The Newsletter of the International Association of Sedimentologists

Issue 10, 2021

Dear IAS Members,
Welcome to the latest issue of the IAS Newsletter.

This month, we open the next round of IAS grant applications – applications are now open for Postgraduate, Postdoctoral and Institutional Grants as well as for the Judith McKenzie Field Work Award.

The deadline to submit your nominations for the IAS awards is fast approaching – there are 5 awards for which we are seeking nominations – the Sorby Medal, Johannes Walther Award, Early-Career Scientist Award and Sun Shu Prizes (x2). The nomination procedure is very simple – if you have a colleague you feel is deserving of recognition by the IAS, then please do invest the few minutes needed to put their name forward for consideration by our selection committees.

As we draw closer to the end of the year, it can be easy to forget to renew our annual membership. Remember that, to take advantage of all that the IAS has to offer, you need to keep your membership up to date – go on, renew now, it'll only take a minute….

Stephen Lokier, *General Secretary*

The 21st International Sedimentological Congress, Beijing 2022

The 21st International Sedimentological Congress will be held in Beijing between the 22nd and 26th August 2022 – get the dates into your diary. **Visit the website for full details.**

This promises to be a truly exceptional meeting with a plethora of exciting, once-in-a-lifetime fieldtrips on offer.

Notification of General Assembly - 2021

The General Assembly of the IAS will take place on December the 10th 2021 at 2pm CET. Due to ongoing restrictions on travel, the meeting shall be held online. The agenda will be distributed to all Members via email 1 month prior to the meeting.

Introducing – Edward Matheson
New Member of the IAS Early Career Scientists Committee

I am currently a Mitacs Postdoctoral Fellow at Queen's University in Kingston, Canada. My research interests are wide-ranging with a focus on Paleozoic biochemical sedimentary rocks, particularly those with limited modern analogues that accumulated during periods of biotic and oceanic instability. I completed my PhD at the University of Nebraska-Lincoln where I investigated a phosphorite-chert-carbonate-evaporite succession that recorded the complex interplay of supercontinental climate and regional oceanography in an epicontinental sea along the Laurentian margin. Ongoing work from an earlier NSERC Postdoctoral Fellowship at Queen's focused on refining ironstone depositional models and investigating its use as a proxy for Paleozoic oceanic oxygenation and biotic instability, as well as work on the genesis of manganiferous carbonates. My current projects include research on a Paleozoic potash giant, carbonate reefs, and ancient high-energy inner-ramp carbonate sands. I am excited to be joining the IAS Early Career Scientists Committee to help ensure the voices of early career sedimentologists are heard.

Edward Matheson

First call – Applications for the Judith McKenzie Field Work Award (Spring 2022 Session)

The **Judith McKenzie Field Work Award** aims to promote sedimentological field observations for the newest generation of Earth Scientists – MSc Students.

Up to 5 awards of €300 each, will be awarded twice per year to IAS student members. Since the award is only available for MSc students, proof of student status will be required. The awardee shall also receive a one-year IAS student membership, upon submission of their MSc thesis.

Applicants should apply for the Judith McKenzie Field Work Award via the **IAS website here**. The application requires submission of a grant proposal (written by the student) with budget and CV (template provided on the submission webpage), and a signed letter of recommendation from the student's supervisor. Applications must be submitted via the IAS website. Application deadline for the Spring 2022 Session is **31st March 24h00 Brussels Time (CET, UTC+1).**

Call for nominations for the:

IAS Sorby Medal
IAS Johannes Walther Award
IAS Early-Career Scientist Award
IAS Sun Shu Prizes

We are delighted to open the call for nominations for the Sorby Medal, Johannes Walther, Early-Career Scientist Awards and Sun Shu Prizes of the IAS.

The 2018 Sorby Medal was awarded to Luis Pomar

The Sorby Medal is the highest award of the International Association of Sedimentologists. It is awarded to scientists of eminent distinction in sedimentology. The Sorby Medal is awarded once every 4 years, at the occasion of the International Sedimentological Congress (ISC).

Or Bialik, winner of the 2020 Early Career Scientist Award

The IAS Early-Career Scientist Award is awarded to recognise contributions and potential of outstanding early-career scientists working in any area of sedimentology. The award is also given once every 2 years.

Emmanuelle Vennin, recipient of the 2020 Johannes Walther Award

The Johannes Walther Award is awarded to scientists at any stage in their career who are considered to have made a significant impact in the field of sedimentology. The award is given once every 2 years.

Huaichun Wu, Winner of the Sun Shu Prize China, 2020

Alex Brasier, Winner of the Sun Shu Prize International, 2020

The IAS Sun Shu Prizes are awarded to recognise outstanding work in the field of sedimentology. The prizes are awarded every two years to a Chinese scientist (SUN SHU Prize China) and an international scientist (SUN SHU Prize International).

Application deadline for all awards is **1st December 2021 24h00 Brussels Time (CEST, UTC+2).**

Full details of all prizes, together with nomination guidelines can be found here.

Obituary: Bernard Pittet (1966 – 2021)

Dear friends and colleagues,

It is with great sadness that we learned that Bernard Pittet passed away at the age of 55. In the spring, he was diagnosed with a very aggressive disease and since then, he fought bravely and with all his strength until the night of October 8th.

Bernard was a field geologist, an outstanding sedimentologist with a passion for his work. After obtaining his PhD in the group of André Strasser at the University of Fribourg in his native Switzerland, he moved to Germany and France to pursue his research as a postdoc in the field of carbonate sedimentology. In 1998, he started his professorship journey at the University Claude Bernard in Lyon, France. Through his research, he has embraced both sides of sedimentology, the carbonate and the siliciclastic world, in which he leaves his mark, refining conceptual models of carbonate export in basins, sedimentary processes involved in the exceptional preservation of fossils, and the constraint of hydrological processes in response to the growth of the Alpine Foreland Basin. In the frame of these projects, Bernard supervised and co-supervised more than 10 PhD students, leaving behind a legacy of sedimentologists active in both industry and academia.

In addition to his strength as a mentor, he was a highly valued colleague and a passionate teacher, and until his last days, Bernard regretted that he no longer had the strength to teach and pass on his sedimentology expertise both in the field and in the classroom! Nevertheless, his expertise is now in the hands of the many young (and not so young!) people he trained.

Bernard has always been very involved in activities serving the research community. His commitment to research and teaching was that of a warm-hearted man, with strong convictions and a strong character that made him very endearing, and who will be remembered. We offer our sincere condolences to his family and friends.

Romain Vaucher, Lausanne, October 2021

Judith McKenzie Field Work Award recipient MSc thesis now available

We are delighted to announce that the thesis of Jarno Huygh, recipient of a Judith McKenzie Field Work Award is now available using this link:

A new independent age model for type-Maastrichtian chalk near Hallembaye (Gulpen Formation, Upper Cretaceous) using a cyclostratigraphic approach based on X-ray fluorescence data

First call – Applications for Institutional Grants (Spring 2022 Session)

Twice a year, IAS awards an Institutional Grant of maximum 10,000 Euro, which is intended to support capacity building initiatives in less developed countries (LDCs). Grants will allow earth science departments in LDCs to acquire durable sedimentological equipment for teaching and research, or tools that can be used by all geology students. The grant application should thus clearly demonstrate how the grant will increase the recipient's capacity to teach sedimentology at undergraduate level in a sustainable way.

Applications must be submitted via the IAS website. Application deadline for the Spring 2022 Session is **31st March 24h00 Brussels Time (CET, UTC+1).**

More information about the Institutional Grant Scheme and guidelines on how to apply can be found on your membership profile.

The Journals of the IAS

For a quick overview of the latest issues of **Sedimentology, Basin Research** and **The Depositional Record**, follow these links:

- **Sedimentology**: directly at Wiley or via the IAS website
- **Basin Research**: directly at Wiley or via the IAS website
- **The Depositional Record**: directly at Wiley or via the IAS website

All of the journals of the IAS are active on Twitter. Stay up to date on the latest news and papers in @sedimentology by following the IAS journals: @JSedimentology, @DepositRecord, @BasinResearch.

The Depositional Record – Open Access – No APC!

The Depositional Record will receive its Impact Factor in Summer 2022. The IAS still pays the APC for papers accepted in The Depositional Record but this will not last forever. Get those submissions in soon!

The Depositional Record is a fully open access journal publishing high quality articles from across the field of Sedimentology. The journal covers all timescales, from Ancient to Modern, and welcomes articles that emphasise the application of sedimentary processes to the study of paleoclimate, changes in the chemical environment, ocean acidification, extra-terrestrial sedimentology, and the application of genetic methods to understanding sedimentological processes.

Open Access

Submit your paper today!

In Memoriam: Remembering Norman D. Smith

On September 9, 2021, Professor Norman D. Smith passed away after a seven-year battle with cancer. He left behind his wife, Judy, and their children, Laurence and Daniel.

Born to mink ranchers in the Adirondack region of northern New York State, USA Norm grew up to be an avid outdoorsman. He earned a B.S. degree in Geology from St. Lawrence University, going on to earn M.Sc. and Ph.D. degrees in Geological Sciences from Brown University. Norm was committed to the study of rivers, fluvial processes and their sedimentary records. He was primarily a field geologist and enjoyed the challenge of working in difficult field conditions. He was one of the early field-based researchers studying sedimentation in ice-contact lakes and glacial marine environments. In addition, he was intrigued by the origin of river bars and the geomorphology of braided, low-sinuosity and anastomosed rivers. He led field expeditions to remote parts of Alaska, Antarctica, Botswana, Canada, Iceland, India, New Zealand and South Africa, as well sites local to him in Nebraska, USA. He published numerous scientific articles about modern and ancient river systems, as well as glacial depositional environments.

Norm was an authority on river avulsions and the formation of natural levees, dedicating more than three decades to field studies of avulsion in his beloved Cumberland Marshes on the Saskatchewan River Delta, Canada. His work showed that that dam-induced sediment starvation is enlarging the main river channel, jeopardizing the current distribution of surrounding wetlands (Smith et al., 1989, Sedimentology). He forged particularly close ties to the Métis community of Cumberland House, Saskatchewan, working tirelessly to educate local residents and policymakers about the critical importance of Saskatchewan's wetlands to its people and the broader North American ecology.

Norm examining a map with long-time collaborator Rudy Slingerland, who sits to his right (image from the 2009 documentary Saskatchewan River Delta, used with permission of the 291 Film Company).

Norm speaking with a member of the film crew (image from the 2009 documentary Saskatchewan River Delta, used with permission of the 291 Film Company).

Norm was recognized for his outstanding scientific efforts. He was a Fulbright Scholar, fellow of the Geological Society of America, and the 2012 SEPM Francis J. Pettijohn Medalist for excellence in sedimentology. He was Editor of the Journal of Sedimentary Petrology (1983-1988) and acted as a liaison between SEPM and IAS. He published in Sedimentology as well as a number of IAS Special Publications. In 1999, he edited the IAS Special Publication Number 28 (with John Rogers), "Fluvial Sedimentology VI".

Norm was also dedicated to advancing science literacy and gave generously of his time to professional and public service. He headed academic departments at the University of Illinois Chicago and at the University of Nebraska–Lincoln. For more than two decades, he led Nebraska Citizens for Science, a non-profit educational organization dedicated to advancing science literacy in the state.

A full obituary is available at:
https://news.unl.edu/newsrooms/today/article/obituary-norman-d-smith/.

Tracy Frank and Gail Ashley

First call – Applications for IAS Post-Doctoral Research Grants (Spring 2022 Session)

IAS Post-Doctoral Research Grants are intended as a seed to a 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 €2,500, are awarded twice per year to Early Career IAS members.

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. More details about the application procedure can be found on your membership profile.

Applications must be submitted via the IAS website. Application deadline for the Spring 2022 Session is **31st March 24h00 Brussels Time (CET, UTC+1).**

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,

IAS Grant Reports

The IAS supports postgraduate and post-doctoral researchers via our various grant schemes.

At the end of this Newsletter you will find some of the latest grant reports received by the IAS.

You can also read recent and past Grant Reports from IAS members who have benefited from Post-Doctoral or Post-Graduate grants here.

IAS Regional Correspondents

IAS Regional Correspondents are your local hotline to the IAS.

Check out the News Feed to see what is happening in your local community. At this link you will also be able to select your correspondent and even elect to receive information from multiple correspondents. IAS Regional Correspondents are IAS Members who have volunteered to act as a representative between sedimentologists in their region and the IAS. If you know of any sedimentology events going on in your region, then please get in touch with your Regional Correspondent and let them know. Similarly, if your region lacks a Regional Correspondent (see the map here) and you would like to propose an IAS Member (Full or Student), or yourself, for this position then please send an email to the General Secretary.

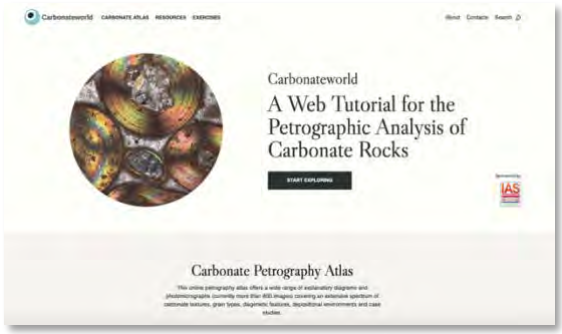
Follow the IAS on Social Media

Follow the IAS on Facebook, Twitter, WeChat and LinkedIn to keep up to date with all of the latest news, announcements and happenings.

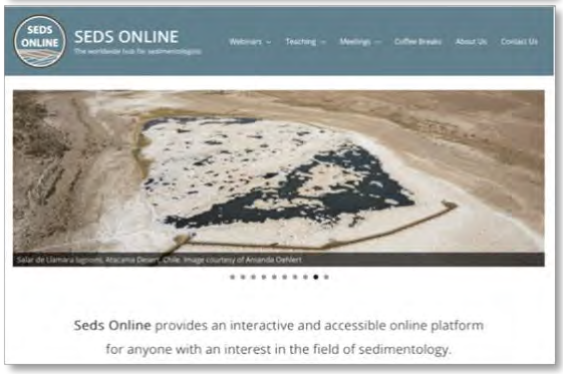
@sedimentology and IAS沉积学之家

Online resources sponsored by the IAS….

The IAS proudly sponsors several online resources.



[Carbonateworld](https://carbonateworld.com/) is an online atlas containing more than 800 images covering an extensive spectrum of carbonate textures, grain types, diagenetic features, depositional environments and case studies. The images are organised in categories and subcategories (e.g., carbonate rock classification, skeletal grains, ooids, corals, burial diagenesis etc.) and are frequently updated with new material.
https://carbonateworld.com/



Seds Online is an exciting free, online initiative that provides an interactive, adaptable and accessible online platform for anyone with an interest in the field of sedimentology. Seds Online welcomes members at any career stage, from both industry and academia!

https://sedsonline.com: Twitter @Seds_Online

The Antarctic Glaciers website is a fabulous resource for anyone interested in global glacial processes, landforms and sedimentology – despite the name, this site goes way beyond Antarctica!

www.AntarcticGlaciers.org

Don't miss out on all that the IAS has to offer - RENEW TODAY!

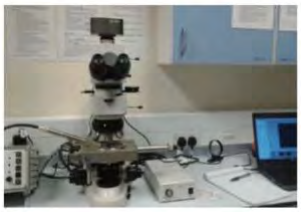
The IAS is the home of Sedimentology.

We are very proud of our ability to keep our membership fees so much lower than most other professional societies.

You can find a complete list of the benefits of membership of the IAS website.

You may also consider becoming a full member for 5 years at a cost of only €100 – effectively getting one year's membership for free. We also offer 'lifelong' membership for just €400.

First call – Applications for Post-Graduate Research Grants (Spring 2022 Session)



Up to **10 research grants**, each to a maximum of €1,000, are awarded twice a year to **IAS Post-Graduate Student Members**. This grant scheme is designed to support PhD students in their studies and research. Post-Graduate Research Grants can be used to (co-)finance fieldwork, acquisition and analysis of data, visits to other institutes to use specialized facilities, etc.

Applications must be submitted via the **IAS website**.

Application deadline for the Spring 2022 Session is **31st March 24h00 Brussels Time (CET, UTC+1).**

More information about the Post-Graduate Grant Scheme and guidelines on how to apply can be found on your membership profile.

Postdoctoral Fellowship in Geoinformatics or Sedimentary Geology

A postdoctoral position is available in the Deep-time Digital Earth Research Centre of Excellence (Suzhou), China supported by the DDE programme. This position is in collaboration with Prof. Chris Fielding from University of Connecticut, USA and Prof. Xiumian Hu from Nanjing University. The major task of the position is to facilitate the establishment of a comprehensive sedimentological database – OneSediment. This position is scheduled to be based in Kunshan city, Jiangsu province, China located 30km from Suzhou city; ~60 km from Shanghai Hongkou Airport and ~70 km from Shanghai city center. This position is available for 2 or 3 years with pre-tax salary $53,000 USD or 350, 000 CNY per year. The applicant should hold a Ph.D degree in **Geoinformatics** or **Sedimentary Geology** awarded within the past 6 years with strong research background in integrated areas of Geosciences, computer science and data sciences, with an emphasis on the application of AI, Machine Learning and other data science tools to geosciences data.

The Deep-time Digital Earth programme is an international consortium aiming to develop open digital platforms with full findable, accessible, interoperable, and re-usable (FAIR) data linking the various spheres of Earth's of geological history. The 'big science' program Deep-time Digital Earth was promoted by the International Union of Geological Sciences (IUGS) in December 2018, and initiated in Beijing on February 26, 2019.

DDE Offers

- A competitive compensation package with generous benefits: DDE offers a competitive salary for postdoctoral researchers (pre-tax $53,000 USD or 350, 000 CNY per year), with free single apartment, reimbursement of travel expenses (each year one international travel round trip) and local medical insurance.
- Opportunities to collaborate with top scientists: DDE postgraduate tutor team

contains academicians from Europe, China, and well-known professors in top universities internationally. Applicants are expected to work under their guidance according to one's research direction.

- First class working environment: DDE offers a comfortable and modern working environment for its employees. The Research Center of Excellence (Suzhou) is surrounded by a large area of green forests and lakes, with a 15 minute high-speed train to Shanghai central railway station.
- Good scientific research facilities: DDE cooperates strategically with local universities and scientific research facilities (Kunshan-Duke University, Nanjing University, etc.), and our researchers are able to carry out their work with the support of first-class scientific research facilities (Super-computing, for example).

Essential Qualifications

- Strong background and documented track record with a Ph.D degree awarded no more than 6 years ago in **Geoinformatics** or **Sedimentary Geology or related areas.**
- Scientific productivity in top peer-reviewed journals or international meeting proceedings.
- Fluency in English or Chinese

Materials to be submitted

Each candidate should submit the following (in Chinese or English):

- A statement of interest outlining why you are applying
- A curriculum vitae.
- Two recommendation letters from referees.

Further information, please contact:

Prof. Chris Fielding, christopher.fielding@uconn.edu

Prof. Xiumian Hu, huxm@nju.edu.cn

Please send applications to Prof. Xiumian Hu

IAS Post-graduate Grant Scheme Report (2nd Session 2020)

Menzoul Bouabdellah,
PhD student at the University of Tlemcen, Algeria, and the Jagiellonian University, Poland.

Proposal: Sedimentology and ichnology of the Numidian Flysch (Oligocene–Miocene) in the Ouarsenis Mountains, northwestern Algeria.

The Grant offered by the IAS has been used to pay the analysis related to zircon dating in order to determine the provenance of the Numidian detrital material in the north-western Algeria.

1. Introduction

The Numidian Formation (NF) is an extensive deep-sea turbiditic series of detritic deposits, outcropping from Gibraltar through Morocco, Algeria and Tunisia to Calabria, over the distance of 2500 km in a 100 km wide belt. It belongs to the Maghrebian orogenic domain called the Maghrébides (Durand-Delga, 1980; Wildi, 1983). The NF deposits was accumulated in the Maghrebian Flysch basin (MFB), which is considered as a foreland basin, remnant of the neo-Tethys Ocean in the western part of the current Mediterranean Basin (Thomas et al., 2010b), during the Oligocene to lower Miocene.

The provenance of the NF deposits was and is still a matter of controversy whether the detrital material that fed the MFB was sourced from the European basements (AlKaPeKa domain) or the African cratonic basement, or from both. Two main sources are invoked: (1) a northern source, represented by the European AlKaPeCa domain. This view was presented by Mattauer (1958, 1973), Caire (1961), Van Houten (1980), Parize et al. (1986, 1999), Benomran et al. (1987), Yaïch et al. (2000), and recently by Fildes et al. (2010) based on the interpretation of zircon dating carried out from the northern Tunisia and Sicily; (2) the second, opposite view suggests a southern source, which is represented by the African craton (Durand Delga, 1955, 1980; Ogniben, 1960; Wezel, 1970; Hoyez, 1989, 1975; Guerrera et al., 1992; Thomas et al., 2010a, b; Fornelli et al., 2015). The review by Thomas et al. (2010a) puts all the results done so far together in their regional context, including the older works and the new ones with zircon ages. This review favors the southern provenance of the NF material. So far, no studies using zircon dating in Algeria. One of the main objective of my PhD research project is to constrain the provenance of the NF outcropping in the Ouarsenis Mountains, NW Algeria, using zircon dating.

Hoyer (1975) suggested an European source for the NF in NE Algeria on the basis of paleoflow data. However, the paleoflow orientation has been weaken later on other studies, including pleomagnetic data from Sicily (Channell et al., 1990; Oldow et al., 1990; Speranza et al., 2003; Monaco and De Guidi, 2006) demonstrating a 70° clockwise rotation of the

nappe pile during the post NF times. Moretti et al. (1991) suggested the African source of the NF in the NE Algeria on the basis petrographic evidences.

2. Methods.

Two samples of sand-rich sandstone were processed by the standard method for separating zircons. i.e. crushing, sieving, using of heavy liquids as well as the Frantz isodynamic separator, followed by careful inspection of the heavy fraction that could potentially contain zircon under binocular microscope. No zircon grains in the magnetic fraction were found in either of the two sand samples.

Following the separation of zircon, more than 200 grains from each sample were transferred to a double-sided tape. Transferring the zircons took place without qualitative selection to achieve random grain choice without any size, color or shape preference.

The zircons from two samples together with the chips of Temora-2 standard zircon ($^{206}Pb/^{238}U$ age of 416.8 ±0.3 Ma: Black et al., 2004) and the "91500" standard zircon as a reference for U-content (U = 78 ppm, a $^{207}Pb/^{206}Pb$ age of 1065.4 ±0.3 Ma, Wiedenbeck et al., 1995) were mounted in epoxy disc (~3.5 cm – megamount) and polished until quasi-central sections were reached. The reference zircon Temora-2 was used in order to control for the stability and accuracy of the instrument.

Subsequently, the grains were photographed under both transmitted light and reflected light mode using a Nikon Eclipse LU100NPol polarizing microscope with NIS Element software. After optical imaging, the mount was vacuum-coated with 5 nm of gold for cathodoluminescence (CL).

The zircon internal textures were imaging using a HITACHI SU 3500 scanning electron microscope located at PGI-NRI. On the basis of SEM CL, the area of U-Pb analysis was pre-selected.

Before isotopic measurement, the gold film was removed and the mount re-cleaned, prior to being recoated with about 15 nm of high purity gold for SHRIMP analysis.
All U–Pb isotopic results were collected on the SHRIMP IIe/MC instrument (the sensitive high resolution ion microprobe) using a duoplasmatron as primary ion source, according to general procedure described by Wiliams (1998).

The isotopic ratios were analyzed using a ~20–23 μm-diameter primary beam consisting of ionized oxygen molecules (O2)1- purified by a Wien filter. Before each analysis, the surface of the site was cleaned by rastering of the primary beam for 2 min, in order to reduce the amount of common Pb on the mount surface. Secondary ions were collected on a single electron multiplier by cycling the magnet through six scans on nine mass: 196 Zr2O, 204Pb, 204.1 (as a background), 206Pb, 207Pb, 208Pb, 238U, 248ThO, and 254UO. The measurements were carried out with a mass resolution of approximately 5400 (at 1% peak height) during about ~16 min.

The analyses were collected in a sequence consisting of one analysis of a Temora-2 reference zircon measurement after every fourth unknown sample analysis. SHRIMP U–Pb data were processed using open source SQUID-2 software from Geoscience Australia and plotted using Isoplot (Ludwig, 2009) and IsoplotR (Vermeesh, 2018) software. Common-Pb corrections for unknown samples were based on measured ^{204}Pb. The isotopic composition was calculated using the Pb isotopic evolution model of Stacey and Kramers (1975), and the time corresponding to the preliminary $^{206}Pb/^{238}U$ age was calculated using the default common-Pb compositions.

The ages are $^{206}Pb/^{238}U$ for zircon grains < 1000 Ma, and $^{207}Pb/^{206}Pb$ for those > 1000 Ma, as a consequence of the relatively short half-life of the ^{235}U parent, making $^{207}Pb/^{206}Pb$ ages less precise than $^{206}Pb/^{238}U$ ages for relatively young zircons (Black et al., 2003). For detrital grains > 1000 Ma, the $^{206}Pb/^{207}Pb$ age is used in the cumulative probability plot but for data < 1000 Ma, the $^{206}Pb/^{238}U$ age is preferred because $^{206}Pb/^{238}U$ ages are generally more precise for younger ages, whereas $^{206}Pb/^{207}Pb$ ages are more precise for older ages (Gehrels, 2011).

This analysis was performed in the Polish Geological Institute, Warsaw, Poland, and supported financially by the International Association of Sedimentologists (IAS).

3. Preliminary results

The result of the U-Pb zircon ages of the two analyzed samples show concordant ages ranging from 784±85 to 2317±88 Ma from the sample KMS B29 and 721±71 to 2253±78 Ma from the sample KRS B01 (Fig. 10).

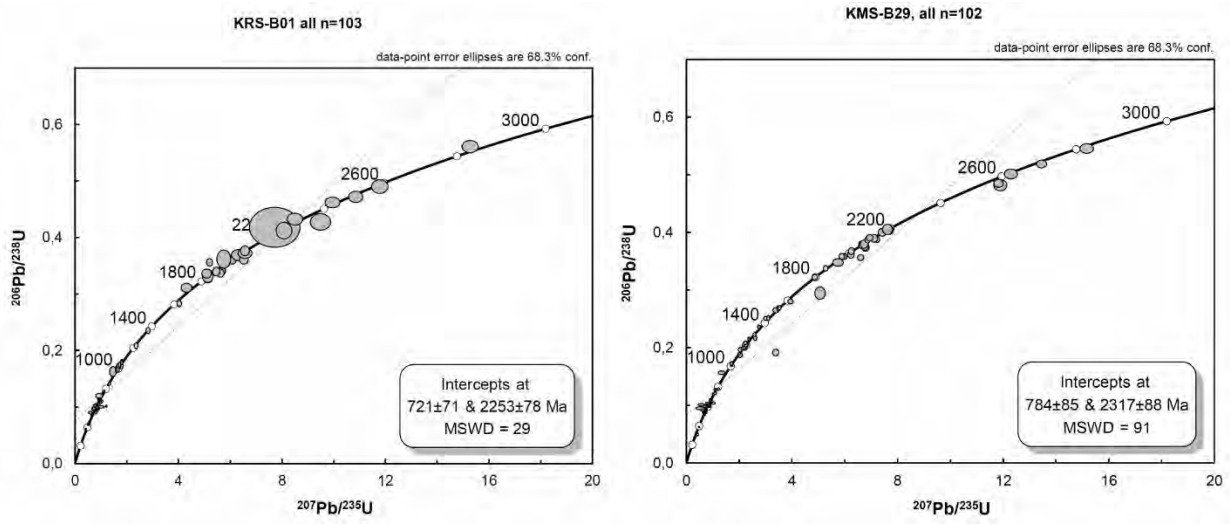


Fig. 1. U-Pb Concordia diagrams of the analyzed samples KMS B29 and KRS B01.

3. Preliminary interpretation

The performed zircons dating analysis from the NF in the Ouarsenis Mountains, Northwestern Algeria show abundant zircon giving the Paleoproterozoic and the Mesoproterozoic ages with less Archean and the Neoproterozoic ages. The absence of zircon ages indicating Hercynian and Alpine orogenic cycle gives evidences that the NF in the study area was sourced from the African Craton, where crystalline rocks of the determined ages are very frequent.

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REPORT

IAS POSTDOCTORAL RESEARCH GRANT
2nd session of 2020

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CONSTRAINING FACIES, ARCHITECTURE AND EVOLUTION OF TIDAL-DUNE DEPOSITS IN PALAEO-STRAIT SETTINGS

Introduction

Tidal straits are relatively common near modern coastlines (e.g. Messina Strait, Taiwan Strait and many others), but rarely recognized in the geological rock record (e.g. Braga et al., 2010; Longhitano et al., 2012). Even though their tidal range might often be microtidal (i.e. < 2 m), tidal currents reach velocities up to several metres per second, accelerating near the strait centre and decelerating towards the two opposite exits (Bignami and Sallusti, 1990; Foreman et al., 1995; Brandt et al., 1999; Hu et al., 2010). The investigation of seafloors in modern straits reveals the presence of tidal bedforms and shows their short-term processes (e.g. Santoro et al., 2004; Droghei et al., 2017); however, little is known about their longer-term evolution (i.e. millennial or longer timescale). The present study aims at filling this gap and to better understand the long-term evolution of these settings, using an outcrop analogue located on the eastern onshore margin of the Messina Strait, near the city of Reggio Calabria (southern Italy) (Fig. 1). This outcrop consists of up to 120 m thick Lower Pleistocene mixed siliciclastic-bioclastic deposits, which were uplifted during the Middle Pleistocene.

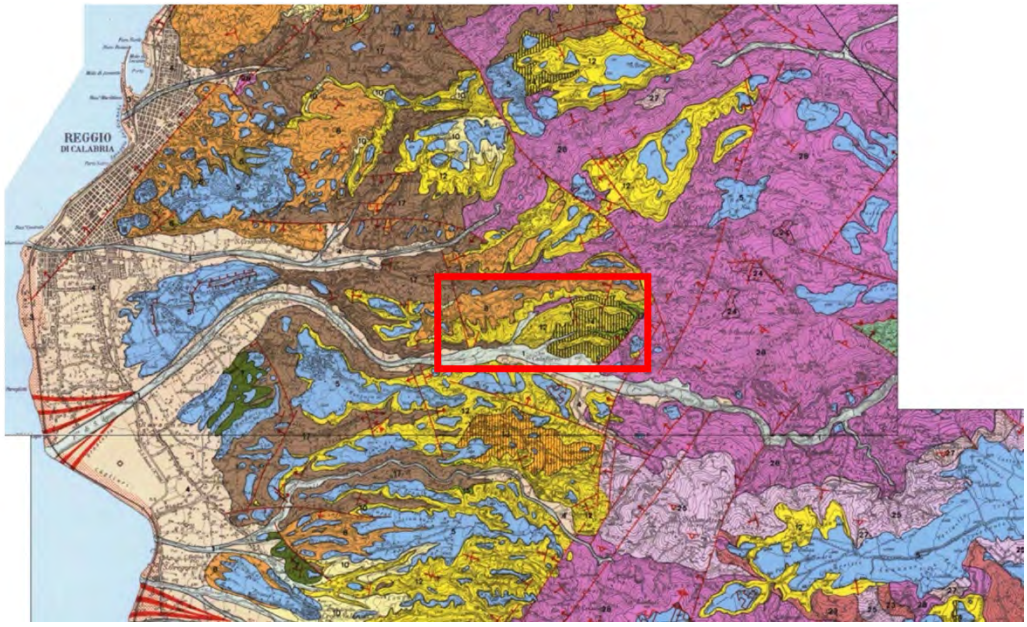

Fig. 1. Geological map of the area near the city of Reggio Calabria. The targeted Lower Pleistocene deposits are indicated in yellow, whereas the red outline box indicate the study area (from Atzori et al., 1983).

Methods and preliminary results

The targeted Lower Pleistocene deposits were investigated during a fieldwork campaign in 2021. Seven sedimentological logs were measured along this succession (Fig. 2), recording sediment composition, sedimentary structures, body and trace fossils, and paleocurrents. In addition, the outcrops were photographed from a drone DJI Mavic Air and scanned with a laser scanner Leica BLK360 in order to build 3D outcrop models. Preliminary results show that the excellently exposed outcrops are characterized almost entirely by sand-sized mixed siliciclastic-bioclastic deposits (Fig. 3) with a subordinate conglomeratic fraction, whereas mud is literally absent. Several facies were identified, including cross-bedded calcarenites, parallel-bedded calcarenites and channelized conglomeratic sandstones.

Fig. 2. View of the study area from Google Earth with base locations of the seven sedimentological logs. The distance between the two farthest logs is approximately 2 km.

Fig. 3. Drone view of one of the outcrops showing a combination of parallel-bedded and cross-bedded calcarenitic facies. The deposits in this view are approximately 30 m thick.

The cross-bedded calcarenitic facies is generally organized in sets of 1–2 m in thickness (Fig. 4) and represent the migration of dunes driven by tidal currents amplified in a strait setting. Although this strait setting during the Lower Pleistocene could have been similar in many ways to the adjacent present-day Messina Strait, preliminary data suggest that the linkage between the ancient strait and the modern one remains unclear.

Fig. 4. Outcrop photo of an approximately 1.5-m thick cross-bedded package interpreted as a tidal dune in a strait setting.

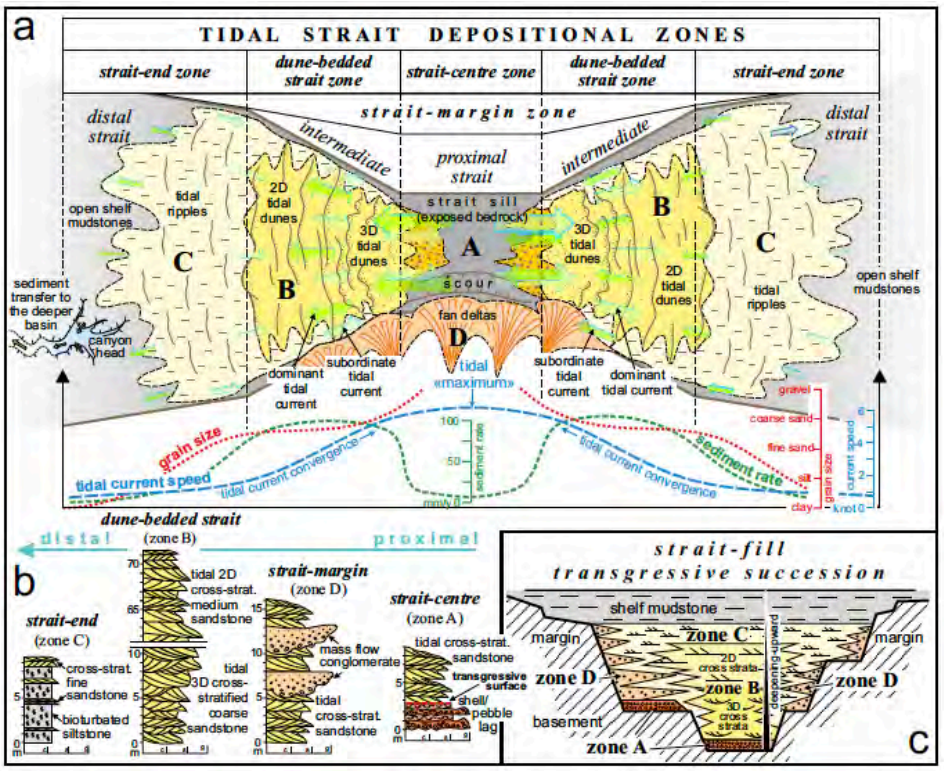

Fig. 5. Conceptual model showing deposition in a tidal strait setting (from Longhitano et al., 2019)

Future directions

The data collected within this project will be further analysed to fully reconstruct the depositional setting in the study area in the Lower Pleistocene. The results of this study will be organized in a manuscript that will be submitted to *Sedimentology* in 2022.

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Turbulent-laminar transitions in cohesive sediment laden gravity currents

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Introduction

Sediment gravity currents are volumetrically one of the most important sediment transport processes on our planet. Cohesive sediments are ubiquitous in terrestrial, shallow and deep marine environments, hence sediment gravity currents commonly transport cohesive sediment in high concentrations. The cohesive properties of clay result in flocculation and formation of gels. Relatively small percentages of clay can dampen turbulence and control rheology, resulting in transitional flow conditions (Wang and Plate, 1996). Baas et al. (2009) developed a phase diagram for pseudo-steady cohesive sediment laden open channel flow, based on the balance between turbulent and cohesive forces, which has since been used to understand turbulent-laminar transitions in gravity currents.

Gravity currents are often assumed to be similar to open channel flows, but clear differences can be identified. Transitional flows in open channel flows show the development of a plug flow region at the water surface, where shear stresses are the lowest. The plug flow region develops downwards to the bed with increasing clay concentration. The development of plug flow in cohesive sediment laden open channel flows has been used to explain depositional features of gravity currents, e.g. hybrid event beds, flutes and tool marks (Peakall et al., 2020). However, turbulence at the upper flow boundary of gravity currents is higher than for open channel flows and gravity currents are not constrained to expand their height. Therefore, stability regimes are expected to vary from those of open channel flows.

Gravity currents are transitional by nature as they adapt their velocity and flow height to the boundary conditions. However, the turbulence structure is poorly characterised for sediment gravity currents. Yet, turbulence and flow transitions are recognised as key control processes in sedimentary deposits, e.g. hybrid event beds (Haughton et al., 2009). Extant models suggest that a single depositional event can record transformation between several different types of lows. The processes influencing these transitional flows are still poorly constrained (Talling et al, 2012).

The aim of the research is to quantify turbulent laminar transitions in cohesive sediment laden gravity currents.

Methods

The experiments were conducted at the Total Environment Simulator (TES) at the University of Hull. Fully submerged within the 14 m long and 6 m wide tank, an 8 m long, 0.1 m wide and 0.6 m high channel was placed under a slope of 2.9 degrees, generating bypassing, non-depositional gravity currents (Figure 1). During the experiments a pump continuously supplied the channel with a uniform clay concentration ranging from 2% to 14% with a duration of around 5 minutes. At two locations along the channel, upstream and downstream, flow velocity was measured with an array of Ultrasonic Velocity Profilers (UVP). At both locations, the sediment concentration in the flow was measured by extracting fluid samples from various heights throughout the flow. Underwater cameras were

installed to capture the development of the gravity currents of the initial runs before suspended clay obstructed the view.

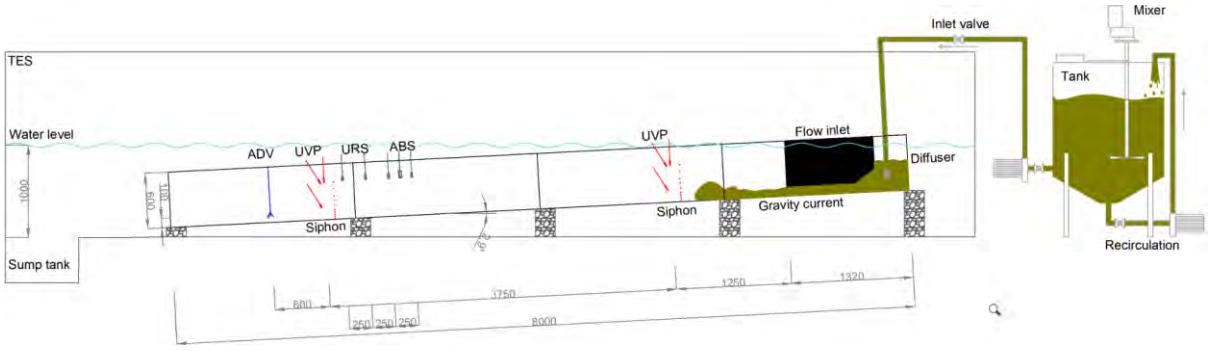

Figure 1: Experimental setup

Preliminary results

The length of the flume allowed generation of transitional flow conditions and the initial results indicate that within the experimental setup, the gravity current is accelerated down the slope resulting in an increased velocity (Fig. 2) and reduced flow height (Fig. 3) at the downstream measurement location compared to upstream. Comparing different initial sediment concentrations within the mixing tank, indicates increased velocity and reduced flow height with increasing sediment concentration (Fig. 2 and Fig. 3).

a) b)

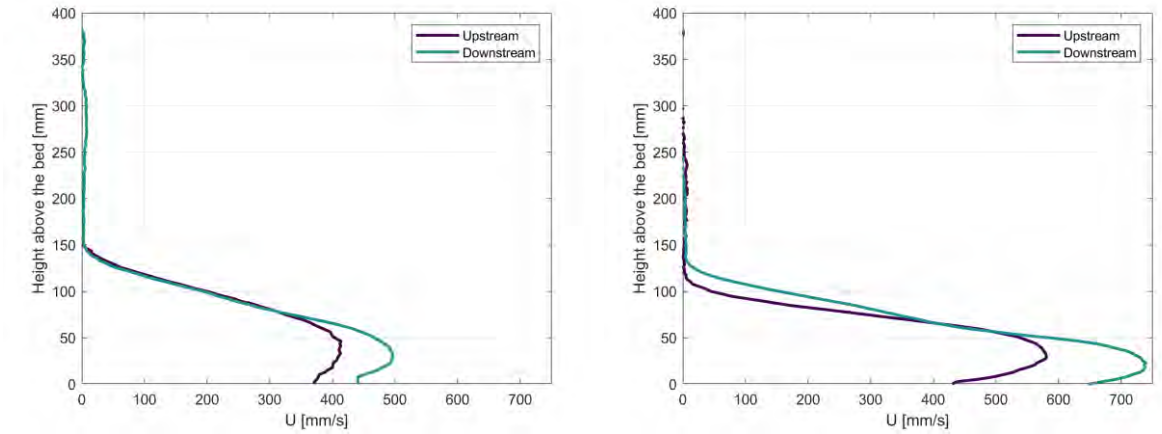

Figure 2: Mean velocity profiles of the body of the flow of a) 4% initial clay concentration and b) 12% initial clay concentration

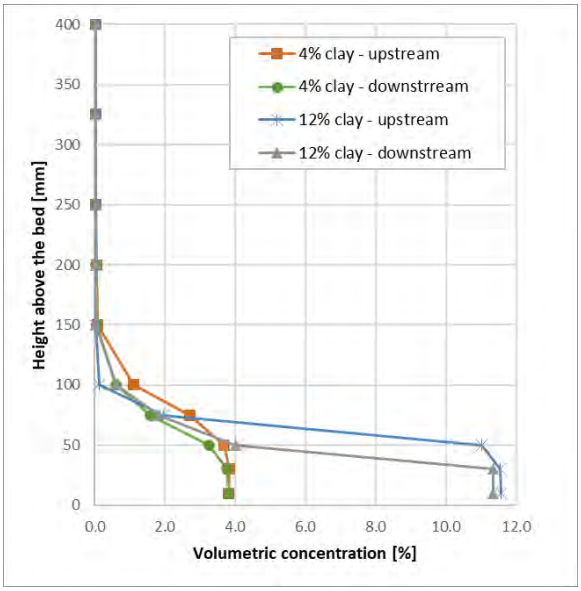

Figure 3: Volumetric concentration profiles of the body of the flow of both 4% and 12% initial clay concentration

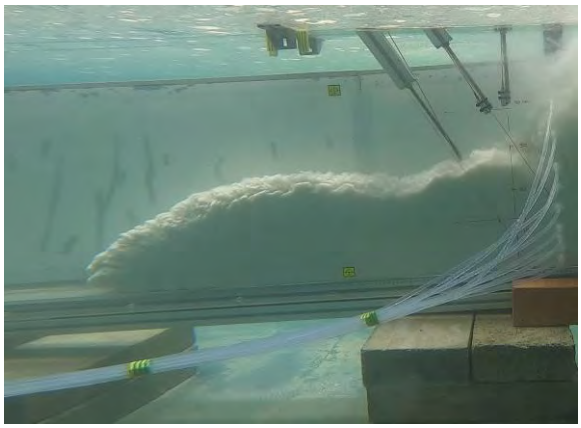

Figure 4: Picture of gravity current with 4% initial clay concentration

The formation of transitional flow conditions is based on the balance between turbulent and cohesive forces. Gravity currents are driven by the density difference between the gravity current and ambient water. Therefore, an increase in sediment concentration correlates to an increase in flow velocity, whereas this phenomena is not found within open-channel flows. Moreover, open-channel flows are restricted by the free surface, whereas gravity currents are able to change their flow depth. Due to these differences between open channel flows and gravity currents, a higher clay concentration is needed for the development of a plug flow within the gravity current.

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