

## Earth System Processes 2 meeting

Planetary Geoscientists,

I would like to call your attention to the Earth System Processes 2 meeting, which will be held in Calgary, Alberta, Canada August 8-11. This will be an interdisciplinary, integrative scientific meeting exploring the interactions among Earth's lithosphere, atmosphere, hydrosphere, cryosphere, and biota. The meeting is being co-sponsored by the Geological Society of America and Geological Association of Canada, with support from the Canadian Institute for Advanced Research and the NASA Astrobiology Institute. Sessions for the meeting have been organized around three basic themes: Ancient Earth Systems, Modern Earth System Processes, and Earth System Futures. I have attached a pdf version of the meeting announcement. For more information, the meeting website can be found at <http://geosociety.org/meetings/esp2/prog.htm>. If you navigate to this site, you will find a wide range of topical sessions and wonderful plenary speakers.

The first ESP meeting was co-sponsored by the GSA and Geological Society of London in Edinburgh, Scotland in 2001 and was a high point for Earth Sciences meetings that year. ESP 2 promises to be excellent as well, so if you have not already made a commitment to attend, I encourage you to consider submitting an abstract.

### **The abstract deadline is April 26!**

While I have your attention, if you have an interest in Solar System exploration, please consider submitting an abstract to the following session:

Session Title: The Future of Solar System Exploration  
Organizer: Jack Farmer (jfarmer@asu.edu; 480-965-6748)

Description: The next two decades of Solar System exploration promises to be both vigorous and exciting, driven by a continuing search for habitable environments and life and supported by government initiatives that will provide for the development of new technologies that will broaden our access to space and enable human missions to the Moon and Mars. "The Future of Solar System Exploration" will present an integrated overview of the future of exploration in our Solar System, with an emphasis on the search for extraterrestrial habitable environments and life via methods of robotic and human exploration. The session will include a variety of topics, including astrobiological missions to explore for potentially habitable planets and moons in our Solar System; sample return missions and attending issues of planetary protection; efforts to prepare for the human exploration and colonization of the Moon and Mars, as well as advances in technology needed to support advanced propulsion systems, surface exploration and habitation; methods and technologies for the prediction and mitigation of terrestrial impact hazards; and related topics.

If you have an interest in any of these, or related areas, please consider submitting an abstract to the "Solar System Futures" session and while you are at it, also send me a message (jfarmer@asu.edu) so I know of your interest. Thanks!

If you have any additional questions, please feel free to contact me. I hope to see you all in Calgary in August!

Regards, Jack

**8–11 August 2005**

**Calgary, Alberta, Canada • Westin Hotel**



# **EARTH SYSTEM PROCESSES 2**

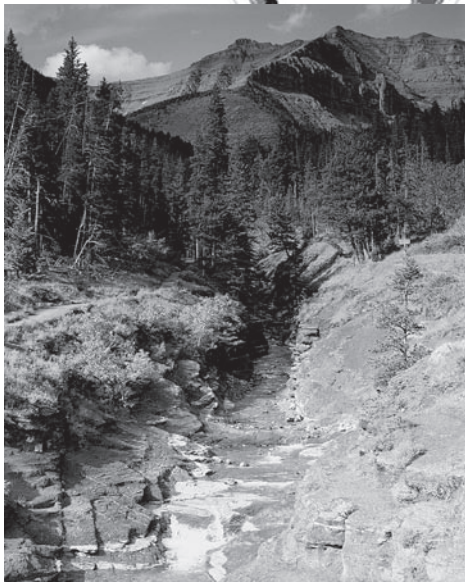
**Interdisciplinary • Integrative • Scientific**

**CALL FOR PAPERS:** Submission deadline midnight (MST)  
26 April 2005. Electronic abstract submission is at  
[www.geosociety.org/meetings/esp2/](http://www.geosociety.org/meetings/esp2/).

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Red Rock Canyon. Used with permission from Tourism Calgary.

**Abstracts Submission:** 1 January 2005–26 April 2005

**Early Registration:** 1 January 2005–28 March 2005

**Standard Registration:** 29 March 2005–27 June 2005

**Late Registration Fees in Effect:** 28 June 2005

**Cancellation Refund Deadline:** 5 July 2005

**Online Registration Closes:** 18 July 2005

**Technical Program:** 8–11 August 2005

*A global meeting presented by*



*and*



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# WELCOME TO EARTH SYSTEM PROCESSES 2

## ANCIENT EARTH SYSTEMS, MODERN EARTH SYSTEM PROCESSES, AND EARTH SYSTEM FUTURES

An interdisciplinary, integrative scientific meeting exploring the interactions among Earth's lithosphere, atmosphere, hydrosphere, cryosphere, and biota.

## EMERGENCE OF A PARADIGM

Once considered vast and unconnected, Earth's surface environment is now seen as finite and highly interconnected by a complex web of feedbacks among the biota, oceans, atmosphere, lithosphere, and cryosphere. This earth systems paradigm is being shaped by geoscientists and their colleagues in diverse disciplines of the natural sciences. Together we are seeking a better understanding of the nature of these feedbacks in the modern world, how they have emerged and evolved over Earth history, and how they will respond to human perturbations in the future.

The Geological Society of America (GSA) and the Geological Association of Canada (GAC) are combining their resources to co-convene a broad, interdisciplinary meeting to discuss recent advances in our understanding of earth system processes.

## THE THEMES

**Ancient Earth Systems** will explore the hypotheses, some controversial, describing the nature and drivers of environmental and biotic evolution on geologic time scales, some of which involve extraterrestrial influences and exchange with Earth's deep interior. As we clarify the processes that drive the evolution of the earth system, we come closer to understanding our origins and the future of our planet.

## Technical Program Co-Chairs

**Lee Kump**

Pennsylvania State University, University Park

**Don Canfield**

University of Southern Denmark

**Chris Beaumont**

Dalhousie University, Halifax

## Field Trip Chair

**Glen Stockmal**

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**David Howell**

U.S. Geological Survey, Menlo Park

**Jim Kasting**

Pennsylvania State University, University Park

**Keith Kvenvolden**

U.S. Geological Survey, Palo Alto

**Tim Lyons**

University of California, Riverside

**Fred Mackenzie**

University of Hawaii—Manoa, Honolulu

**Jerry Mitrovica**

University of Toronto, Ontario

**Guy Narbonne**

Queens University, Kingston

**Mark Patzkowsky**

Pennsylvania State University, University Park

**David B. Rowley**

University of Chicago

**Dan Schrag**

Harvard University, Cambridge

**Kelin Whipple**

Massachusetts Institute of Technology,  
Cambridge

We also learn how to refine our search for habitable environments and life elsewhere in the universe. **Modern Earth System Processes** will delve into the processes that link the components of the earth system across all scales of space and time. Interdisciplinary studies are just now beginning to elucidate these feedbacks through observation, experimentation, and modeling. These studies provide the phenomenological basis for the investigation of the evolution and future of the earth system.

**Earth System Futures** will address important questions about Earth's future. Can we understand the interactions of the earth system well enough to predict how human-induced and natural changes in one component will affect other components over the next century to millennium? Can we make scientific, social, and economic decisions that will minimize the likelihood of catastrophic stress on the biosphere?

## THE VENUE

Earth System Processes 2 (ESP2) will be held at the spacious and well-appointed Westin Hotel in Calgary, Alberta, Canada. Calgary is strikingly beautiful in its High Plains setting just beyond the foothills of the Canadian Rockies, and the comfortable, friendly city is well known for welcoming visitors from all over the globe. Plan to travel with family or friends and include a vacation to explore all the classic geology, paleontology, and geomorphology that Alberta offers. Enjoy August in Calgary and the Rockies—long, sunny days, crisp clear nights—a perfect spot to gather with fellow scientists and advance our understanding of earth system processes.

## THE GEOLOGICAL SOCIETY OF AMERICA AND THE GEOLOGICAL ASSOCIATION OF CANADA INVITE YOU TO ATTEND

*On behalf of the Geological Society of America, I invite you to attend and participate in Earth System Processes 2, a meeting jointly organized and co-convened with the Geological Association of Canada.*

Earth system science has become the preeminent integrative model for all the different science branches that deal with the solid, liquid, and gaseous Earth and its interactive processes. The GSA and GAC membership is collectively in an excellent position to continue playing a very central role in the exploration on geological time scales of the many controversial hypotheses that describe the nature of environmental and biotic evolution. To succeed in their never-ending quest for a better understanding of the processes in the geosphere that drive this evolution, geoscientists must join forces and are encouraged to do so in Calgary in August 2005 to map what is known and project where we shall wish to go in the coming decades. Earth is an immensely complex system, which can only be understood by joining forces as we plan our next research projects. This conference is intended to bring together specialists from all fields interested in our natural Earth and planetary environment. Given the success of the first ESP meeting in Edinburgh in 2001, which was co-convened by GSA and the Geological Society (London), I can confidently predict that the Calgary meeting will again be an eye-opener and a gratifying experience for all who decide to attend.

**Rob Van der Voo**

*Past President, Geological Society of America*



*The Geological Association of Canada is pleased to join with the Geological Society of America to cosponsor the Earth Systems Processes 2 conference in Calgary, Alberta, 8–11 August 2005.*

ESP2 is a broad interdisciplinary conference aimed at enhanced understanding of the past, present, and future processes that drive the evolution of Earth. The study of earth system processes is inherently integrative and interdisciplinary, and hence it is the hope of the organizers that the conference will attract a wide range of scientists interested in understanding Earth's complexity, irrespective of their background. ESP2 targets not only members of both GSA and GAC, but also the wider scientific community, with the objective of encouraging holistic scientific exchange regarding this crucial topic.

It is particularly appropriate that GSA and GAC are collaborating in the organization of this conference, as the two organizations have much in common in the diversity and multidisciplinary makeup of their memberships. It is the hope of GAC that this meeting will initiate a longer term, closer collaboration between the two organizations. From the perspective of the GAC, ESP2 will also serve to provide an opportunity to highlight the excellence of earth systems science work in Canada to an international audience.

Calgary, Alberta, is a particularly exciting venue for the conference, being a major center for industry, government, and university earth science in Canada.

The ESP2 conference is timely as the important role of earth science in global society becomes increasingly apparent to scientists, politicians, and the general public. On behalf of GAC, I extend to you a sincere invitation to participate in this major scientific event.

**Sandra M. Barr**

*President, Geological Association of Canada*

The conference will follow the three linked themes of **Ancient Earth Systems, Modern Earth System Processes**, and **Earth System Futures** through its four days. The conference venue has large, integrated spaces, which enable poster display adjacent to the lecture auditoriums. There will be four parallel oral sessions, with each oral session containing presentations chosen from the submitted abstracts, together with the invited keynote presentations. Poster presentations will not run concurrent with the oral presentations. Correspondingly, the daily schedule will be designed to enhance exposure and discussion time for the posters. Evening sessions will allow for presentations and discussion on topics such as medical geology, natural hazard risk reduction, and earth system science education.

## PLENARY KEYNOTE ADDRESSES

**Fred Mackenzie**, professor of oceanography at the University of Hawaii, will draw upon his considerable experience studying modern and ancient biogeochemical cycles to describe the ways in which the earth system likely will respond to the human acceleration of nutrient cycles. His plenary address is **Recent Past and Future Feedbacks in the Climate-C-N-P Earth System** (P1).

Progress in earth system science requires scientists who span traditional disciplinary boundaries. **Dianne Newman**, assistant professor of geobiology at the California Institute of Technology, is a leader in the application of techniques from molecular biology to geologic problems. Her plenary address is **Linking Modern Anaerobic Microbial Processes to the Archean Rock Record** (P2).

**Jerry X. Mitrovica** is the J. Tuzo Wilson Professor of Geophysics in the department of physics at the University of Toronto and director of the Earth System Evolution Program of the Canadian Institute for Advanced Research. He is the recipient of the Rutherford Medal (Physics) from the Royal Society of Canada, as well as the Steacie Prize from the National Research Council. Mitrovica is internationally recognized for research related to ice age dynamics and climate as well as the link between mantle convection and the geological record. His plenary address is **Critical Events in the Ice Age Earth System** (P3).

**Stefan Bengtson** is senior curator and chair of the Department of Palaeozoology at the Swedish Museum of Natural History. Bengtson is well known for his studies of early animal evolution. He is recipient of the Walcott Medal from the U.S. National Academy of Sciences and is a member of the Royal Swedish Academy of Sciences. His plenary address is **Biominerals, Skeletons, and Rocks through Time** (P4).

## THEME AND GENERAL SESSIONS

The conference will include both specific theme sessions and general sessions. The theme sessions were proposed by the scientific community and accepted by the technical program committee as particularly appropriate for the meeting, while the general sessions are intended to provide a milieu for a wider variety of presentations addressing the three basic themes. Both types of sessions will consist of oral and poster presentations. Keynote speakers will be identified for each of these sessions in the weeks to come. We hope to find a place for all technically sound earth system science in the meeting.

### Theme Sessions

Theme sessions have been proposed by the co-conveners, who will review the submitted abstracts and select the oral presentations. Consult the theme session chair or the lead convener if you need advice about submission. We anticipate that a few themes will be added, so please

check the ESP2 Web site, [www.geosociety.org/esp2/](http://www.geosociety.org/esp2/). The abstract submission deadline is 26 April 2005.

## Ancient Earth Systems

*Theme Session Chair: Tim Lyons, University of California, Riverside, [lyonst@missouri.edu](mailto:lyonst@missouri.edu)*

- T1. **Methane as a Climate Driver throughout Earth History.** *James F. Kasting, Penn State University, [kasting@essc.psu.edu](mailto:kasting@essc.psu.edu).* Methane is a greenhouse gas of importance throughout Earth's history. This session will examine the role of methane as a climate driver at all time scales and examine how the biota may have caused and responded to such climate changes.
- T2. **Proterozoic Oceans, Atmospheres, and Life.** *Guy Narbonne, Queen's University, [narbonne@geol.queensu.ca](mailto:narbonne@geol.queensu.ca).* This session will explore the linkages between the evolving Proterozoic oceans and atmosphere and the evolution of life through integration of the latest paleobiological and geological datasets.
- T3. **Influence of Epeiric Sea Dynamics on the Interpretation of Isotope Secular Curves.** *Chris Holmden, University of Saskatchewan, [Holmden@usask.ca](mailto:Holmden@usask.ca).* Ancient epeiric seas record chemical proxies used to reconstruct ancient atmosphere and ocean chemistry. This session brings together researchers seeking to clarify the magnitude of epeiric sea overprinting on a variety of elemental and isotopic proxies and the relevance of this overprinting on identifying global signals.
- T4. **Biodiversity Dynamics and Global Change in Deep Time.** *Hallie Sims, Smithsonian Institution, [hallie@nsmnh.si.edu](mailto:hallie@nsmnh.si.edu).* This session will showcase the effects of environmental processes such as climate change and physical geography on biodiversity and ecosystem structure over the Phanerozoic.
- T5. **Late Neoproterozoic Biospheric, Climate, and Evolutionary Events.** *Martin Kennedy, University of California–Riverside, [martink@mail.ucr.edu](mailto:martink@mail.ucr.edu).* The Neoproterozoic was an especially dynamic era in Earth's history. This session will explore the relationship between the evolution of multicellular animals and plants in the late Neoproterozoic and potential ecological driving factors such as the rise of atmospheric oxygen, planetary temperature, ocean redox state, nutrient availability, and climatic crisis.
- T6. **Marine Anoxia over Geologic Time—Where, When, Why, and Cause and Effect Relationships to the Evolving Biosphere.** *Tim Lyons, University of California–Riverside, [lyonst@missouri.edu](mailto:lyonst@missouri.edu); Brad Sageman, Northwestern University, [brad@earth.northwestern.edu](mailto:brad@earth.northwestern.edu); Ariel Anbar, Arizona State University, [anbar@asu.edu](mailto:anbar@asu.edu).* Marine anoxia was common in Earth's past. This session seeks to

- explore the latest proxy approaches for delineation of marine anoxia on local and ocean scales, the spatial and temporal distributions of anoxia in oceans and shallow seas, and the mechanisms by which such environments become anoxic.
- T7. **Climate, Tectonics, and Sea Level Change—Applications of Sequence Stratigraphy to Deciphering the Record of Global Change.** *Octavian Catuneanu, University of Alberta, octavian@ualberta.ca.* This session focuses on the use of sequence stratigraphy, and the record of sedimentation it provides, to reconstruct the complex history of climatic, tectonic, and sea level changes in the geological record.
- T8. **Paleogene Biota and Climates of Western North America: Atmospheric, Biological, and Geological Processes on a Warm World.** *David Greenwood, Brandon University, greenwoodd@brandonu.ca.* Paleogene geographical settings in western North America range from the cooler climate Eocene highlands in the Pacific Northwest to the adjacent coastal warm climate lowlands and interior. Presentations will focus on the flora and fauna, paleogeography, and paleoclimate of this region.
- T9. **Large Igneous Provinces: Their Biotic, Climatic, and Oceanic Impact.** *Paul Wignall, University of Leeds, wignall@earth.leeds.ac.uk.* Large igneous provinces (LIP) have punctuated many important intervals in Earth's history. This session will explore the relationship between LIP eruptions, major extinction events, significant changes in climate, and ocean and atmospheric chemistry.
- T10. **Phanerozoic O<sub>2</sub>: Animals, Plants, and Fires.** *Robert Berner, Yale University, robert.berner@yale.edu.* This session explores the possibility that changes in atmospheric O<sub>2</sub> during the past 550 million years affected biological adaptation and natural selection by forcing changes in plant and animal physiology. In return, the evolution of plants could have affected atmospheric O<sub>2</sub>, leading to an interesting interplay of feedback processes.
- T11. **Oxygen and Evolution on Early Earth.** *David Catling, University of Washington, davidc@atmos.washington.edu; Ariel Anbar, Arizona State University, anbar@asu.edu.* Atmospheric oxygen levels have changed dramatically through time. Presentations will explore the relationship between levels of atmospheric oxygen through Earth's history and its relationship to biological and geochemical evolution. An emphasis will be placed on the early Earth.
- T12. **Impacts of Climate Change on Earth Surface Processes.** *Nicholas Lancaster, U.S. Geological Survey, nlancaster@usgs.gov.* This session considers how climate change has affected landform development and surface processes such as vegetation, erosion, and river sediment discharge.
- T13. **The Last Great Global Warming: Proxy Reconstructions and Modeling the Pliocene Climate.** *Mark Chandler, Columbia University, mac59@columbia.edu.* The middle Pliocene, three million years ago, was much warmer than today. However, climate scientists suggest that Earth might once again return to such a state before the end of the century. What can this previous global warming tell us about global climate change in our future?
- T14. **The First 800 Million Years—The Initial Earth System.** *Hugh Rollinson, Sultan Qaboos University, hrollin@squ.edu.om.* This session explores, through modeling and observations on primitive solar system and Earth materials, the first 800 million years of Earth history.
- T15. **GeoSystems and CHRONOS: Probing Earth's Deep-Time Climate and Linked Systems.** *Gerilyn S. (Lynn) Soreghan, University of Oklahoma, Isoreg@ou.edu; Ethan L. Grossman, Texas A&M University, e-grossman@tamu.edu; John McArthur, University College London, j.mcarthur@ucl.ac.uk.* Cosponsored by *GeoSystems and CHRONOS–Sedimentary Geochemistry*. Research on deep-time climate and linked systems behavior is reaching new levels of parametric and chronologic resolution. Novel geochemical, sedimentological, and paleobiological proxies provide refined information on the intimate relationship between climate change and the state of Earth's oceans, atmosphere, and lithosphere. This session focuses on these past “alternative Earths.”
- T16. **The Search for Archean Life on Earth and Beyond.** *Neil R. Banerjee, University of Bergen, Neil.Banerjee@geo.uib.no.* Recent studies documenting evidence for Archean life on Earth have helped us understand the diversity of environments in which Archean life may have existed. Some of this work has been fueled by our desire to refine our search for life elsewhere in the universe. This session invites submissions on a broad spectrum of topics relating to the search for Archean life and aims at a truly interdisciplinary discussion including the disciplines of biology, geology, geochemistry, and geophysics.
- T17. **Coupled Evolution of Plants, Climate, and Carbon Dioxide over the Phanerozoic.** *David Beerling, University of Sheffield, D.J.Beerling@sheffield.ac.uk.* This session will show how biological-physiological studies of the effect of CO<sub>2</sub> on plants are important elements of the earth system through their role in promoting geochemical processes and setting up feedbacks. A largely geological audience will be exposed, many for the first time, to the latest paleobotanical and paleophysiological research.

## Modern Earth System Processes

Theme Session Chair: Jerry Mitrovica, University of Toronto, [jxm@physics.utoronto.ca](mailto:jxm@physics.utoronto.ca)

- T18. **Constraints from Coupling Surface, Crustal, and Upper Mantle Processes: The Key to Improved Imaging of Lithospheric Deformation.** *Kevin Furlong, Pennsylvania State University, [kevin@geodyn.psu.edu](mailto:kevin@geodyn.psu.edu); Eric Kirby, Pennsylvania State University, [ekirby@geosc.psu.edu](mailto:ekirby@geosc.psu.edu); Peter Kamp, University of the Waikato, [p.kamp@waikato.ac.nz](mailto:p.kamp@waikato.ac.nz).* This session explores the processes that drive plate boundary and orogenic lithospheric deformation through quantitative geophysical observations and models that also draw on developments in geomorphology, geochronology, and other fields. The aim is to foster communication and collaboration among observationalists, experimentalists, and modelers.
- T19. **Causal Connections amongst Chemical/Physical Weathering, Geomorphology, and Biologic Processes.** *Ed Johnson, University of Calgary, [johnsone@ucalgary.ca](mailto:johnsone@ucalgary.ca); Yvonne Martin, University of Calgary, [ymartin@ucalgary.ca](mailto:ymartin@ucalgary.ca); Josh Roering, University of Oregon, [jroering@uoregon.edu](mailto:jroering@uoregon.edu); Peter Sak, Dickinson College, [sakp@dickinson.edu](mailto:sakp@dickinson.edu); Art White, U.S. Geological Survey, Menlo Park, [afwhite@usgs.gov](mailto:afwhite@usgs.gov).* Formulation of models for chemical weathering and geomorphic processes requires improved understanding of chemical and physical weathering, the effects of climate and the biota, and the scaling between laboratory and field relationships. Contributions are invited on these topics using field and laboratory data and theory to address interactions in weathering systems in biogeochemical and geomorphic systems over a range of spatial and temporal scales.
- T20. **Ice Age Dynamics and Climate.** *Shawn Marshall, University of Calgary, [shawn.marshall@ucalgary.ca](mailto:shawn.marshall@ucalgary.ca); Kurt M. Cuffey, University of California–Berkeley, [kcuffey@socrates.berkeley.edu](mailto:kcuffey@socrates.berkeley.edu).* We invite contributions that present recent progress in understanding of Pleistocene glaciations, with an emphasis on earth system and climate dynamics during the last glacial cycle. The session will provide a forum for new insights into ice sheet–climate dynamics, the glacial carbon cycle, and interactions between the solid Earth, Earth surface, and climate system processes.
- T21. **The Deep Biosphere and its Role in the Earth System.** *Ulrich Wortmann, University of Toronto, [uli.wortmann@utoronto.ca](mailto:uli.wortmann@utoronto.ca).* Although it has been proposed that a significant part of Earth’s living biomass is in the deep biosphere, the impact of these ecosystems on CHONS cycles is not understood. Papers on deep biosphere research from a cellular to a global scale are welcomed in this session designed to address deep biosphere research in its larger context of earth systems science.
- T22. **Soil Organic Matter: Cycling, Transport, and Ocean–Climate Interaction.** *David Manning, University of Newcastle, [david.manning@ncl.ac.uk](mailto:david.manning@ncl.ac.uk).* This session addresses the hypothesis that terrestrial (soil) organic matter is an important, yet hardly constrained, contributor to marine sediments that provides valuable information on terrestrial climate at the source, modes of transport, and diagenetic mechanisms controlling the formation of geological signals stored at the sea floor.
- T23. **The Himalayan-Tibetan Orogen: A Natural Earth Systems Laboratory.** *Djordje Grujic, Dalhousie University, [djordje.grujic@dal.ca](mailto:djordje.grujic@dal.ca); Kelin Whipple, Massachusetts Institute of Technology, [kxw@mit.edu](mailto:kxw@mit.edu).* The Himalayan-Tibetan orogen is an ideal earth system laboratory for the study of feedbacks between components of orogenic systems. This session will bring together the latest evidence and stimulate discussion concerning the relative importance of couplings among climate, topography, erosion rates, and tectonics in this system and others that yield compelling information on and insights into these processes.
- T24. **Advances in Understanding the Global Water and Energy Cycle.** *Lawrence Martz, University of Saskatchewan, [lawrence.martz@usask.ca](mailto:lawrence.martz@usask.ca).* The goal of this session is to critically evaluate the advances that have been made in our understanding of the global water and energy cycle over the past decade. We particularly encourage submissions that address efforts to reproduce and predict, by means of suitable models, variations of the global hydrological regime, its impact on atmospheric and surface dynamics, and variations in regional hydrological processes and water resources and their response to changes in the environment, such as the increase in greenhouse gases.
- T25. **Sediment Dynamics and Fluid Flow across Continent–Ocean Margins.** *John Bratton, U.S. Geological Survey, Woods Hole, [jbratton@usgs.gov](mailto:jbratton@usgs.gov); Jasper Knight, University of Exeter, [j.knight@exeter.ac.uk](mailto:j.knight@exeter.ac.uk).* The exchanges that take place at the edge of the sea are rapid, huge, and globally important. This session will focus on the role of sea level and climate change in controlling sediment and fluid movement at margins. It will showcase recent conceptual and technical advances, at all scales, in the understanding of topics such as sediment budgets of estuaries and coastlines, lowstand incision–highstand filling of shelf channels, submarine canyon formation, continental shelf hydrogeology, submarine groundwater discharge, and gas hydrates. Human impacts on margins will also be considered

## Earth System Futures

Theme Session Chair: *Fred Mackenzie, University of Hawaii, fredm@soest.hawaii.edu*

- T26. **The Future of Solar System Exploration.** *Jack D. Farmer, Arizona State University, jfarmer@asu.edu.* This session will present an integrated view of the future of solar system exploration, with an emphasis on the search for extraterrestrial habitable environments and life, via robotic and human exploration.
- T27. **Biosphere-Atmosphere Feedbacks in the 20th–21st Centuries: Modeling Uncertainties and Key Approaches.** *Sharon A. Cowling, University of Toronto, cowling@geog.utoronto.ca; Chris Jones, Hadley Centre for Climate Prediction, chris.d.jones@metoffice.gov.uk.* Interdisciplinary modeling research highlights the importance of biospheric feedbacks on climate over varying temporal and spatial scales, with recent research focusing on the effect of terrestrial and marine ecosystem processes on the global carbon cycle.
- T28. **Climate Change and the Thermohaline Circulation of the Oceans: Lessons from the Past.** *W. Richard Peltier, University of Toronto, peltier@atmos.physics.utoronto.ca.* This session will be designed to bring together scientists working in all areas of research on thermohaline circulation, its variability in the past, the causes of these variations and the extent to which this element of the climate system will change in the future.
- T29. **Corals, Coccoliths, and CO<sub>2</sub>: The Role of Global Carbonate Cycling in the Earth System.** *Andy Ridgwell, University of British Columbia, aridgwell@eos.ubc.ca.* The current threat to pelagic and shallow water calcifiers by continued atmospheric release of fossil fuel CO<sub>2</sub> and the acidification of the surface ocean will be highlighted in papers addressing laboratory, field, and modeling approaches to addressing this very pressing societal problem.



The Frank Slide, Alberta Canada. Photo by Glen Stockmal.

## HOW TO SUBMIT YOUR ABSTRACT

**Abstracts Submission Deadline: 26 April 2005**

Abstracts for all sessions must be submitted online at the GSA Web site, [www.geosociety.org/meetings/esp2/](http://www.geosociety.org/meetings/esp2/), using GSA's abstract management system.

If you choose, you may compose your abstract using word-processing programs such as Microsoft Word or WordPerfect, then paste the text into the system. This allows you to take advantage of layout options and to check your spelling.

Step-by-step instructions on the Web site will help with any questions you have about using the system. You may contact technical support at any point during your submission process.

Future issues of *GSA Today* will contain further information on Earth System Processes 2. Visit [www.geosociety.org/meetings/esp2/](http://www.geosociety.org/meetings/esp2/) to sign up for e-news or for:

- Updates on Theme Sessions
- Field Trips and other delegate and accompanying partner activities
- Calgary, Alberta
- Hotel accommodations and rates
- Advice to U.S. citizens and residents on passports, clearing customs and immigration, and cell phone service.

## Lodging for ESP2 is at the Westin

GSA has contracted for discounted sleeping rooms with the Westin Hotel in beautiful downtown Calgary. All ESP2 technical and poster sessions will occur at the Westin Hotel. GSA has contracted for and guaranteed a large number of sleeping rooms at the Westin in order to obtain the space necessary for the meeting. Large financial penalties will apply if our block of rooms is not met; therefore, ESP2 attendees are highly encouraged to stay with the GSA block at the Westin.

The sleeping room rate is \$165 (Canadian dollars—CAD) for single or double occupancy, plus 7% GST and 5% Alberta hotel taxes. To make your reservation, please call the Westin at 1-403-266-1611 or toll free at 1-800-937-8461 and indicate that you will be attending the GSA/GAC Earth Systems Processes 2 meeting. The deadline for making reservations is 22 July 2005. Please make your reservation in the name of the meeting attendee to ensure that GSA receives proper credit for your room.





THE  
GEOLOGICAL  
SOCIETY  
OF AMERICA

Early Registration Deadline: 28 March 2005  
Standard Registration Deadline: 27 June 2005  
Cancellation Deadline: 5 July 2005

# EARTH SYSTEM PROCESSES 2

## Calgary, Alberta, Canada 8–11 August 05

PLEASE CHECK SESSIONS YOU PLAN TO ATTEND

**USE ONE FORM FOR EACH REGISTRANT ATTENDING THE MEETING** (Please print clearly.)

First Name \_\_\_\_\_  
Last Name \_\_\_\_\_  
Mailing Address \_\_\_\_\_  
City \_\_\_\_\_ State or Province \_\_\_\_\_  
ZIP or Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
E-mail \_\_\_\_\_  
Daytime Phone \_\_\_\_\_  
Fax \_\_\_\_\_

**BADGE INFORMATION** (This information will appear on your badge.)

First Name or Nickname \_\_\_\_\_  
Last Name \_\_\_\_\_  
Affiliation or Institute \_\_\_\_\_  
City \_\_\_\_\_ State or Province \_\_\_\_\_  
ZIP or Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
Spouse/Guest First Name/Nickname \_\_\_\_\_  
Last Name \_\_\_\_\_  
City \_\_\_\_\_ State or Province \_\_\_\_\_  
ZIP or Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Do you or your guest require any special considerations?  Yes  No

**REGISTRATION FEES**

	US\$ (CREDIT CARD OR US CURRENCY CHECK)			CANADIAN \$ (CANADIAN CURRENCY CHECK)		
	EARLY (by 3/28)	STANDARD (3/29–6/27)	LATE (after 6/27)	EARLY (by 3/28)	STANDARD (3/29–6/27)	LATE (after 6/27)
Professional Member*—Full Meeting	\$375	\$400	\$500	\$450	\$480	\$605
Professional Member*—One Day	\$250	\$250	\$265	\$305	\$305	\$320
Professional Member (70+)*—Full Meeting	\$310	\$325	\$350	\$380	\$395	\$420
Professional Member (70+)*—One Day	\$220	\$220	\$235	\$270	\$270	\$285
Professional Nonmember—Full Meeting	\$475	\$500	\$600	\$575	\$605	\$720
Professional Nonmember—One Day	\$300	\$300	\$315	\$365	\$365	\$380
Student Member*—Full Meeting	\$100	\$120	\$130	\$125	\$155	\$165
Student Member*—One Day	\$75	\$75	\$90	\$95	\$95	\$115
Student Nonmember—Full Meeting	\$130	\$150	\$160	\$165	\$190	\$200
Student Nonmember—One Day	\$90	\$90	\$100	\$115	\$115	\$125
Guest or Spouse*	\$60	\$60	\$70	\$80	\$80	\$90
Field Trip Only†	\$40	\$40	\$40	\$50	\$50	\$50
Wire Transfer Fee‡	\$20	\$20	\$20	\$30	\$30	\$30

Credit cards will be charged in US\$ at the currency exchange rate available at the time the advance registration is processed.

\*This member fee applies to any current Professional or Student member of GSA, GAC, or EGU. Discount does not apply to guest registrants.

\*\*Guest or Spouse registration fee does NOT allow access to technical sessions.

†Field Trip Only registration fee does NOT allow access to any sessions over the course of the meeting.

‡If you will be making payment by wire transfer, you must add the wire transfer fee to your registration. This is the fee GSA is charged by the banks to receive a wire transfer.

**TOTAL OF ALL FEES REMITTED** \$ \_\_\_\_\_

PLEASE CHECK SESSIONS YOU PLAN TO ATTEND

**PLENARY SESSIONS**

P1. Recent Past and Future Feedbacks in the Climate-C-N-P Earth System   
P2. Linking Modern Anaerobic Microbial Processes to the Archean Rock Record   
P3. Critical Events in the Ice Age Earth System   
P4. Biominerals, Skeletons, and Rocks through Time

**THEME SESSIONS**

T1. Methane as a Climate Driver throughout Earth History   
T2. Proterozoic Oceans, Atmospheres, and Life   
T3. Influence of Epeiric Sea Dynamics on the Interpretation of Isotope Secular Curves   
T4. Biodiversity Dynamics and Global Change in Deep Time   
T5. Late Neoproterozoic Biospheric, Climate, and Evolutionary Events   
T6. Marine Anoxia over Geologic Time—Where, When, Why, and Cause-and-Effect Relationships to the Evolving Biosphere   
T7. Climate, Tectonics, and Sea Level Change—Applications of Sequence Stratigraphy to Deciphering the Record of Global Change   
T8. Paleogene Biota and Climates of Western North America: Atmospheric, Biological, and Geological Processes on a Warm World   
T9. Large Igneous Provinces: Their Biotic, Climatic, and Oceanic Impact   
T10. Phanerozoic O<sub>2</sub>: Animals, Plants, and Fires   
T11. Oxygen and Evolution on Early Earth   
T12. Impacts of Climate Change on Earth Surface Processes   
T13. The Last Great Global Warming: Proxy Reconstructions and Modeling the Pliocene Climate   
T14. The First 800 Million Years—The Initial Earth System   
T15. GeoSystems and CHRONOS: Probing Earth's Deep-Time Climate and Linked Systems   
T16. The Search for Archean Life on Earth and Beyond   
T17. Coupled Evolution of Plants, Climate, and Carbon Dioxide over the Phanerozoic   
T18. Constraints from Coupling Surface, Crustal, and Upper Mantle Processes: The Key to Improved Imaging of Lithospheric Deformation   
T19. Causal Connections amongst Chemical/Physical Weathering, Geomorphology, and Biologic Processes   
T20. Ice Age Dynamics and Climate   
T21. The Deep Biosphere and its Role in the Earth System   
T22. Soil Organic Matter: Cycling, Transport, and Ocean-Climate Interaction   
T23. The Himalayan-Tibetan Orogen: A Natural Earth Systems Laboratory   
T24. Advances in Understanding the Global Water and Energy Cycle   
T25. Sediment Dynamics and Fluid Flow across Continent-Ocean Margins   
T26. The Future of Solar System Exploration   
T27. Biosphere-Atmosphere Feedbacks in the 20th–21st Centuries: Modeling Uncertainties and Key Approaches   
T28. Climate Change and the Thermohaline Circulation of the Oceans—Lessons From the Past   
T29. Corals, Coccoliths, and CO<sub>2</sub>: The Role of Global Carbonate Cycling in the Earth System

**TOTAL OF ALL FEES REMITTED** \$ \_\_\_\_\_

**FAX TO:** +1.303.357.1071 or +1.303.357.1072

**MAIL TO:** 2005 EARTH SYSTEM PROCESSES 2  
P.O. Box 9140, Boulder, CO 80301-9140

**Remit in U.S. or Canadian funds payable to:**  
2005 EARTH SYSTEM PROCESSES 2

(All registrations must be prepaid. Purchase orders not accepted.)

**PAYMENT BY (CHECK ONE):**

Check Indicate if  U.S. Funds  Canadian Funds  
 American Express  Visa  MasterCard  Discover

Card Number \_\_\_\_\_

Expiration Date \_\_\_\_\_

Signature \_\_\_\_\_

(name as appears on card)

Registration confirmations will be sent via one of the following methods:

① E-mail (if valid e-mail address is provided) or ② Fax, or ③ Mail

**REGISTER ONLINE AT WWW.GEOSOCIETY.ORG/ESP2/**