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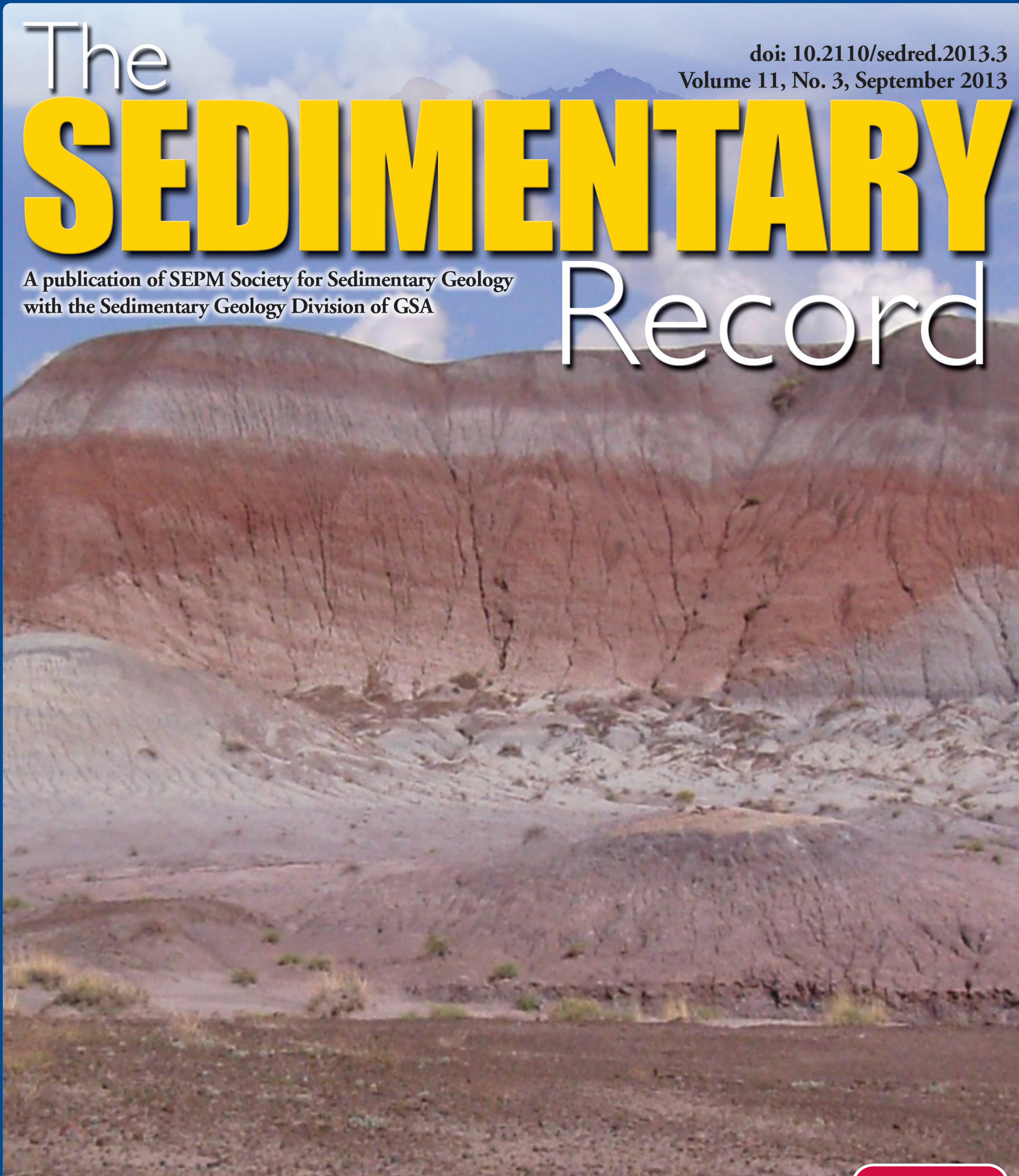

INSIDE: APPLICATION OF THE CRITICAL ZONE CONCEPT TO THE DEEP-TIME SEDIMENTARY RECORD

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Special Publication #102

Sedimentary Geology of Mars

Edited by: John P. Grotzinger and Ralph E. Milliken

Often thought of as a volcanically dominated planet, the last several decades of Mars exploration have revealed with increasing clarity the role of sedimentary processes on the Red Planet. Data from recent orbiters have highlighted the role of sedimentary processes throughout the geologic evolution of Mars by providing evidence that such processes are preserved in a rock record that likely spans a period of over four billion years. Rover observations have provided complementary outcrop-scale evidence for ancient eolian and fluvial transport and deposition, as well as surprisingly Earth-like patterns of diagenesis that involve recrystallization and the formation of concretions. In addition, the detection of clay minerals and sulfate salts on Mars, coupled with large-scale morphologic features indicative of fluvial activity, indicate that water-rock interactions were once common on the martian surface. This is in stark contrast to the dry and cold surface environment that exists today, in which eolian processes appear to be the dominant mode for sediment transport on Mars. These issues and others were discussed at the First International Conference on Mars Sedimentology and Stratigraphy, held in El Paso, Texas in April of 2010. The papers presented in this volume are largely an extension of that workshop and cover topics ranging from laboratory studies of the geochemistry of Martian meteorites, to sediment transport and deposition on Mars, to studies of terrestrial analogs to gain insight into ancient Martian environments. These papers incorporate data from recent orbiter and rover missions and are designed to provide both terrestrial and planetary geologists with an overview of our current knowledge of Mars sedimentology as well as outstanding questions related to sedimentary processes on Mars.

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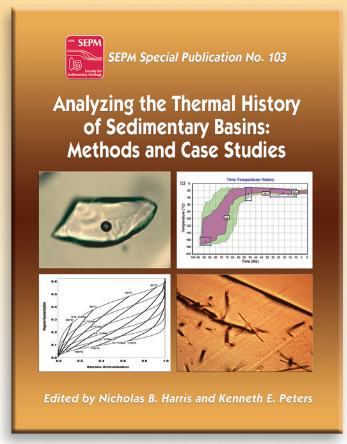

Special Publication #103

Analyzing Thermal Histories of Sedimentary Basins: Methods and Case Studies

Edited by: Nicholas B. Harris and Kenneth E. Peters

Thermal histories of sedimentary basins are critical sources of scientific and practical information. They provide us with windows into past and present tectonic processes and the configuration of the crust and mantle. Using records of present and past temperature distributions, we can identify and constrain interpretations of tectonic events, distinguish different basin types and interpret pathways of fluid flow. These insights can be used calibrate basin and petroleum system models and to interpret and predict the distribution of minerals and petroleum, diagenesis and reservoir quality, and the geomechanical properties of rock units. This volume summarizes the current state of the art for many modern approaches used to estimate paleotemperature. Many techniques are now available based on both organic and inorganic components in the rock. Even techniques that are now many years old, such as apatite fission track analysis, have undergone significant advances in the past decade. This volume provides comprehensive reviews of the fundamental science underpinning each method and the basic principles used to interpret data, as well as case studies illustrating practical applications and the complexity of paleotemperature interpretation. Geoscientists from all sectors will find this volume to be a valuable resource in their work.

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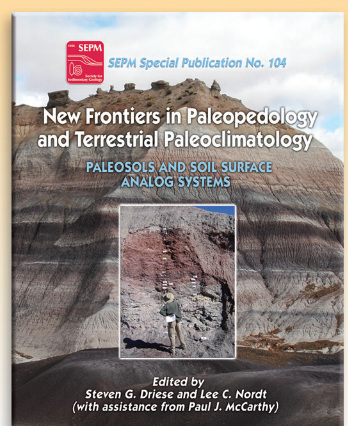
Special Publication #104

New Frontiers in Paleopedology and Terrestrial Paleoclimatology: Paleosols and Soil Surface Analog Systems

Edited by: Steven G. Driese and Lee C. Nordt, with assistance by Paul J. McCarthy



After initial breakthroughs in the discovery of fossil soils, or paleosols in the 1970s and early 1980s, the last several decades of intensified research have revealed the much greater role that these deposits can play in reconstructing ancient Earth surface systems. Research currently focuses on terrestrial paleoclimatology, in which climates of the past are reconstructed at temporal scales ranging from hundreds to millions of years, using paleosols as archives of that information. Such research requires interdisciplinary study of soils conducted in both modern and ancient environments. These issues and many others were discussed at the joint SEPM-NSF Workshop “Paleosols and Soil Surface Analog Systems”, held at Petrified Forest National Park in Arizona in September of 2010. The papers presented in this volume are largely an extension of that workshop and cover topics ranging from historical perspectives, followed by lessons from studies of surface soil systems, with examples crossing between soils and applications to paleosols. The remainder of the volume begins with an examination of the relationship between paleosols and alluvial stratigraphy and depositional systems, and ends with three case studies of ancient soil systems. Because some readers may find the nomenclature rather “foreign” the editors have included a glossary of pedological terms at the end of this volume. These papers incorporate data from studies of surface soil systems as well as deep-time sedimentary rock successions and are designed to provide sedimentary geologists with an overview of our current knowledge of paleosols and their use in interpreting past climates, landscapes, and atmospheric chemistry.

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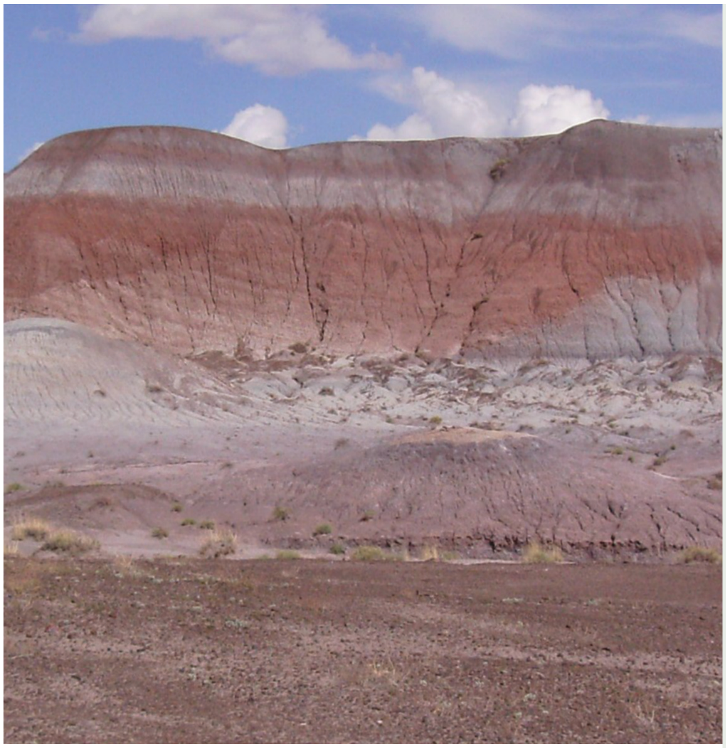

Cover photo: Landscape view of a Late Triassic DTCZ displaying an entrenched channel deposit with cross bedding, and marginal channel and overbank floodbasin facies to the right of the channel (red beds). This ancient Critical Zone would have extended from the top of the inferred plant canopy and down to the base of the weathering zone, including the entire thickness of the channel fill but also the gray deposits underlying the red floodbasin facies and paleosol.

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Application of the Critical Zone Concept to the Deep-Time Sedimentary Record

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ABSTRACT

In 2006 the US National Science Foundation (NSF) created a national Critical Zone Observatory (CZO) program. As defined in that report, the Critical Zone (CZ) extends from the top of the vegetation canopy to the groundwater table, and integrates interactions of the atmosphere, lithosphere, pedosphere, biosphere, and hydrosphere. Following themes of two recent discussions presented in the *Sedimentary Record*, we propose to extend the CZ concept to deep-time Critical Zones (DTCZ), arbitrarily defined as pre-Quaternary (>2 Ma). Because of recent advances in the study of paleosols (termed paleopedology), especially refined geochemical paleoclimate proxies and pedotransfer functions, it is now possible to reconstruct biogeochemical cycles from paleosols preserved in the sedimentary record in deep-time. We present a case study of a DTCZ as investigated within the framework of a deep-time Critical Zone observatory (DTCZO). Additional advances in interpretations derived from mining of a modern geochemical data base derived from a broad array of Critical Zone environments will improve our understanding of the geochemistry of weathering, and strengthen the veracity of the records of the paleo-atmosphere, biosphere, and hydrosphere.

INTRODUCTION

As originally proposed by the NSF, invoking the "Critical Zone" concept provided a framework challenging the Earth sciences community to expand its capability for predicting future changes in the Earth climate system (National Science Foundation 2000). The National Research Council (NRC) subsequently identified integrative studies of the "Critical Zone" as one of the six compelling opportunities for earth scientists in the next decade (National Research Council 2001, 2003); a report that was recently updated and reinforced (National Research Council 2012). In 2006 the NSF created and funded a national Critical Zone Observatory (CZO) program, now consisting of 6 observatories stationed throughout the U.S. and Puerto Rico (http://criticalzone.org/).

Why is the "Critical Zone" so important to the Earth sciences? The Critical Zone (CZ) is an actualistic environmental laboratory designed to study the biogeochemical by-products of the interactions of the atmosphere (energy, gases) and hydrosphere (water flux, mineral weathering) acting on the lithosphere (chemical elements, physical substrate) to produce the pedosphere (weathered lithosphere, nutrient storage) and biosphere (floral/faunal, nutrient cycling). Critical Zone observatories (CZO) are designed to study quantitatively the interface of the Earth systems within a defined area to better understand the current structure and function of the CZ and to predict its future response to tectonic, climatic and anthropogenic forcing (Brantley et al., 2007).

However, the sedimentary geology community, and the smaller subset community interested in paleosols, has largely been excluded from the CZ discussion. The recent *Transitions* (2011) document (http://www.nsf.gov/pubs/2012/nsf12608/nsf12608.pdf) argues that the deep-time critical zone concept is important because the climate state of the last 2 Ma years (glacial epoch) is a non-analog to a future world without glaciers. Furthermore, climates of the past are often examined using general circulation models (GCMs) where the validity of any proposed GCM depends on actual data obtained from ancient geologic records of climate that are preserved in rocks, including ancient soil deposits known as paleosols.

Following themes of two recent discussions presented in the *Sedimentary Record* (Montañez and Isaacson 2013, Parrish and Soreghan 2013), we propose to extend the CZ concept to deep-time (DTCZ), arbitrarily defined as pre-Quaternary (>2 Ma). To preserve the integrity of the CZ concept, a DTCZ must be recognized as a snapshot in time - a land surface that extends laterally across a continent, region, or local landscape (Fig. 1). A DTCZ can be studied in the context of a deep-time critical interval (DTCI) recognized, for example, as an intense greenhouse episode or faunal turnover. Sediment cores might expose a DTCI within which to identify and study a DTCZ and even offer complementary interpretive information (Retallack and Dilcher, 2011). At the local scale, however, an outcrop exposure would be the

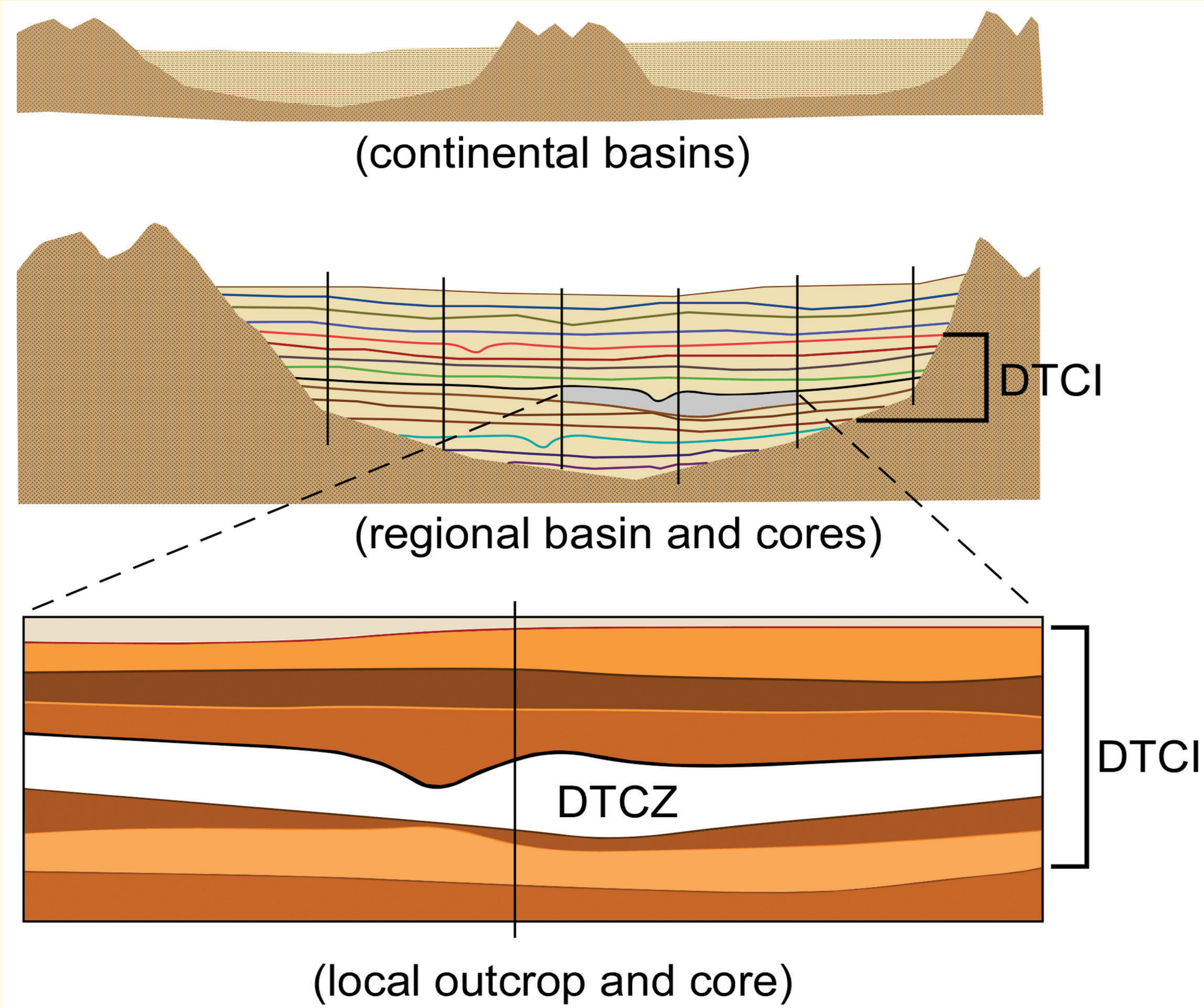

***Figure 1:** Top panel - Schematic cross section of two continental-scale structural basins (each ~40 km wide and 100 m deep) containing a succession of alluvial deposits. Middle panel - regional view of a basin accessed by 6 sediment cores penetrating 14 demarcated DTCZ's (color coded lines) through a DTCI. Lower panel - Local outcrop (~6 km wide and 20 m thick) of an alluvial succession illustrating a DTCZ (gray) within the designated DTCI. Note that the single sediment core through this alluvial section would provide limited CZ information. The upper part of each DTCZ is assumed to have been weathered to a paleosol.*

ideal environmental laboratory for studying a specific DTCZ and all associated facies (Fig. 1). Creation of a deep-time Critical Zone observatory (DTCZO) would require a team of scientists studying the structure and function of a DTCZ (http://www.nsf.gov/pubs/2012/nsf12608/nsf12608.pdf).

Our expertise is in the area of paleopedology (study of paleosol morphology, genesis, and interpretation) and as such the purpose of this paper is to present many of the interpretations possible from studying paleosols within the DTCZ concept. In a 2010 SEPM-NSF jointly sponsored Workshop *"Paleosols and Soil Surface System Analogs"*, the paleopedology community was able to assess its role in deep-time climate reconstructions, propose methodological approaches to the characterization of ancient Critical Zones, and voice its desire for increased involvement and support through NSF (Driese and Nordt, 2013).

IMPORTANT ADVANCES IN PALEOPEDOLOGY

In the absence of monitoring stations, the paleopedologist must study vestiges of once functioning critical zones using a variety of forensic field morphological and laboratory investigative methods (Nordt and Driese 2010a, Nordt et al., 2012, Nordt et al. 2013). Once a paleosol is characterized a number of important interpretations related to the Earth systems are strengthened.

Advances in paleo-atmospheric sciences based on a more robust reconstruction of ancient pedospheres are summarized in Sheldon and Tabor (2009). Whole-rock molecular oxides, especially the Chemical Index of Alteration Minus Potassium (CIA-K), have been

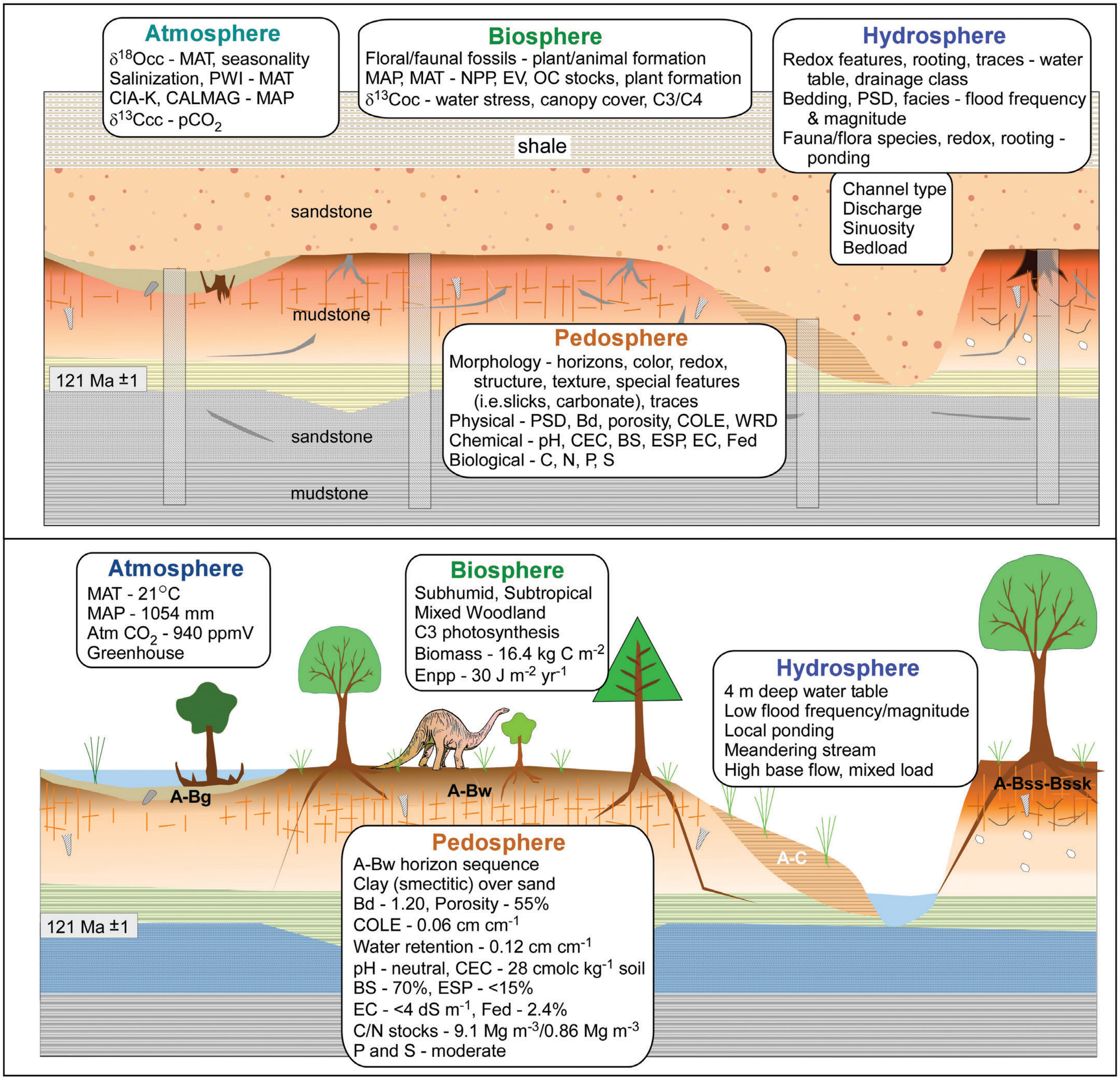

Figure 2: Illustration of a 2 km wide and 10 m thick cross section of a Cretaceous DTCZ in outcrop before (top panel) and after (bottom panel) reconstruction (refer to Figure 1). Reconstruction was performed from field descriptions and geochemical characterization analysis of 4 fluvial facies (vertical cross-hatched columns). Climate reconstruction from data from the A-Bss-Bssk paleosol profile, biosphere and pedosphere reconstruction from the A-Bw profile, and hydrosphere reconstruction from characteristics of both the fluvial system and paleosols. Note slight color changes and transformation of root traces to drab halos during diagenesis. gray - iron reduction zones in mass or after roots, white ovals - pedogenic carbonate nodules, cross-hatched cylinders - faunal traces, dark features in subsurface - tree stumps, Bd - bulk density, COLE - coefficient of linear extensibility, WRD - water retention difference (AWC – available water capacity), PSD - particle size distribution, ExC - exchangeable cations, CEC - cation exchange capacity, BS – base saturation, ESP - exchangeable sodium percentage, pH - hydrogen ion activity in solution, EC - electrical conductivity, Fed - citrate dithionite extractable iron, cc and oc - calcium carbonate and organic carbon for isotopic analysis, PWI – paleosol weathering index, EV - evapotranspiration, Enpp - net primary productivity expressed in units of energy.

popularly used in the paleosol community for reconstructing climate, especially mean annual precipitation (MAP) (Sheldon et al. 2002). However, because CIA-K, defined as (Al_2O_3/(Al_2O_3+CaO+Na_2O)*100), is fundamentally an index of clay formation and base loss related to feldspar weathering, it is inappropriate for one soil order that is well-represented in the rock record as paleosols, namely, the Vertisols. These soils have high clay-content and high shrink-swell potential, and commonly form from alluvium that has been "pre-weathered"

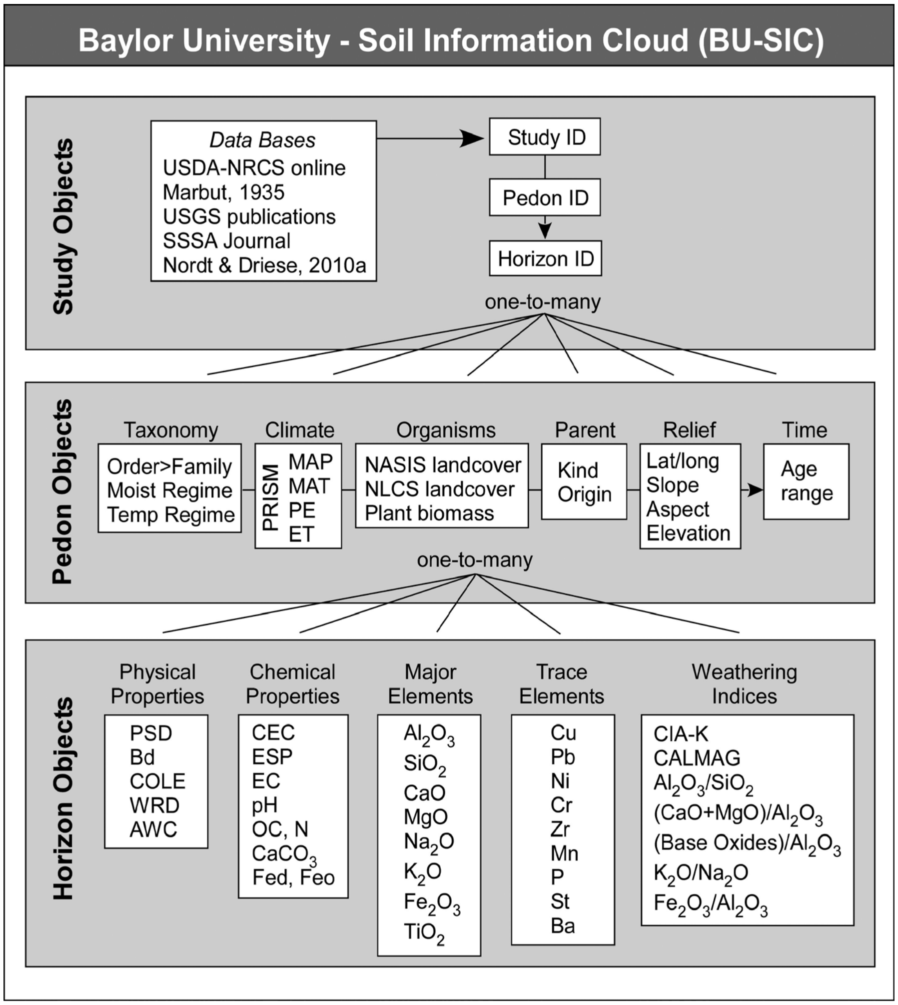

Figure 3: Baylor University-Soil Information Cloud (BU-SIC) for database management of information sources scaled from study objects to pedon objects to horizon objects. The hierarchical structure permits many different types of queries depending on the needs of the researcher. The database is currently being queried for correlations between bulk soil oxides (major and trace elements, and weathering indexes) and climate parameters, and between bulk soil oxides and physical and chemical properties for establishing pedotransfer functions. NASIS – National Soil Information System, NLCS – National Landscape Conservation System, PRISM – Parameter-elevation Regressions on Independent Slopes Model, PSD – particle-size distribution, Bd – bulk density, COLE – coefficient of linear extensibility, WRD – water retention difference, AWC – available water capacity, CEC – cation exchange capacity, ESP – exchangeable sodium percentage, EC – electrical conductivity, OC – organic carbon, N – nitrogen, P – phosphorous, S-Sulfur, Fed – citrate dithionite extractable iron (crystalline, pedogenic), Feo – ammonium oxalate extractable iron (amorphous, pedogenic).

(Nordt and Driese 2010a). Recent advances developing MAP proxies specific to Vertisols, such as CALMAG, defined as (Al_2O_3/(Al_2O_3+CaO+MgO)*100), have improved MAP estimates (Nordt and Driese 2010b). Estimating paleo-temperatures has been problematic because the $\delta^{18}O$ of pedogenic carbonate nodules involves many uncontrained assumptions (Dworkin et al., 2005). However, the wide error bar in the original geochemical salinization equation for temperature proposed by Sheldon et al. (2002) was recently improved by developing the paleosol weathering index (PWI) designed specifically for forested paleosols (Gallagher and Sheldon, 2013). The stable C composition of paleosol carbonate has had long standing success helping to reconstruct long-term trends in atmospheric CO_2 (see Ekart et al., 1999).

The pedosphere also provides important clues to the paleo-biosphere. For example, Nordt et al. (2012) calculated organic carbon stocks of paleosols using the rationale that as organic materials decompose upon burial certain trace elements remain behind as conservative tracers of the original organic content. Gulbranson et al. (2011), using modern climate (PRISM) and bulk soil geochemistry data, developed energy fields for paleosols in the rock record. As defined in this work, E_{PPT} (energy from precipitation, kJ m^{-2} yr^{-1}) and E_T (evapotranspiration, cm) can now help classify Holdrege life zones and associated plant formations. Other studies show that the $\delta^{13}C$ of bulk paleosol organic carbon provide insights into atmospheric ^{13}C to potential moisture stress levels of C3 plants and to differences in canopy cover (Kohn 2010). Moreover, Fox and Koch (2003) were one of the first to document the spread of C4 plants from the stable C isotopic composition of paleosol organic materials. Röbler et al. (2012) developed an approach to reconstruct the structure of a plant community across a landscape as a snapshot in time from botanical remains and traces in paleosols.

Reconstructing terrestrial hydrospheres include, in addition to climate parameters from geochemical analysis, information extracted from paleosols and the affiliated environments of deposition (i.e. fluvial). Soil water-holding capacity and hydraulic conductivity can now be measured or inferred in paleosols (Nordt et al. 2013). Drainage class can be inferred from redoximorphic features and faunal traces related to water table levels, ponding, and flooding (Kraus and Hasiotis, 2006). Channel parameters can be related to paleo-discharge, channel type, and even flood magnitudes (Flaig et al. 2011), which in turn controls the stability of the landscape in fluvial settings.

CASE STUDY OF THE DTCZ CONCEPT

Figure 2 is a schematic representation of the logic and steps in reconstructing a DTCZ in the sedimentary record at the outcrop scale, beginning with morphological description and laboratory analysis of samples collected from each alluvial facies (cross-hatched columns). The optimal approach would be for a team of geoscience specialists to study the outcrop exposure from varying perspectives.

From these data secular atmospheric conditions were calculated from geochemical and isotopic analysis of the most weathered paleosol, i.e., that most likely in equilibrium with ambient climate conditions (Fig. 2, A-Bss-Bssk profile). The floodbasin facies in Figure 2 (A-Bw profile) is used as an example of studying one facies of the DTCZ in detail. Here, biogeochemical characterization of the paleosol is performed by a combination of field description, direct laboratory analysis, and pedotranfer functions, and the biosphere is reconstructed from atmospheric conditions, paleosol edaphics, and botanical remains. The hydrosphere is recreated from channel dimensions of buried river channels and from the distribution of redoximorphic features in paleosols for extrapolating water table depths.

Reconstruction of the entire schematic cross-section in Figure 2 from the integrated field and laboratory studies discussed herein indicates that this DTCZ formed in a temperate subhumid to humid greenhouse climate (high MAP and pCO_2) with soils in the floodbasin facies that were nutrient-rich (neutral pH, high BS, low EC or salinity, and low ESP or sodicity), and that had optimal water holding capacity (strong ped structure, low bulk density, high porosity and water retention), optimal nutrient retention (high clay content and CEC) and nutrient reserves (relatively high C, N, P, Fe), and moderate shrink-swell potential (COLE). Comparatively high NPP and minor water stress and open canopy based on C3 isotopic signatures, suggest that carbon and nitrogen stocks were in plentiful supply in both above- and below ground biomass. The DTCZ formed in an infrequently flooded floodplain of a meandering stream (attached point bars, mixed load, aerial view of channel features), but with variable drainage conditions depending on the affiliated facies (redoximorphic features, Fed content, faunal traces). Immature, wet Entisols (Aquents, A-Bg profile) occurred in what were ponded areas supporting early to midsuccessional swamps (hydrophytes). More mature and better drained Vertisols (Uderts, A-Bw and A-Bss-Bssk profiles) formed across the floodbasin facies supporting mixed woodlands (mesophytes). Variably drained Entisols (Fluvents, A-C) formed on riparian point bars bordering incised river channels (mixed hydrophytes and mesophytes). Comparing these conditions to another DTCZ with different environmental conditions, say in a stratigraphically superposed cool house interval, would strengthen the understanding of ecosystem response to different forcing mechanisms.

LOOKING TO THE FUTURE

We are currently developing a soil database (BU-SIC) that contains over 1500 pedons and 6000 soil horizon records obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) that can be queried using different soil and geochemical (whole-soil) parameters to (Fig. 3): 1) develop new paleosol bulk geochemical proxies using partial least squares regression (PLSR) for a universal approach to calculating MAP and mean annual temperature (MAT), 2) establish paleosol pedotransfer functions that relate bulk geochemical assays to modern soil characterization properties for all paleosol types, and 3) develop a new paleosol taxonomic system based on a combination of field morphological properties, measured laboratory properties, and pedotransfer functions.

Regarding paleosol classification, there are two competing taxonomic systems employed for the rock record. The Mack et al. (1993) scheme takes the minimalist approach with classification criteria limited to field observations of preserved morphological features. This strength is also its weakness in that it provides limited interpretative value and little in the way of the reasons why any taxonomic system is constructed. In contrast is the modern U.S. soil taxonomic system (Soil Survey Staff 1999). If this system is taken through all six categorical levels for classification it requires so much quantitative and semi-quantitative information as to make it impossible to apply to all fossil soils. Thus a compromise of approaches is needed to improve consistent communication and application.

CONCLUSION

Even though this paper is not a comprehensive over view of all aspects of the DTCZ concept, it is apparent that the design and implementation of DTCZ observatories will improve our understanding of deep-time sedimentary records. These records will for the first time provide valuable information in a holistic manner about ancient landscapes as opposed to the limitations of studying one-dimensional stratigraphic sections. We recommend the formation of task forces that would work towards developing these various concepts and to form teams of scientists designing DTCZ studies across deep-time critical intervals.

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PRESIDENT'S COMMENTS

As touched upon in the March issue of the Sedimentary Record, the world of scientific publishing continues to change. A major development that is sweeping across the world is the distribution of, and accessibility to, research through a process known as Open Access (OA). In general, OA is a method that promotes free availability and unrestricted use of scholarly research. In terms of the publication of research, OA literature is available online and free of charge to readers. Copyright and licensing restrictions are minimal, which eliminates permission barriers.

OA has been mandated by over 150 universities worldwide and more than 50 research funding agencies. The list continues to grow. In February 2013, The White House announced a major new policy aimed at increasing public access to federally financed research (http://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf). The new policy requires scientific data and peer reviewed publications from unclassified, federally supported research to be made available to the public. Affected agencies had six months to decide how to implement the policy. The National Science Foundation followed the announcement saying it had already established a timetable and that implementation would likely vary by discipline "and that new business models for universities, libraries, publishers, and scholarly and professional societies could emerge." (Howard, 2013)

Scientific societies similar to SEPM have already adopted or are developing OA policies. SEPM journals publish a significant number of papers each year in which research is funded by agencies that will now require OA publication. The SEPM Council has been discussing Open Access issues for the last several years and to continue to attract and publish the best papers that may now fall under the OA mandate, SEPM has now developed an official OA policy, which is published in this issue of the Sedimentary Record. This policy was developed with the currently available information on OA. There are still unknowns, and rules for OA are not yet fully developed, so policies are likely to evolve to remain in line with requirements as they become available.

There are many questions concerning OA, how it works, associated costs, and impacts to societies and society members. Most of these are covered in the policy and in an FAQ page on the SEPM Website (under Publications).

In terms of the concept, OA promotes the mission of SEPM for disseminating scientific information as widely as possible. Making peer-reviewed literature freely accessible, searchable, and reusable to anyone with an internet connection helps achieve this goal. There is a broad consensus that widespread open access to scientific publications is good for scientists and good for science. Society members want to maximize the impact of their work. Articles that are freely available online are cited more frequently than those that are not (Lawrence 2001).

The term "open access" does not imply that there are no costs associated with publishing in OA format. The costs for editing, producing, distributing, and maintaining server space and access systems for journal papers remain, but OA requires a business model that pays for those costs apart from charging for access to content. Quite simply put, OA transfers the costs of publication from the readers (subscribers) to authors or the author's sponsor (employer, funding agency). The cost to publish an OA paper will include an article processing charge (APC). The OA option whereby authors pay for the costs is known as the Gold Open Access option; this option makes the online access free to everyone at the time of publication. It also allows authors to freely distribute and post the fully formatted version of their article in any other online repository. If an author does not pay for Gold OA then a Green Open Access option basically allows any author to post their final accepted manuscript version in other free access depositories but only after a twelve month delay.

One development as a result of OA mandates is the recent emergence of many new open access journals. There are fully OA journals that charge all authors to publish and hybrid journals that have both open access articles and subscriber only access articles within each issue. SEPM journals will initially be using the hybrid model. This will allow authors that are funded and must or want to publish their work in Gold OA to pay the article processing charge. Authors without a Gold OA funded mandate can continue to publish without any cost to them and use the Green OA option after the embargo. The viability of the OA only journals as attractive, quality publication outlets remains to be seen. They do not have the history, reputation for quality, nor impact factors and citation rates that journals such as SEPM's have. The need for our quality journals will not diminish and having the option of OA publication continues SEPM's ability to attract and publish the best papers. The process for OA publication is the same as for the traditional form of publication in terms of editorial and peer review process, SEPM will not have a 'if you pay you will be published' policy

In terms of direct benefits to Society members, when the first author of an accepted manuscript is an SEPM member, they will receive a $200 discount when they choose the Gold OA option. In addition, as stated in the policy, when the subscription renewal rates for any SEPM publication are set each year, there will be a discount proportional to the amount of OA fees received in the previous 12 months.

Historically, SEPM's journals have provided the bulk of the revenue which has supported other Society activities for disseminating scientific research (conferences, books, short courses, field trips). The evolving journal publication landscape, which now includes OA mandates, is likely to have a continuing economic impact, which will require SEPM's financial model to evolve so that SEPM continues to remain viable for achieving their mission and providing benefits of membership.

Evan Franseen, SEPM President

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What's new in SEPM Special Publications?

The SEPM Special Publications or 'Red Book' Series, is an SEPM icon documenting all aspects of sedimentology since its inception in 1929. However, in the last four years there have been a number of changes in the publishing world that have led to new ways of producing these books and new publication formats that we believe will ultimately make Special Publications (SPs) and the other SEPM book series accessible and more relevant now and in the future.The changes include improvements to the submission and review process, faster publication of papers by releasing them on-line prior to publication of the final book, a wider variety of print and digital formats, and inclusion of volume papers in ISI-type indexing.

1. ***Manuscript submission:*** All SP manuscripts are now submitted as digital files that are uploaded to Allen Track – an on-line system that organizes volume contributions and allows authors and volume editors to track the passage of their manuscript through the review, revision and galley stages. This follows the process that has been successfully used by SEPM journals for a number of years and speeds up the processes of submission and revision.

2. ***Publication format:*** All future SPs will be published in digital formats that allow on-line access (through SEPM Online and also on the GSW platform – see item 5 below), and as CD's (these options also include out-of-print books). There will also be provision for Print on Demand (PoD) for those who still like to have the feel of a solid object and the rustle of paper; we will use a commercial printer for PoD books. We have trialled two recent SPs in this way and the products are of comparable quality to longer print runs. PoD provides a way of offering hard-copies of SPs to those who wish to have them without SEPM incurring the costs of full print runs and storage of the books. Keep visiting the SEPM Bookstore to see the full range of publications that are available.

3. ***Citation indices:*** Individual papers in a Special Publication volume are now included in the Web of Science citation index; they are also included in Google Scholar, Scirus and Scopus. This means that publication of papers in SPs now have the same citation status as a journal paper.

4. ***On-line first:*** It is authors who are slowest to submit, revise and proof their manuscripts that delay publication of SP volumes. We are currently putting the finishing touches to this new approach to early publication of SP papers that will help alleviate this perennial problem. Manuscripts that have completed all stages, including final proofing, will be uploaded to an SEPM site where they will be available as a 'published paper' that includes a DOI, but not page numbers (these will appear in the final volume); there will be a charge to access these papers on line. Once the volume has been completed, these papers will be withdrawn from the web site and the book will be available for purchase as usual from the SEPM Bookstore, as a CD or PoD version, and online digitally at SEPM Online. Authors who move their contribution quickly through the system will benefit from early publication and exposure.

5. ***The Geoscience World e-book program:*** GSW (hosted at HighWire Press) has been licensed to include the aggregate of SEPM books, old and new, to sell on-line in e-book format to institutions and individuals (via pay-per-view). The program includes several other major geological societies such as the GSA, AAPG and the Geological Society of London. This means that all SEPM books will have significantly increased exposure for citation and sales, not just to SEPM members but to all of the global GSW subscribers.

All these changes have been introduced with the aim of ensuring that Special Publications remain an attractive vehicle for publication of thematic papers in sedimentology, stratigraphy and palaeontology. Thematic sets have always formed an important part of the scientific publishing landscape. By speeding up the process of publication of individual papers via Allen Track and on-line first, ensuring that these papers are included in citation indices, and keeping the costs down for both SPEM and its members, we can be certain that SPs will continue to exist – and in a variety of formats to suit the needs of both readers and authors. All of these changes should be implemented by early 2014 or sooner.

Brian Ricketts and Gary Nichols,
SEPM Special Publications Co-editors

THE GEOLOGICAL SOCIETY OF AMERICA®
SEDIMENTARY GEOLOGY DIVISION

The 125th Annual GSA Meeting in Denver is Coming This October.

2013 GSA Annual Meeting

The Sedimentary Geology Division is looking toward a good meeting at GSA this year. The technical program is diverse and integrated with research in other disciplines.

2013 Laurence L. Sloss Award Recipient

Dr Fred Read, Sloss Award

The GSA Sedimentary Geology Division is happy to announce that Dr. Fred Read of Virginia Tech University is the 2013 Laurence L. Sloss Award recipient.

Dr. Read was one of the pioneers of modern carbonate sedimentology, and his extensive work on carbonate platforms has provided the basic framework for carbonate sequence stratigraphy. Fred has authored or co-authored over 100 publications, many of them significant contributions to carbonate sedimentation and cyclostratigraphy. His studies have focused elucidating how climate and eustatic changes are reflected in carbonate stratigraphy.

His thorough studies of Paleozoic carbonates have provided the facies models that are the standards for modern carbonate research. These models are the primary tools, used by both academicians and exploration geologists. His research has been of tremendous economic as well as academic importance. Of equal importance to his research are his contributions to the education of his fellow scientists through the mentoring of 30 graduate students, many of who have gone on to distinguished careers of their own. His numerous short courses and field trips have been some of the most important elements in disseminating the sedimentary studies through the geologic community. We are proud to award Dr. Read with the 2013 Laurence L. Sloss Award.

2012 SGD Student Research Award Recipient

The division sends our congratulations to Latisha Brengman of the University of Tennessee at Knoxville. Latisha is this year's winner of the Student Research Grant! Her research was an extremely innovative look at how seawater chemistry is preserved in different types of Precambrian chert. This research uses silicon and rare earth isotopic data to look at how chert chemistry evolved during the Precambrian. Chert forms both depositionally and diagenetically and Latisha will be using isotope signatures and geochemistry to constrain the effects of both weathering and seawater temperature.

Please join us at the SEPM-sponsored SGD and Limnogeology Division Joint Business Meeting and Awards Reception as we recognize Latisha efforts as well as those of the SGD student poster and student travel award recipients.

The 2012 Stephen E. Laubach Structural Diagenesis Research Award

Dr. Peter Mozeley Laubach Award Recipient

The Stephen E. Laubach award is an interdisciplinary award that promotes research combining structural geology and diagenesis. The award is given jointly by the Sedimentary Geology and Structural Geology and Tectonics divisions and is presented at our respective awards ceremonies. This year the Sedimentary Geology Division will be presenting the award to Dr. Peter Mozeley of New Mexico Tech University, for his study "Using Diagenetic Alterations to Infer Past Fluid Flow in Faults that Cut Basement Nonconformities: Implications for Induced Seismicity". Dr. Mozeley is the first faculty member to receive this award, which up until now has been given to graduate students. Dr. Mozeley's innovative research will investigate how fluids promote faulting at the interfaces between basinal sequences and basement.

2012 GSA Annual Meeting Charlotte

Sedimentary Geology continues its to exhibit the integration with diverse other fields, which is a hallmark of our specialization at this years at GSA Annual Meeting. This year GSA Sedimentary Geology and SEPM sponsored a whopping 4 short courses and 37 technical sessions. The variety and importance of these sessions, on both scientific and societal levels highlights the importance of our discipline.

Do you know a colleague who would be particularly deserving of the Laurence L. Sloss Award for Sedimentary Geology?
Please forward nominations to Richard Lanford at riplangford@gmail.com.

Seds and Suds

This year's Seds and Suds will inform our community about the exciting new STEPPE program, which will serve to help integrate the Sedimentary Community to answer important, multidisciplinary research questions in Sedimentary Geology. The Steppe Director is being hired this summer and the program will be operation by the annual meeting.

http://www.steppe.org

Seds and Suds got kicked out of its old time slot and will now be held on Monday October 28 at 5:45-7:00 pm.

Sponsored Short Courses

502. **Sequence Stratigraphy for Graduate Students.**

505. **Structural and Stratigraphic Concepts Applied to Basin Exploration.**

514. **Modern Digital Geologic Mapping Techniques.**

523. **Mars for Earthlings: Introductory Earth-Mars Teaching Resources for Higher Education.**

Sponsored Topical Sessions

T1. **Curiosity at Gale—Past and Present Environments of Mars**

T2. **From the Sahara to Mars and Beyond: The History and Future of Aeolian Research (Posters)**

T17. **Coupling Interactions between Fluvial and Aeolian Processes in Drylands: Assessment and Quantification of Their Role in Geomorphological Change and in an Era of Climatic Uncertainty**

T21. **Peaks to Plains: Late Cenozoic Landscape Evolution of the Rocky Mountains and Western Great Plains**

T29. **New Frontiers in Cosmogenic Nuclide Applications: Pushing Analytical and Geological Limits to Understand the Past, Present, and Future of Earth's Surface**

T60. **Caves as Deep Time Repositories of Geological, Biological, and Anthropological Information**

T64. **Lacustrine Basin Analysis and Petroleum Systems: Ancient Case Studies, Modern Analogs, New Frontiers**

T66. **New or Improved Proxy Methodology for Enhanced Resolution and Accuracy of Climatic and Paleoenvironmental Interpretations in Sedimentary Records**

T88. **Pyrogenic Black Carbon, or Biochar, in Soils and Sediments, Its Characterization and Fate, Its Effects on the Carbon Cycle and Carbon Sequestration, and Its Effects on Soil Properties (Posters)**

T119. **Digital Geology Express (Digital Posters)**

T150. **Advances in X-ray Fluorescence and Diffraction and Their Role in Sedimentary Geochemistry and Chemostratigraphy**

T151. **Biogeochemical Processes Affecting Metal and Metalloid Isotopes**

T162. **Interdisciplinary Studies across the Critical Zone**

T163. **Pedogenic Minerals as Indicators of Ecosystems: Understanding the Critical Zone through Space and Time**

T178. **A Review of Old and New Concepts in Laramide Basin Evolution: A Multidisciplinary Approach**

T179. **Geological and Geophysical Constraints on the Tectonic Evolution and Resource Potential of Alaska and the Northern North American Cordillera**

T190. **The Life and Death of Mobile Belts along the North American Cordillera: Advances in Understanding the Long-Term Construction of Continental Margins (Posters)**

T193. **Continental Carbonates**

T194. **Current Understanding of Dolomite, Dolomitization, and Dolomite Problems**

T195. **Advances in Quantitative Sediment Provenance Research: Novel Approaches from Multi-Proxy Provenance Data to Provenance Modeling**

T196. **Ancient Floodplains and Rivers: Unraveling the Mysteries of Colorado's Conglomerates**

T197. **Sevier to Laramide Tectonism along the Western Laurentian Margin: Sedimentologic and Stratigraphic Constraints on Cretaceous-Tertiary Magmatism, Deformation, and Orogenic Exhumation**

T198. **Earth Deep Time Revolution by Global Chronostratigraphic Correlation**

T199. **Impact of GSSPs on The Evolution of North American Chronostratigraphy**

T200. **Paleozoic Rocks in the Denver Basin**

T224. **A Life in Earth History from Tectonics to Climate (Posters): The Scientific Legacy of Paul F. Hoffman**

T225. **Climate of the Late Paleozoic—Earth's Last Icehouse and Icehouse Collapse**

T226. **Geologic Process Rates—Past, Present and Future**

T227. **Into the Frying PAN: The Early Triassic Hothouse of Pangea and Panthalassa**

T230. **Quantitative Reconstructions of the Large-Scale Cenozoic Terrestrial Climate Change**

T232. **Using the Past to Look to the Future: Reconstructing Terrestrial Paleoenvironments and Paleoecosystems of Past Warm Worlds**

T234. **Cyberinfrastructure for Paleogeographic Synthesis**

T238. **New Insights into Triassic-Jurassic Transition Events and End-Triassic Mass Extinction**

T240. **Advances in the Application of Biogeochemical Datasets in Paleoenvironmental and Paleoecological Studies**

T241. **Ancient Polar Ecosystems and Climate History in Deep Time**

T251. **Advances in Describing the Critical Geologic Components of Effective Oil and Gas Reservoirs**

T254. **New Advances in Pore System Characterization Cross Geologic Boundaries**

SEPM Open Access Policy

The SEPM Society for Sedimentary Geology (SEPM) will respond positively to the new RCUK and OSTP policies on public access to research results and will implement new policies for articles received on or after September 1, 2013. These policies will apply to all authors, and the Society will retain its commitment to publishing only high-quality peer-reviewed research outputs.

The Society's journals and online book publications will take a hybrid approach to publication, enabling a combination of Gold (author pays) Open Access, Green (repository) Open Access and access-controlled (subscription) articles. SEPM will also work with co-publishers to encourage the adoption of compatible policies.

Gold Open Access

1. For an article to be published on a Gold Open Access basis, the payment of an Article Processing Charge (APC) is required on acceptance of the article for publication. Payment must be received prior to online publication. The APC charged for Gold OA will be $2,700 for articles submitted in 2013.
2. APC charges will be reviewed on a regular basis, and may be waived for (e.g.) commissioned journal articles. A discount of $200 will be available for members of the Society, and discounts may be offered to authors from developing countries. The eligibility for a discount is restricted to the first author's status.
3. Gold OA articles will be published under the terms of the **CC-BY 3.0 license**. These terms include the readers freedom to Share — to copy, distribute and transmit the work; to Remix — to adapt the work; and to make commercial use of the work as long as the source of the work is attributed in the manner specified by the licensor (SEPM) (but not in any way that suggests that the authors or publishers endorse the use of the work). SEPM requires attribution to include a full reference, including author(s), date and publication.

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Compliance With Funder and License Requirements

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