The Newsletter of the International Association of Sedimentologists

Issue 1, 2021

Dear IAS Members,
Welcome to the first IAS Newsletter of 2021. Happy New Year.

We kick off 2021 with the exciting news that the IAS will be paying the full registration fees for IAS Student Members who present as first authors at the 35th International Meeting of Sedimentology.

This is just the first of many exciting new announcements that you can expect from the IAS over the next few months. In addition to our 'normal' sponsorship activities, last year the IAS supported three fabulous new online initiatives: **AntarcticGlaciers (www.AntarcticGlaciers.org), CarbonateWorld (carbonateworld.com)** and **Seds Online (sedsonline.com)**. We are not standing still and have many new initiatives in the pipeline – exciting times are ahead!

Remember, to take advantage of all that the IAS has to offer, you need to keep your membership up to date. We are delighted that membership fees have again been frozen this year. We are not for profit – we are for you!

Finally, on behalf of the Society, I wish you and your families good health and all the best for the year ahead.

Stephen Lokier, *General Secretary*

Last call for Abstracts for the 35th International Meeting of Sedimentology, Prague 2021

The IAS will pay the full registration fee for IAS Student Members presenting as first authors at the 35th IMS!

IAS student membership costs just €10 and we shall then cover the full €140 registration fee!

The closing date for abstract for the International Meeting of Sedimentology is the 1st of February. Don't miss out. Get your abstracts submitted today!

The 35th International Meeting of Sedimentology will be held between 21st-25th June 2021 in Prague, Czech Republic. Everything that you need to know about the meeting is contained in the Second Circular that is now available on the conference website.

Have you renewed your IAS membership for 2021?

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.

IAS membership runs on an annual basis (1st January – 31st December) so, please do be certain to invest 5 minutes to renew your membership for 2021.

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.

The IAS pays 100% of the Article Processing Charges (APC) for papers accepted in The Depositional Record!

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

Article publication charges are still fully covered by the IAS but this will have to change soon, so submit your paper today!

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

Congratulations to IAS Member and Walther Medallist Ana María Alonso-Zarza on her appointment as Director of the Geological and Mining Institute of Spain

We were delighted to receive the news that Ana María Alonso-Zarza has recently taken up the position of Director of the Geological and Mining Institute of Spain. Ana has been a highly active member of the IAS for many years, driving the IAS' involvement in Geolodía and being awarded the Walther Medal in 2016. Here are a few words from Ana….

Dear IAS Colleagues,
The last year has been terrible, lot of things have changed and significantly affected our lives. We missed our annual meeting in Prague.

During 2020, on September 7th I became the Director of the Geological and Mining Institute of Spain (IGME), it was certainly a big change for me, I provisionally left the university and my work now is mostly administration. It is a big challenge for me, we are in the time of the climatic change, it is the time that Geology must contribute to a green planet, and so our institution (IGME) should become critical for the so-called Ecological Transition.

This is the time for some changes in the IGME, we will keep our work as the Geological Survey of Spain but, in addition, as we are a Public Research Organism, our aim is to implement our leadership in Earth Science research and its significance for society. The long history of IGME, more than 170 years, parallels our science; their deep and solid foundations will help to make our modern science helpful and close to people. Our main research will focus on: Water, Resources for the Ecological Transition, Geological Risks Climatic Change, and Earth and Marine Geology.

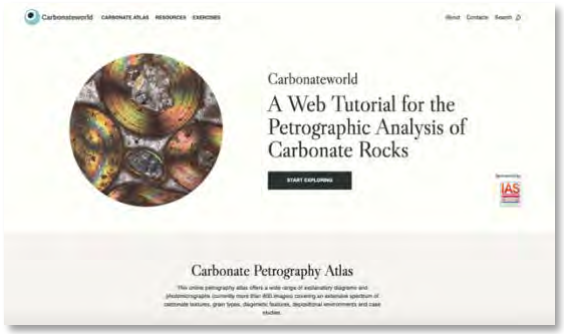
Sediments and sedimentary rocks are critical for our studies and we hope to implement our collaboration with IAS, not only for research but also for dissemination of Geology, as both IAS and IGME support Geolodía.

We have a beautiful building with our own Museum, almost one hundred years old, where in 1926 we celebrated the XIV International Geological Meeting. If any of you visit Madrid, please come I am sure you will get a nice surprise.

Ana María Alonso-Zarza
IAS Member, Walther Medal 2016
Director of Geological and Mining Institute of Spain.

Online resources sponsored by the IAS….

The IAS proudly sponsors several online resources.



Carbonateworld 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

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.

Open – Applications for Institutional Grants (Spring 2021 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 have to be submitted via the **IAS website.** Application deadline for the Spring 2021 Session is **31st March 2021 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.

Grant Reports on the IAS web site

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

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

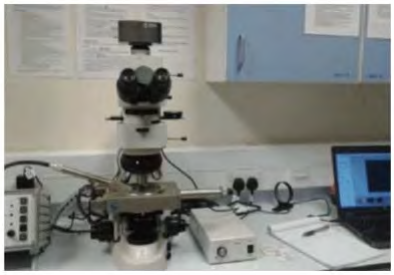
The Journals of the IAS

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 (after login) for member access
- **Basin Research**: directly at Wiley or via the IAS website (after login) for member access
- **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.

Open – Applications for Post-Graduate Research Grants (Spring 2021 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 2021 Session is **31st March 2021 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.

Open – Applications for the Judith McKenzie Field Work Award (Spring 2021 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.

Application deadline for the Spring 2021 Session is **31st March 2021 24h00 Brussels Time (CET, UTC+1)**.

Open – Applications for IAS Post-Doctoral Research Grants (Spring 2021 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.

Application deadline for the Spring 2021 Session is **31st March 2021 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.

Diagnostic Rock Textures in Fault-Controlled Dolomite Bodies

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1. Introduction

Although dolomite has been the subject of extensive research, uncertainty persists regarding its formation, particularly how it develops during fault-controlled, often-called "hydrothermal" fluid flow. Models for the formation of hydrothermal dolomite (HTD) are based on petrographic and geochemical studies but typically lack a thorough geomechanical characterization. In particular, the formation of certain rock textures in HTD bodies are inappropriately amalgamated as a single step in their paragenetic sequence. Zebra textures, for example, consist of alternating, cm-scale, dark replacement dolomite (RD) bands and light saddle dolomite (SD) bands that form symmetrical RD-SD-SD-RD patterns[1.2.3.4.]. Their presence is commonly considered evidence of high pressure, high temperature, fluid flow; particularly in ore- and hydrocarbon-bearing systems. Numerous models have been proposed to explain the formation of zebra textures, yet there is little consensus and previous studies suggest that they arise due to dissolution[1.], fracturing[2.3.], or recrystallization[4.]. Of the models proposed, a comprehensive petrographic, geochemical, and geomechanical characterization has yet to be presented and they have not been tested by iterative experimental analyses.

This study aims to elucidate the genesis of zebra textures through the characterization of HTD in multiple successions that are situated in contrasting tectonic settings. Given that the timing/mechanism of dolomitization is well-constrained[5.], this study is based primarily on exposures of Middle Cambrian strata in the Western Canadian Sedimentary Basin (Fig. 1). These results will be substantiated with, and contrasted to, Mississippian strata from the North Wales Platform. Petrographic and geochemical analyses are conducted in parallel with triaxial rock deformation experiments that reproduce zebra textures in the laboratory; an original approach that utilizes systematic sampling and analyses to inform process-based experimental analysis. The results of this study have wide applications as zebra textures are associated with faults and carbonate-hosted ore deposits, suggesting they provide information regarding fluid flux and diagenesis under high pressure, high temperature, conditions.

2. Results

In the southern Rocky Mountains, the Cathedral Formation and the Eldon Formation consist of subequal parts of light-grey limestone, medium-grey to tan finely crystalline

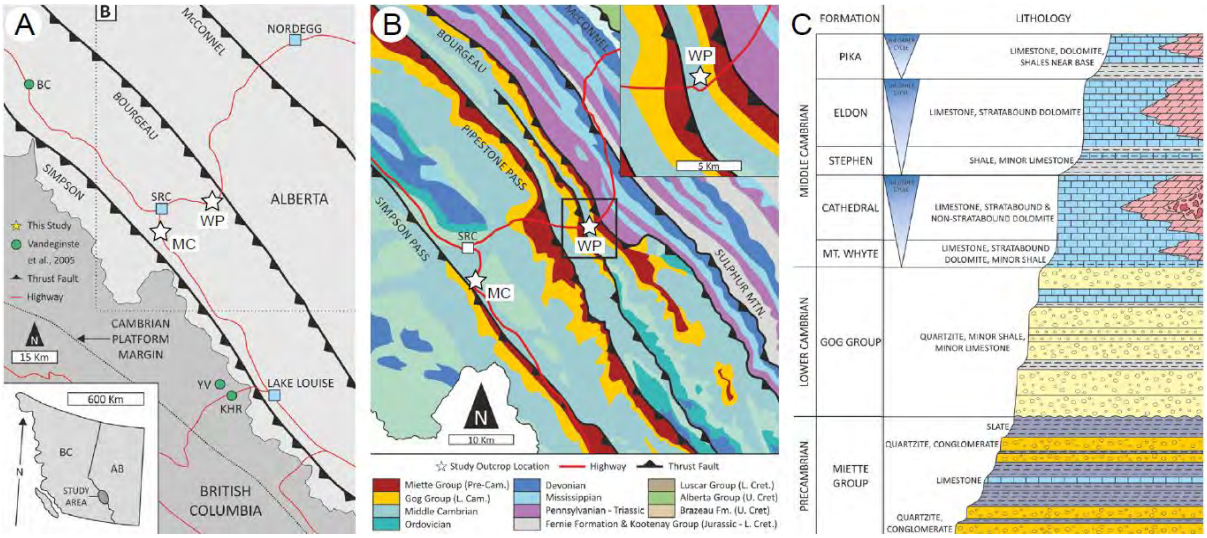

Fig. 1. (A) Regional map of the southern Rocky Mountains, WCSB showing the location of the study area relative to major thrust faults and the Cambrian platform margin. (B) Geologic map showing the exposed strata and selected outcrop locations. WP = Whirlpool Point, MC = Mistaya Canyon. (C) Stratigraphic column showing the Precambrian, Lower Cambrian, and Middle Cambrian stratigraphy of the southern Rocky Mountains, WCSB and their respective lithologies.

replacement dolomite, and white coarsely crystalline saddle dolomite (Fig. 2). A large (> 210 m wide, > 40 m thick) non-stratiform, fault-controlled dolomite body is hosted in the Cathedral Formation at Whirlpool Point (WP). Three diagenetic facies are recognized in relation to a transtensional fault at WP, including, (1) cement-supported dolomite breccias in the proximal part of the hangingwall and the footwall, (2) bedding-inclined, planar-to-sigmoidal zebra textures in the medial part of the hangingwall and the proximal-to-medial parts of the footwall, and (3) bedding-parallel, planar zebra textures in the distal part of the hangingwall and the medial-to-distal parts of the footwall. Although a major fault is not exposed in outcrop, a large (> 300 m wide, > 10 m thick), stratiform, dolomite body with characteristic features of fault-controlled dolomitization is located at Mistaya Canyon (MC).

Transmitted-light and cathodoluminescence petrography of zebra textures indicate that the dark bands comprise two phases of RD, whereas the light bands comprise two phases of non-ferroan SD and one phase of ferroan SD (Fig. 3). RD1 includes planar-s dolomite crystals, 20 to 150 µm in diameter, that grade laterally into RD2. RD2 includes recrystallized, nonplanar-a dolomite crystals that are 100 to 400 µm in diameter. RD1 is concentrically zoned with dull-purple luminescent cores and dull-red luminescent rims, whereas RD2 is unzoned with a dull-red luminescence. SD1 consists of equant saddle dolomite crystals, 250 to 550 µm in diameter, that form an isopachous rim nucleated on the host rock margin. SD2 consists of elongate saddle dolomite crystals, 250 to 550 µm wide and up to 2500 µm long,

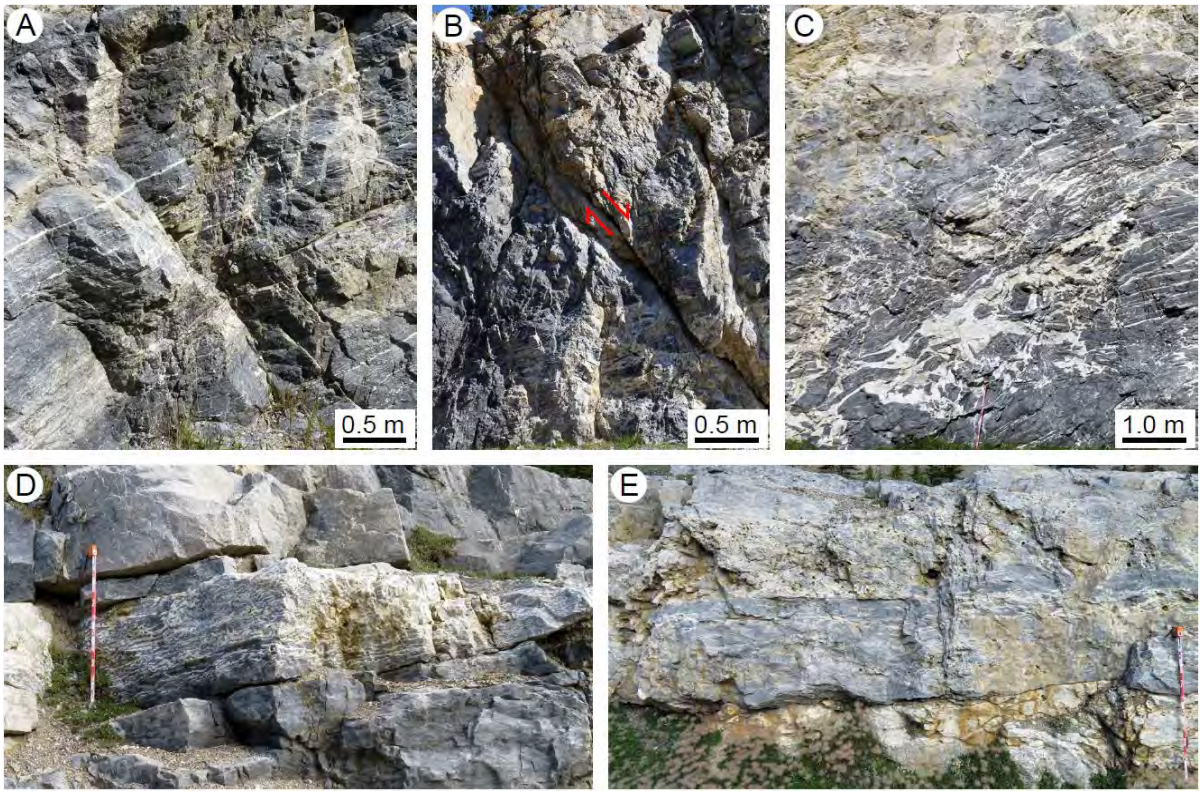

Fig. 2. (A) Outcrop photograph of a series of bedding-parallel, planar zebra textures in the footwall of a (B) transtensional fault at Whirlpool Point (WP). Cathedral Formation, WCSB. (C) Outcrop photograph of a cement supported dolomite breccia in the proximal part of the hangingwall at WP. (D) Outcrop photograph of a stratiform set of bedding-inclined, planar-to-sigmoidal zebra textures in the medial parts of the fault-controlled dolomite body at Mistaya Canyon (MC). Eldon Formation, WCSB. Scale = 1.0 m. (E) Outcrop photograph of a stratiform set of chaotic zebra textures in the proximal parts of the fault-controlled dolomite body at MC. Scale = 1.0 m.

that nucleated on SD1 and grew perpendicular to the RD/SD boundary. SD3 consists of compositionally zoned, ferroan saddle dolomite rims that are 250 to 750 µm thick and grew on the central margin of SD2 crystals. SD1 and SD2 are unzoned with dull-red luminescence, whereas SD3 comprises alternating zones with bright- and moderate-red luminescence.

3. Preliminary Interpretations/Conclusions

Funding provided by the IAS Postgraduate Research Grant enabled the fieldwork and sampling of Middle Cambrian strata in western Canada. Preliminary analyses of, potentially diagnostic, rock textures in fault-controlled dolomite bodies has led to the following conclusions, (1) rock textures can be classified as diagenetic facies based on their relationship and proximity to faults, (2) each of the RD and SD bands in zebra textures are formed by a complex architecture of multiple dolomite phases that require independent interpretations, and (3) triaxial rock deformation experiments are a novel method that have not been applied to zebra textures and complement traditional petrographic and geochemical analyses.

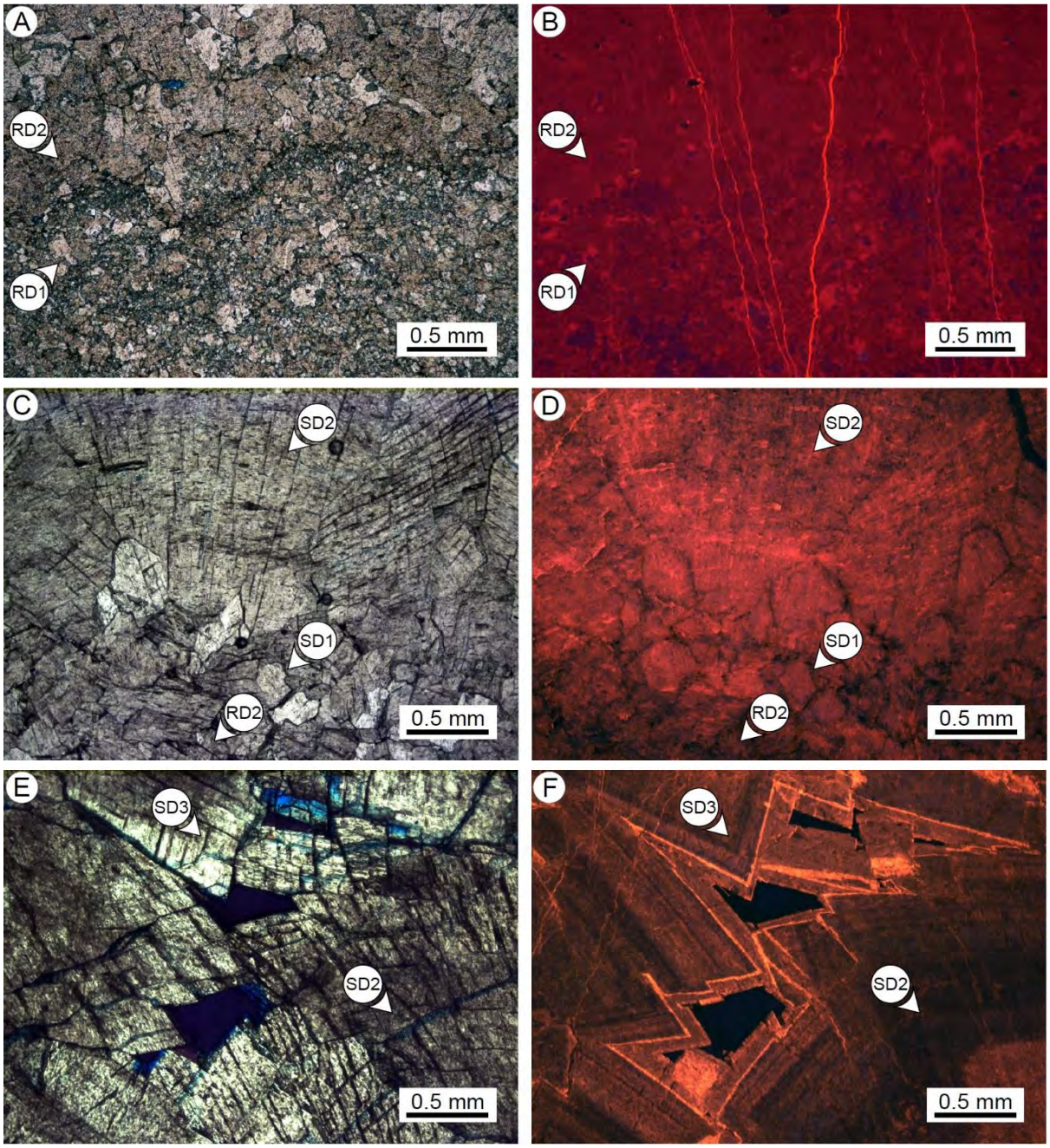

Fig. 3. Microscopic classification of zebra textures based on cathodoluminescence microscopy. (A, B) Phases RD1 (dull-purple luminescent) and RD2 (dull-red luminescent). (C, D) The RD/SD boundary showing negligible contrast in CL signature. (E, F) The phase SD2/SD3 boundary showing the compositional zoning of the SD3 rims (bright-red and moderate-red luminescent).

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DECIPHERING THE LINKS BETWEEN EXHUMATION-DRIVING PROCESSES IN THE OROGEN AND SEDIMENTATION IN THE RETROARC. A CASE STUDY FROM SOUTHERN PATAGONIA.

Inés Aramendía

INTRODUCTION

The aim of my PhD research is to unravel the sedimentological evolution of the Neogene foreland depocenter in the northwestern edge of the Austral-Magallanes Basin (~46° to 48° SL; southern Argentina) along the foothills of the Austral Patagonian Andes (APA). This is conducted in combination with paleoclimatic analysis using different proxies (paleosols; stable isotopes on pedogenic carbonates, major elements on mudstones). In particular, it is intended to link the overall effect of Andean orogenic deformational processes and the exhumation rates of source areas with the accommodation space dynamics of the associated foreland sedimentary systems. This sedimentation period, recording marine to continental sediment accumulation (Cuitiño *et al.*, 2015; 2019; Aramendía *et al.*, 2019), was synchronous with the main phase of Andean uplift (Ramos, 1989), related to the approximation and collision of a series of segments of the COR (Chile Oceanic Ridge) (Lagabrielle *et al.*, 2004, Ghiglione *et al.*, 2016). An Oligocene to lower Miocene compressional phase preceded COR collision, uplifting basement rocks above 1000 m high that consequently produced an orographic rain shadow and aridification in Patagonia since ~16 Ma (Blisniuk *et al.*, 2005). At the regional scale, sedimentation in this depocenter abruptly ended in the middle Miocene, probably as a consequence of the end of shortening and beginning of dynamic uplift (Ghiglione *et al.*, 2016). Therefore, the overall scientific scope is to discriminate between long-lasted-debated processes interacting with the foreland basin system: in one hand tectonic processes (classical crustal thrusting; dynamic topography); in the other hand, the climatic drivers (orogenic rain shadow, glaciations and related erosional pulses).

In this report, I highlight the chronological implications of the recently acquired U-Pb age results from the sedimentary infill to the tectonostratigraphic evolution of the northwestern edge of the Austral-Magallanes Basin (Figure 1). The new U-Pb ages contributes to the calibration and consequent relation between sedimentary paleoenvironmental shift and the main deformational stages of the APA.

Nowadays I am trying to relate with more accuracy the relation between the Neogene Andean uplift with the sedimentary record. For this reason, radiometric dating is fundamental because it allows to calibrate the timing of the deformational stages and the subsequent response of the sedimentation on the basin. With this reliable data acquired, we will link sedimentary logs with the chronostratigraphic framework and so reconstruct the evolution of the basin through time. Due the high price of this radiometric dating analysis, this grant was a great help for this PhD research project.

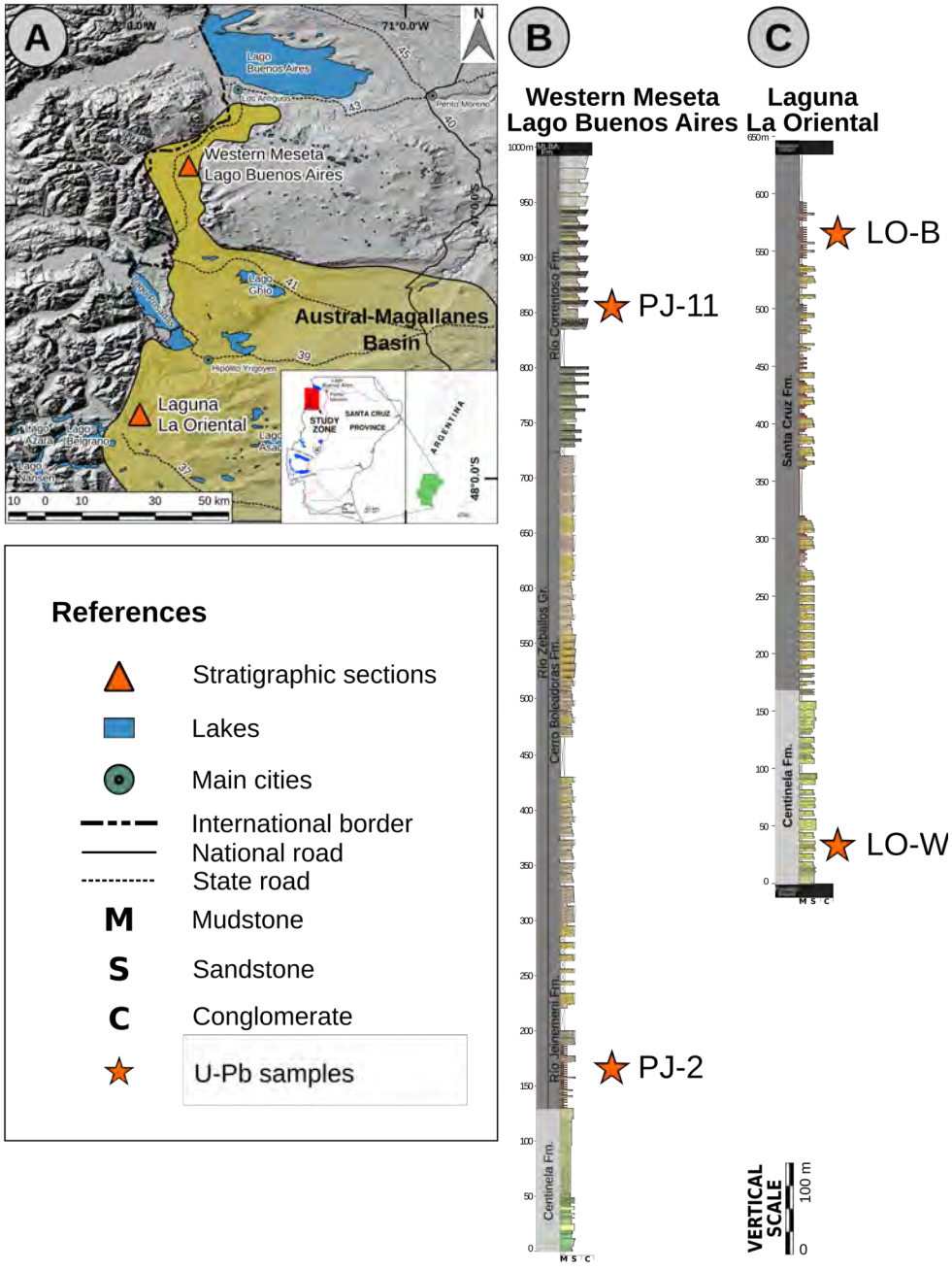

Figure 1: *Schematic geographical location of the study area with indication of the studied stratigraphic sections. (A) Austral-Magallanes Basin limits for the study area and location of the 2 stratigraphical logs. (B) Western Meseta Lago Buenos Aires stratigraphic section of the Miocene sedimentary units of the Austral-Magallanes Basin. Modified from Aramendía et al. (2019). (C) Laguna La Oriental stratigraphic log of the Miocene sedimentary units of the Austral-Magallanes Basin. Stars indicate the 4 sandstones samples analyzed by U-Pb dating*.

METHODS

In the field, I have described between 1000 and 700 m of sedimentary logs, as well as architectural panels, facies analysis and paleopedofeatures obtained from strategic locations. I have also taken sandstones samples for petrographic provenance analysis, mudstones for X-ray diffraction and carbonates for stable isotopic studies. With all that information, I was able to establish a paleoenvironmental evolution during the whole sedimentary profiles in order to evaluate the mean paleoenvironmental shifts from shallow marine deposits to mixed-fluvial system and finally alluvial fans (Armendía *et al.*, 2019) and their autocyclic or allocyclic implications.

ZIRCONS SEPARATION, SELECTION AND U–PB ANALYSIS

The preparation of the sandstone samples was done by crushing and milling of about 3 kg of material through a specific protocol in order to separate the heavy minerals from the whole rock minerals at Centro de Investigaciones Geológicas (CIG, CONICET-UNLP). After that, the sieve of interest fraction and the separation of heavy minerals through hydraulic methods (using water and a separation pan) were done. Then, magnetic minerals were removed using a neodymium magnet. Finally, I did the zircon hand picking under binocular magnifying lens at Facultad de Ciencias Exactas y Naturales of the Universidad de Buenos Aires (FCEN-UBA). In order to determine the more precise age and detrital composition of the samples, diverse zircons shapes were selected. As a result, 200 zircons per sample were separated and sent to the Laboratório de Estudos Geodinâmicos, Geocronológicos e Ambientais, Instituto de Geociências, Universidade de Brasília (UNB), Brasil.

At the UNB lab the zircons were analyzed for their U-Pb and trace element composition using a Thermo-Fischer, Neptune, Laser Ablation Inductively Coupled Plasma Mass Spectrometry system. The data reduction protocol is described in detail by Petrus and Kamber (2012). Each analysis consists of a 20 seconds gas blank followed by 40 seconds of ablation. Analyses were conducted using a ESI/New Wave 213nm solid state (Nd:YAG) laser ablation system, with a laser spot size diameter of 25 μm, with a repetition rate of 10 Hz, and a fluence of ~3-3.5 J/cm^2.

The calibration strategy and the reference material were referred to GJ-1 (Jackson *et al.,* 2004; Horstwood *et al*., 2016) as primary reference and 91500 (Wiedenbeck *et al.* 1995) was used for secondary reference and validation. Data processing package Iolite v.4.0 (Paton *et al.*, 2011) and IsoPlot free software (Vermeesch, 2018).

RESULTS

A total of 4 sandstone samples (Figure 1) were analyzed and 40 to 80 zircon crystals per sample were analyzed. All samples show a multimodal age distribution, showing a young and marked Miocene peak and older, less pronounced peaks (Figure 2).

The maximum frequency of the PJ-11 sample is ~12.1 ± 0.51 Ma (Figure 2 A). The maximum frequency of the PJ-2 sample is ~17.8 ± 0.38 Ma (Figure 2 B). The maximum frequency of the LO-B sample was ~16.6 ± 0.52 Ma (Figure 2 C). The maximum frequency of the LO-W sample is ~18.5 ± 0.19 Ma (Figure 2 D). For each sample there is a dispersal of the ages indicates some source areas for these sandstones.

With this 4 ages constrained, I am allowed to link the sedimentary infill of the basin with the main deformational stages of the APA, the paleoenvironmental shift and the provenance analysis.

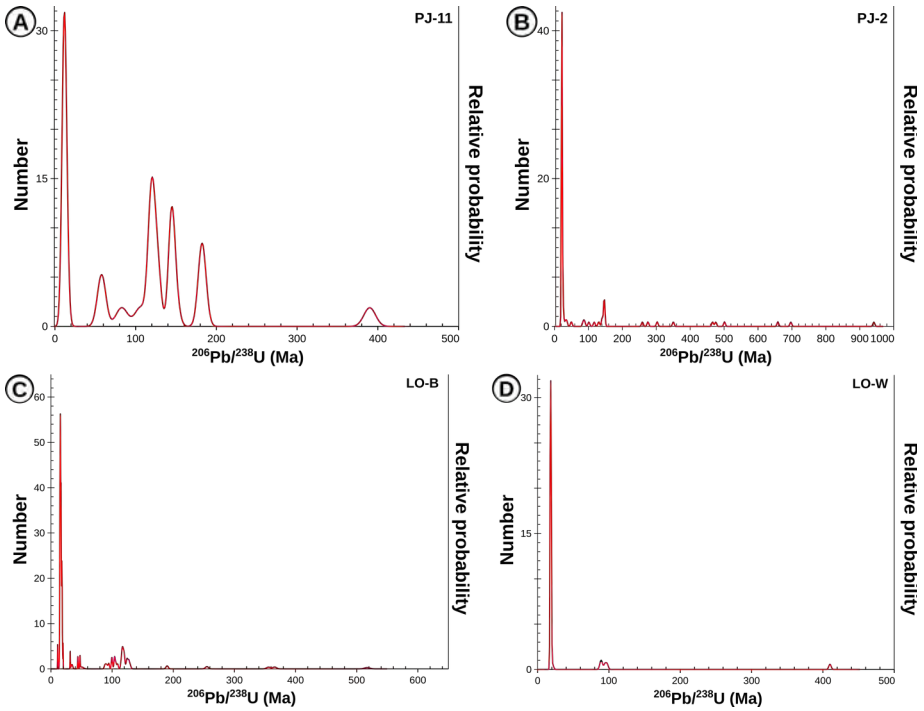

Figure 2: *Zircon U–Pb crystallization ages for the 4 studied samples from the sedimentary Miocene units. (A) and (B) normalized probability distribution for all grains for the PJ-11 and PJ-2 samples of the Western Meseta Lago Buenos Aires stratigraphic section. (C) and (D) normalized probability distribution for all grains for the LO-B and LO-W samples of the Laguna La Oriental stratigraphic section.*

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