presence over a range of longer time-scales.

## Methodology

Fieldwork was conducted at the Cape Eleuthera Institute (CEI), Eleuthera, the Bahamas in December 2011. Several fish species with known crystalline products were selected for experimental work to ensure that the preservation potential

*Fig. 2.- Researchers using the seine net method for capturing fish close inshore*

of the full range of crystal morphologies and compositions was investigated. Fish were captured from various nearshore sites either by hook and line, baited trap, or seine net (Fig. 2). Immediately after capture fish were transferred to tanks within the aquaria facilities at CEI (Fig. 3A), where they were kept individually or in small groups (up to 15 individuals). Tanks were supplied with a constant flow of aerated seawater drawn from nearby offshore, and thus physical conditions in which fish were kept were close to ambient local near-surface waters: salinity of 36-37 (practical salinity scale) and temperature of 24-28°C. Seawater was filtered to 1 ìm in order to minimise influx of external carbonate minerals (foram tests, fragments of calcareous algae etc.) entering the system. Fish were kept in these conditions, unfed, throughout the experimental period, and were left for two days prior to sampling to allow excretion of food material ingested

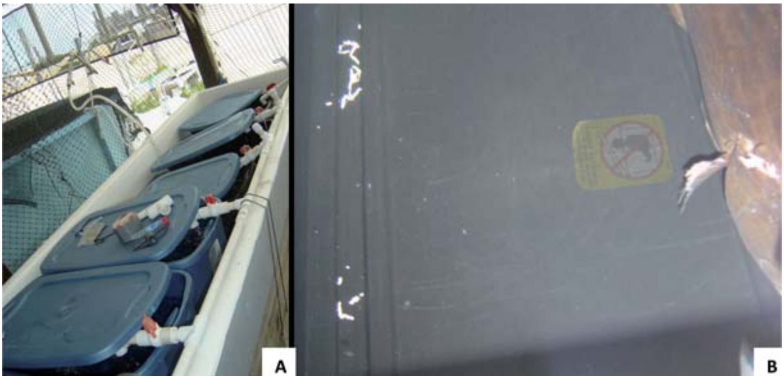


*Fig. 3.- (A) Array of tanks in which fish were kept, supplied with constant flow of seawater (drawn from close inshore). (B) Black grouper,* Mycteroperca bonaci, *in a tank with a typical example of excreted mucus-bound carbonates (white pellets, left side of image).*

before capture. Excreted carbonates (Fig 3B) were collected daily using a plastic Pasteur pipette.

Excreted carbonates were used in three main experiments: i) very short-term (days to weeks) preservation in seawater to examine the behaviour of crystals immediately after excretion, and to identify interactions between crystalline material and the organic mucus membrane in which it is excreted; ii) extended short-term preservation (several months) in seawater to examine the behaviour of crystals after prolonged exposure to open marine conditions, after natural degradation of the organic mucus membrane; and iii) short-term preservation in porewater environments to examine the behaviour of crystals early in their burial history.

### *Short-term preservation experiments (days/weeks)*

For short-term preservation experiments in seawater, samples were placed in 300 ml of filtered seawater for periods of 2, 4, 8, 12 and 16 days. Seawater was aerated via polyethylene tubing (internal diameter 0.58 mm) connected to an electric pump, thereby maintaining oxygenated conditions whilst also gently agitating the carbonate samples (thus mimicking the natural movements they would usually experience associated with waves and currents). Aeration was removed on every second day to allow any carbonates in suspension to settle out prior to half of the seawater being siphoned off and replaced with freshly collected and filtered seawater.

After this experimental phase samples were taken out of the seawater and processed to remove organic residues and dissolved salts. A rapid rinse in distilled water to remove salts, was followed by soaking in 5.25% sodium hypochlorite (commercial bleach) for several hours to disaggregate organic material (after Gaffey and Bronniman, 1993). A final rinse in distilled water was carried out to remove all remaining salt and bleach residues before samples were filtered onto 47 mm, 0.45 ìm cellulose nitrate membranes. The cleaned carbonates were then dried on the membranes in a low temperature oven at 40 °C before being transported back to the UK for analysis.

For samples in these (and all other) preservation experiments, corresponding control samples were also collected within two hours of excretion, thus allowing comparisons to be made between crystals immediately at the point of excretion and after the intervening experimental periods.

### *Short-term preservation experiments (months)*

The initial stages of this experiment followed the protocol described above. However, due to time restrictions at the field location, it was necessary to complete the experiment in the UK. After a two week phase in natural filtered seawater, samples were transported back to the UK in 30 ml of artificial seawater (Tropic Marin) held in watertight plastic containers (eliminating the need to dry samples and thereby minimising the possibility that further interactions in the crystal-fluid-organic system would be altered). After a transport time of 40 hours, samples were transferred to 500 ml artificial seawater (Tropic Marin) in covered glass beakers. Water temperature was maintained at 28 °C (annual average near-surface temperature of near-shore seawater off Eleuthera) by keeping the bottles in a heated water bath. Artificial seawater was prepared with a salinity of 36 (practical salinity scale), and half was removed and replaced with a freshly made batch (pre-heated to 28 °C) on a weekly basis. Aeration to each bottle was via a quartz sand air stone connected to a compressed air supply. Sub-samples were collected from each beaker after periods of one, three, and six months, and processed following the method outlined above.

### *Porewater preservation experiments*

Samples were collected for porewater experiments in the same manner as described for the seawater preservation experiments (above). Having been kept, with mucus intact, in seawater for up to 10 days, samples were placed in plastic screw-cap containers perforated with several hundred 0.5 mm holes. These containers were designed to facilitate free circulation of porewater whilst preventing external sediments from entering and contaminating the fish-derived carbonates. The containers are also able to better withstand disturbances caused by burrowing organisms than other porous media (e.g. dialysis bags) and do not alter the water chemistry such as a metal container might.

Containers were subsequently buried within loose sediment, approximately 10 cm below the sediment-water interface. The burial location in Eleuthera Sound (Fig. 4A) is typical of the sedimentary environments in this area: a wide expanse of skeletal sands, numerous small patch reefs distributed throughout, sparse to medium seagrass cover, overlying waters that are 2 to 8 m in depth, and a limited tidal range (but strong tidal currents). The skeletal sands form a veneer of loose sediment overlying a hard carbonate surface (presumably bedrock or sub-surface hardground), and vary in thickness from approximately 5 to 30 cm. The specific burial site, approximately 15 m away from a known patch reef (located by GPS), was selected as a sheltered site where samples could readily be relocated. Water depth at the site is 3 m.

Sample burial took place with the aid of SCUBA. An array of several 1 m long, 2.5 cm diameter PVC pipes (tapered at one end) were hammered through the sediment veneer to a depth where they

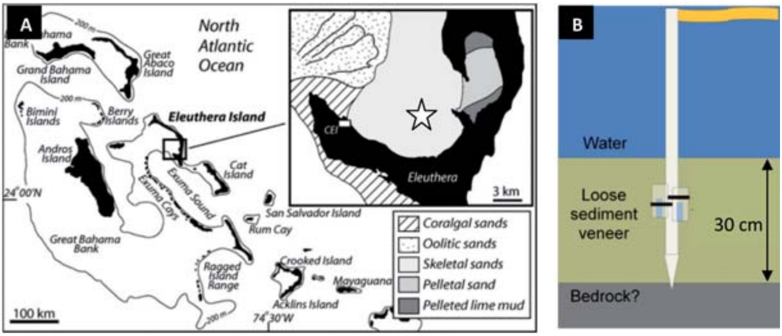


*Fig. 4.- (A) Map showing the location of Eleuthera Island and (inset) CEI and the sample burial location (star). Inset map also shows the major sedimentary facies of Eleuthera Sound (after Dravis, 1979). (B) Detail on the porewater preservation experimental setup, showing buried samples held in two containers attached to a stake (PVC pipe).*

were secure. Shallow pits were then dug by hand in the surficial sediment surrounding each pipe, and within the hollow two sample containers were attached to each pipe with cable ties. The pits were refilled to the original sediment level, such that containers were approximately 10 cm below the sediment-water interface (Fig. 4B). Following burial, seawater within the containers should have rapidly equilibrated with surrounding porewaters. Samples are due to be collected in March 2012, by which time they will have spent 3 months in the porewater environment. Upon collection samples will be processed with distilled water and bleach as described above. Porewater samples will also be retained for characterisation (carbonate ion activity, pH etc.)

### *Analytical techniques*

All samples will be analysed at Manchester Metropolitan University in the UK using Scanning Electron Microscopy (SEM)-based techniques and X-ray diffraction (XRD). Detailed examination of crystal morphologies will be conducted on intact and disaggregated pellets (disaggregated by placing in an ultrasonic bath with deionised water for a few seconds) using SEM-based backscatter electron (BSE) and secondary electron (SE) imaging. Chemical analyses will be conducted using SEM-based Energy-dispersive X-ray spectroscopy (EDX). XRD data will determine the mineral phases and, in the case of Mg calcites, will also be used to confirm $MgCO_3$ contents (thus supporting EDX data). This suite of techniques will facilitate the tracking of morphological, mineralogical and compositional changes as they have taken place throughout the experiments described above.

Additional analytical techniques could include Fourier transform infrared spectroscopy (FTI-R) to track changes in degree of crystallinity, and inductively coupled plasma atomic emission spectroscopy (ICP-AES) to measure trace element concentrations.

## Results

The extended short-term seawater and porewater preservation experiments are ongoing and as such there are presently no data to report. However, SEM observations and chemical analyses have been conducted on some of the short-term (up to 16 days) seawater preservation experiments and preliminary results are presented below.

Casual observations of all samples during the experimental phase indicate that, after 16 days in seawater, the organic mucus membranes surrounding carbonates were almost entirely disaggregated. All crystalline samples examined with SEM to date, which include low-Mg calcite spheres and high-Mg calcite ellipsoids, show that no apparent morphological changes took place during the 16 day experimental period (Fig. 5). There also appear to have been no compositional changes; differences between samples are within the range of variability found in previous studies (Salter **et al.**, In Review)

## Discussion and Further Work

These preliminary results indicate that, in the post-excretion marine environment, fish-derived carbonates undergo no significant changes. Given that the mucus membrane they are excreted in is in a highly degraded state by the end of 16 days in seawater, it appears unlikely that this organic material has any significant post-excretion influence on these carbonates. Further detailed analyses

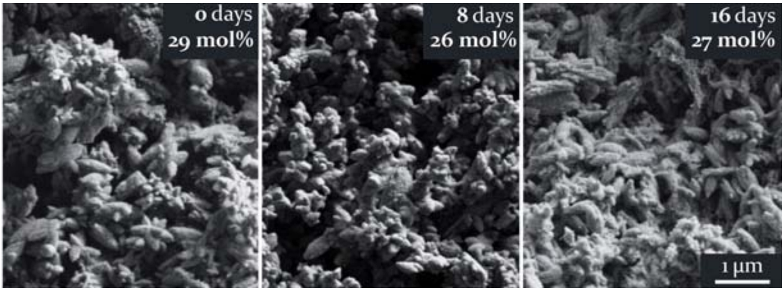


*Fig. 5.- SEM images showing high-Mg calcite ellipsoids precipitated within the intestine of black grouper (*Mycteroperca bonaci*) and kept in aerated seawater for periods of 0, 8, and 16 days after excretion. Average $MgCO_3$ content is also shown. No morphological or compositional changes appear to have taken place during this period.*

are ongoing and will aim to confirm this.

At least in the very short-term, fish-derived carbonates appear to be insoluble in the shallow tropical marine environment and it is therefore perhaps not surprising that similar crystals have been described from Bahamian surficial sediments (Perry **et al.**, 2011). However, the kinetic reactions governing processes of recrystallisation and/or dissolution depend on a complex range of factors and numerous reaction steps, the slowest of which is rate-limiting (Morse **et al.**, 2007). Consequently post-excretion changes to fish-derived carbonates may require longer than 16 days in which to take place, and the ongoing longer-term preservation experiments are therefore an important step towards an improved understanding of their sedimentary significance.

## Acknowledgements

I would like to thank the International Association of Sedimentologists for kindly providing financial assistance for this work. I am also grateful to my supervisors, Chris Perry and Rod Wilson (University of Exeter), for providing useful input and invaluable discussion throughout, and to the staff at CEI who assisted with fieldwork.

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# BOOK REVIEW

## IAS Special Publication N. 44

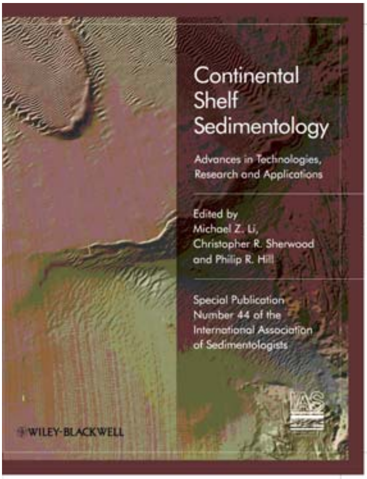
## Sediments, Morphology and Sedimentary Processes on Continental Shelves: Advances in technologies, research and applications

*BY MICHAEL Z LI, CHRISTOPHER R SHERWOOD, PHILIP R HILL (WILEY, 2012 - ISBN 978-1-4443-5082-1)*

The application of multibeam and sediment transport measurement technologies and the adoption of multi-faceted research methodologies have greatly advanced our understanding of the sedimentary processes on continental shelves in the last decade.

This book uniquely blends cutting-edge research and state-of-the art review articles that take stock of new advances in multibeam mapping and sediment transport technologies, spatial analysis and modelling, and the applications of these advances to the understanding of shelf sediments, morphodynamics, and sedimentary processes. Case studies are also presented to illustrate the utilization of seabed property and process knowledge in habitat mapping and ocean management.

With its mix of papers focusing on technological advances, integration of shelf morphology and processes, and the application of these advances to coastal and ocean management, this Special Publication volume will serve as a milestone reference for professional marine scientists and as advanced text for students in marine geology, sedimentology and oceanography.



## Articles

Optimal use of multibeam technology in the study of shelf morphodynamics.
JOHN E. HUGHES CLARKE

Palaeogeographic reconstruction of Hecate Strait British Columbia: changing sea levels and sedimentary processes reshape a glaciated shelf.
J. VAUGHN BARRIE AND KIM W. CONWAY

Changes in submarine channel morphology and slope sedimentation patterns from repeat multibeam surveys in the Fraser River delta, western Canada.
PHILIP R. HILL

Recent sedimentary processes in the Cap de Creus canyon head and adjacent continental shelf, NE spain: evidence from multibeam bathymetry, sub-bottom profiles and coring.
A. GARCI´A-GARCI´A , T. SCHOOLMEESTER, D. ORANGE, A. CALAFAT, J. FABRES, E. GROSSMAN, M. FIELD, T.D. LORENSON, M. LEVEY AND M. SANSOUCY

Geology metrics for predicting shoreline change using seabed and sub-bottom observations from the surf zone and nearshore.
JESSE E. McNINCH AND JENNIFER L. MISELIS

Re-examination of sand ridges on the middle and outer New Jersey shelf based on combined analysis of multibeam bathymetry and backscatter, seafloor grab samples and chirp seismic data.
JOHN A. GOFF AND LAURIE SCHUUR DUNCAN

Sedimentary facies of shoreface-connected sand ridges off the East Frisian barrier-island coast, southern North Sea: climatic controls and preservation potential.
CHANG SOO SON , BURGHARD W. FLEMMING AND TAE SOO CHANG

Recent advances in understanding continental shelf sediment transport.
L.D. WRIGHT

Recent advances in instrumentation used to study sediment transport.
JON J. WILLIAMS

Seabed disturbance and bedform distribution and mobility on the storm-dominated Sable Island Bank, Scotian Shelf.
MICHAEL Z. LI, EDWARD L. KING AND ROBERT H. PRESCOTT

Temporal variability, migration rates and preservation potential of subaqueous dune fields generated in the Agulhas Current on the southeast African continental shelf .
BURGHARD W. FLEMMING AND ALEXANDER BARTHOLOM A

Measurement of bedload transport in a coastal sea using repeat swath bathymetry surveys: assessing bedload formulae using sand dune migration.
GARRET P. DUFFY AND JOHN E. HUGHES CLARKE

Analyzing bedforms mapped using multibeam sonar to determine regional bedload sediment transport patterns in the San Francisco Bay coastal system.
PATRICK L. BARNARD , LI ERIKSON, DAVID M. RUBIN , PETE DARTNELL AND RIKK G. KVITEK

Sediment transport on continental shelves: storm bed formation and preservation in heterogeneous sediments.

T. R. KEEN , R. L. SLINGERLAND, S. J. BENTLEY, Y. FURUKAWA , W. J. TEAGUE AND J. D. DYKES

Tidal influence on the transport of suspended matter in the southwestern Yellow Sea at 6 ka.
KATSUTO UEHARA AND YOSHIKI SAITO

Origin, transport processes and distribution pattern of modern sediments in the Yellow Sea.
XUEFA SHI , YANGUANG LIU , ZHIHUA CHEN , JIANWEI WEI, SHULAN GE , KUNSHAN WANG , GUOQING WANG , SHOUYE YANG , SHUQING QIAO , DELING CAI , ZHENBO CHENG, WENRUI BU AND HI-II YI

Seasonal and spatial variation in suspended sediment characteristics off the Changjiang estuary.
GUOQING WANG, XUEFA SHI, YANGUANG LIU, XISHENG FANG AND GANG YANG

Factors controlling downward fluxes of particulate matter in glacier-contact and non-glacier contact settings in a subpolar fjord (Billefjorden, Svalbard).
WITOLD SZCZUCIN´ SKI AND MAREK ZAJA²CZKOWSKI

On seabed disturbance, marine ecological succession and applications for environmental management: a physical sedimentological perspective.
PETER T. HARRIS

Benthic habitat mapping from seabed acoustic surveys: do implicit assumptions hold?.
VLADIMIR E. KOSTYLEV

# ANNOUNCEMENTS

## Extreme sedimentary events @ the Geologische Vereinigung Annual Meeting on «Of Land and Sea: Processes and Products» Hamburg, Germany, September 23-28, 2012.

For information, please click: http://www.gv-hamburg2012.de/

Conveners:

Heinrich Bahlburg, Institut für Geologie und Paläontologie, Münster University, Germany

Robert Weiss, Department of Geosciences, Virginia Tech, U.S.A.

Session will be addressed to the analysis of sedimentological processes involved in the generation and preservation of the sediments and sedimentary rocks deposited during extreme sedimentary events, modern and ancient. Such events include, but are not restricted to, floods, storms and hurricanes, submarine and subaerial mass wasting, pyroclastic processes, earthquakes and tsunami. Observations on event magnitudes, rates of change and recurrence intervals relevant for hazard estimates are particularly welcome. Contributions may represent theoretical, analogue and numerical considerations as well as case studies of modern or ancient examples.

Visit the BSRG at www.bsrg.org.uk

## Alluvial Fans 2012 Al-Khaimah, United Arab Emirates, December 1-6, 2012

The Fourth International conference on Alluvial Fans will be held from, at Ras Al-Khaimah, United Arab Emirates. The meeting will bring together an international and interdisciplinary group of scientists interested in various aspects of alluvial fans: sedimentology, geology, geomorphology, geotectonics, hydrology, hydrogeology, engineering, resources and hazards, economics, and land use on fans. Studies of modern fans as well as fans that are part of the stratigraphic record will be presented. All those interested in the study of alluvial fans are invited to attend this meeting.

### Meeting Description

The meeting will consist of four days of presentation sessions (Saturday Sunday, Tuesday and Thursday), and two days of mid-conference field trips to examine fans in the Ras Al-Khaimah and Eastern coastal areas (Monday and Wednesday). Presentations may be made in either oral or poster format. A post-meeting field trip is also being organized.

### Contact Information

Website: http://alluvialfans.co.uk/

Dr. Asma Al-Farraj, Geography program, UAE University, P.O Box 177771, Al-Ain United Arab Emirates, Tel: 97137555557, Fax: 97137670495, asma@uaeu.ac.ae

Prof Adrian Harvey

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Dr. Anne Mather

School of Geography, University of Plymouth, UK.

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## VI Latinamerican Congress Of Sedimentology São Paulo (Brazil) - December 9-12, 2012

The Latinamerican Congress of Sedimentology is an event that takes place every three years, and has the purpose of promoting integration among geoscientists interested to exchange experiences on several disciplines related to sedimentology and stratigraphy of South America, including their application for hydrocarbon and mineral exploration. The first congress of this nature took place in Margaritas Island (Venezuela) in 1997, the second in Mar del Plata (Argentina) in 2000, the third in Belém (Brazil) in 2003, the fourth in Bariloche (Argentina) in 2006, the fifth in Puerto La Cruz (Venezuela) in 2009.

The 6th Latinamerican Congress of Sedimentology will take place in São Paulo, Brazil, from December 9th to 12th, 2012. The technical programme comprises 51 thematic sessions grouped into 11 main themes that will be developed during three days of the congress. The main themes include: siliciclastic depositional systems and sequences; carbonates and evaporates; tectonics and sedimentation; source-to-sink systems; volcano-sedimentology; palaeontology and sedimentology; sedimentary record of climate change; geohazards and applied sedimentology; sedimentology and carbon energy resources; and geotechnologies. Five short courses will take place previously from the congress, which are: SC1 - Biomarkers in petroleum geology; SC2 - Microbialites; SC3 - Stalagmites and sediment cores as paleoclimate archives; SC4 - Depositional models and petrophysics of siliciclastic reservoirs; and SC5 - Dating of depositional and diagenetic events (OSL, Pb210, Cs137, U-Pb, K-Ar and Ar-Ar). The congress will also have organized one pre-congress field trip, i.e., FT1 - The Itu Varvite Park and the roche moutonnée of Salto, State of São Paulo, and three post-congress field trips, which are: FT2 - The Gondwana succession at the eastern part of the Paraná Basin, State of São Paulo; FT3 - The estuarine system of Cananéia and the caves of the Ribeira de Iguape River Valley; and FT4 - The Mantiqueira Plateau, Taubaté Basin and the Serra do Mar coastal range: tectonics and sedimentation in the elevated, passive continental margin of Southeastern Brazil. In addition, the congress will run six conferences with outstanding lecturers.

All participants are invited to submit abstracts for oral and poster presentations. Abstracts should be submitted to the congress address between May 1 and June 15, 2012. For more information about this congress, including registration fees and direction for abstract preparation, please access the web: **http://www.6lacs.com**

Any questions related to this congress should be addressed to the following e-mail address: contact@6lacs.com

## Contact Information

Claudio Riccomini
President of the Organizing Committee
VI Latinoamerican Congress of Sedimentology
São Paulo, Brazil
riccomin@usp.br

# IAS STUDENT GRANT APPLICATION GUIDELINES

## 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.

Recommendation letter (by e-mail) from the PhD supervisor supporting the applicant is mandatory, as well as recommendation letter (by e-mail also) from the Head of Department/ Laboratory of guest institution in case of laboratory visit.

Please make sure to adequately answer all questions.

## Deadlines and notifications

Application deadlines:
1st session: March, 31
2nd session: September, 30
Recipient notification:
Before June, 30
Before December, 31

## Guidelines for letter from supervisor

The letter from the supervisor should provide an evaluation of the capability of the student to carry out the proposed research, the significance and necessity of the research, and reasonableness of the budget request. The letter must be sent directly to the Treasurer of the IAS by e-mail before the application deadline.

## 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

When you apply for a grant, your PhD supervisor will receive an automated e-mail with a request to send the IAS a letter of recommendation by e-mail. You should, however, check with your supervisor everything is carried out the way it should be. It will be considered as a plus for your application if your PhD supervisor is also a member of IAS.

Supervisor's name: .......

Supervisor's e-mail: .......

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 fill in his/her name and e-mail address to solicit his/her advise about your visit.

Name of Head of guest Department/ Laboratory: …….

E-mail address of Head of Guest Department/Laboratory: …….

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 had contact in the past with the Head of the Guest Department/Laboratory (if appropriate)

# CALENDAR

## The 6th International Siberian Early Career GeoSciences Conference

*9th-23rd June*
*2012*
*Novosibirsk*
*Russia*

Info
http://sibconf.igm.nsc.ru

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## Italian Association for Sedimentary Geology GeoSed

*2nd-6th July*
*2012*
*Feltre*
*Italy*

Massimiliano Ghinassi
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## 8th International Conference on Tidal Environments

*28th July–5th August 5*
*2012*
*Caen, Normandy*
*France*

Bernadette Tessier
bernadette.tessier@unicaen.fr
www.unicaen.fr/colloques/tidalites2012/index.php

## 34th International Geological Congress (IGC)

*5th-10th August*
*2012*
*Brisbane*
*Australia*

Info
http://www.34igc.org

## European Seismological Commission 33rd General Assembly

*August 19-24,*
*2011*
*Moscow,*
*Russia*

Marianna Tuchkova
tuchkova@ginras.ru

## Of Land and Sea: Processes and Products

*3rd-28th September*
*2012*
*Hamburg*
*Germany*

Info
http://www.gv-hamburg2012.de/

## 29th IAS MEETING OF SEDIMENTOLOGY *

*10th-13th September*
*2012*
*Schladming*
*Austria*

Hans-Jürgen Gawlick
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www.sedimentologists.org/ims-2012

## 4th International Geologica Belgica Meeting 2012

*11th-14th September*
*2012*
*Brussels*
*Belgium*

Info
http://www.geologicabelgica.be

## 86TH CONGRESS OF THE ITALIAN GEOLOGICAL SOCIETY (SGI) «MEDITERRANEAN: A GEOLOGICAL ARCHIVE FROM PAST TO THE PRESENT»*

*18th-20th September 2012*
*Arcavacata di Rende, Italy*

Salvatore Critelli
critelli@unical.it
www.socgeol.it

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## GV and SEDIMENT «Of Land and Sea: Processes and Products»

*23rd-28th September 2012*
*Hamburg Germany.*

Christian Betzler
gv-hamburg2012@gv-conference.de
www.gv-hamburg2012.de/.

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## GV and SEDIMENT meeting 2012
Of Land and Sea: Processes and Products

*23rd-28th September 2012*
*Hamburg Germany*

Info
http://www.gv-hamburg2012.de/

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## AT THE EDGE OF THE SEA: SEDIMENTS, SEA LEVEL, TECTONICS, AND STRATIGRAPHY AS MAIN ELEMENTS OF A MULTIDISCIPLINARY APPROACH AND CORRELATION IN STUDYING QUATERNARY CHANGES *

*27th-30th September 2012*
*Alghero Italy*

Mauro Coltori
mauro.coltorti@unisi.it
www.dst.unisi.it/SEQS2012.htm

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## Hopi Buttes volcanic field workshop: interpreting maar-diatreme volcanism using base to top exposures, syn-eruptive surface deposits and country-rock strata

*21st-27th October 2012*
*Flagstaff Arizona (USA)*

Info
Nathalie Lefebvre
nathaliel.lefebvre@otago.ac.nz

## 3RD CONFERENCE TERRESTRIAL MARS ANALOGUES*

*25th-27th October*
*2012*
*Marrakech*
*Ibn Battuta Centre*
*Morocco*

Gian Gabriele Ori
ggori@irsps.unich.it
www.ibnbattutacentre.org/conf/mars2012

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## Alluvial Fans

*1st-6th December*
*2012*
*Ras Al-Khaimah*
*United Arab Emirates*

Info
http://alluvialfans.co.uk/

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## VI LATINAMERICAN CONGRESS OF SEDIMENTOLOGY*

*9th-12th December*
*2012*
*São Paulo*
*Brazi*

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