CSDMS Newsletter - January 2024

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ON THE SURFACE

CSDMS Newsletter
January 2024

Join CSDMS

Registration Now Open!

CSDMS 2024: Coastlines, critical zones, and cascading hazards: modeling dynamic interfaces from deep time to human time

Montclair State University, NJ
May 14-16, 2024

Please join us for the upcoming CSDMS Annual Meeting, *"CSDMS 2024: Coastlines, critical zones, and cascading hazards: modeling dynamic interfaces from deep time to human time"*, taking place May 14-16, 2024 at Montclair State University in

Montclair, NJ. As always, there will be a great lineup of keynote talks and clinics!
Lively poster sessions and breakout sessions/jams will provide a chance to meet
with old and new friends, and learn about new tools and resources.

- A limited number of **Travel Scholarships** will be available and the deadline to
  apply is February 16th, 2024. Application information [here](#).

Register Now!

The CSDMS 2024 Spring Webinar Series registration links/details are provided below.

Developing AI and research pipelines for operational use: towards Digital Twins
February 19th, 2024 @ 8:00AM MST
James Byrne & Jonathan Smith, British Antarctic Survey
In this presentation, the authors will be describing existing digital infrastructure projects and
developments happening in and around the British Antarctic Survey. They will give a flavour of
how technology is influencing the development of environmental and polar science, covering
numerous research and operational domains. They will be focusing on the digital infrastructure
applied to IceNet, an AI-based deep learning infrastructure. They will then show how
generalized approaches to digital infrastructure are being applied in other areas, including
cutting-edge Autonomous Marine Operations Planning (AMOP) capabilities. They will end
highlighting the challenges that need solving in working towards an Antarctic Digital Twin and
how they might approach them.

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What can CSDMS do for you? An overview of CSDMS Products and Services

March 26th, 2024 @ 10:00AM MDT

Mark Piper, CSDMS IF

CSDMS develops and maintains a suite of products and services with the goal of supporting research in the Earth and planetary surface processes community. This includes products such as Landlab, the Basic Model Interface, Data Components, the Model Repository, EKT Labs, and ESPIn. Examples of services include the Help Desk, Office Hours, Roadshows, RSEaaS, and EarthscapeHub.

One problem, though, is that if the community doesn't know about these products and services, then they don't get used—and, like the Old Gods in Neil Gaiman's *American Gods*, they fade into obscurity. Let's break the cycle! Please join us for this webinar where we will present information about all of the products and services offered by CSDMS, and explain how they can help you accelerate your research.

Attendees will leave with knowledge of what CSDMS can do for them, which they can bring back to their home institutions and apply to their research and share with their colleagues.

Direct Link - Registration not Required

Landscape Dynamics Dictate the Evolution of Biodiversity on Earth

April 16th, 2024 @ 9:00AM MDT

Tristan Salles, University of Sydney

Earth's surface is the living skin of our planet – it connects physical, chemical, & biological systems. Over geological time, this surface evolves with rivers fragmenting the landscape into environmentally diverse range of habitats. These rivers not only carve canyons & form valleys, but also serve as the main conveyors of sediment & nutrients from mountains to continental plains & oceans. Here we hypothesize that it is not just geodynamics or climate, but their interaction, which, by regulating topography and sedimentary flows, determines long-term evolution of biodiversity. As such, we propose that surface processes are a prime limiting factor of diversification of Life on Earth before any form of intrinsic biotic process.

To test this hypothesis, we use reconstructions of ancient climates & plate tectonics to simulate the evolution of landscape & sedimentary history over the entire Phanerozoic era, a period of 540 million years. We then compare these results with reconstructions of marine & continental biodiversity over geological times. Our findings suggest that biodiversity is strongly influenced by landscape dynamics, which at any given moment determine the carrying capacity of continental & oceanic domains, i.e., the maximum number of different species they can support at any given time.

In the oceans, diversity closely correlates with the sedimentary flow from the continents, providing the necessary nutrients for primary production. Episodes of mass extinctions in the oceans have occurred shortly after a significant decrease in sedimentary flow, suggesting that a nutrient deficit destabilizes biodiversity & makes it particularly vulnerable to catastrophic events.

On the continents, it took the gradual coverage of the surface with sedimentary basins for plants to develop & diversify, thanks to the development of more elaborate root systems. This slow expansion of terrestrial flora was further stimulated during tectonic episodes.

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Frugal computing: On the need for low carbon and sustainable computing
April 29th, 2024 @ 8:00AM MDT
Wim Vanderbauwhede, University of Glasgow

In this talk, I will discuss the need for low carbon and sustainable computing. The current emissions from computing are almost 4% of the world total. This is already more than emissions from the airline industry and ICT emissions are projected to rise steeply over the next two decades. By 2040 emissions from computing alone will account for more than half of the emissions budget to keep global warming below 1.5°C. Consequently, this growth in computing emissions is unsustainable. The emissions from production of computing devices exceed the emissions from operating them, so even if devices are more energy efficient producing more of them will make the emissions problem worse. Therefore we must extend the useful life of our computing devices. As a society we need to start treating computational resources as finite and precious, to be utilized only when necessary, and as effectively as possible. We need frugal computing: achieving our aims with less energy and material.

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Previous CSDMS-sponsored webinars are archived here and available for viewing anytime. If you have suggestions for future webinars, please contact csdms@colorado.edu.

CSDMS/Open Earthscape
2024 Visiting Scholars Program

The Summer Visiting Scholar Program is open to graduate students interested in spending up to 6 weeks at the CSDMS Integration Facility at the University of Colorado, Boulder. Selected students will be working on their own research and will benefit from mentoring with the CSDMS Research Software Engineers and faculty/staff. Our cohorts in 2022 and 2023 were resounding successes and we hope to make the 2024 program even more beneficial for your research progress. We anticipate 2-3 students will be selected for the 2024 program. In addition to proximity to the CSDMS Software Engineers and other team members, the Integration Facility can provide the following support:

Student
Domestic travel and lodging support for up to 45 days in Boulder.

Stipend support is available for US Citizens only and is based on CU GRA rates @100% for summer semester (about $5,300 per month). International students and students in the US on F-1 and J-1 visas are welcome to apply and travel/lodging support will be provided, but stipend support cannot be provided due to visa restrictions.

Advisor

Travel and lodging support for a 7-day trip to Boulder (including per diem and ground transportation) to work collaboratively with CSDMS and the student.

Priority will be given to students that have computational projects that:

- Are "shovel ready".
- Will result in a product, such as a publication, a conference presentation, a new model component, an educational tutorial, etc.

To apply, please send an email to csdms@colorado.edu by March 1st, 2024 with your name, brief description of your future goals, description of the specific project that could benefit from CSDMS Integration Facility support and any resulting products proposed. Additionally, we'll need approval from your advisor to participate in the program (this can be in the form of an attached letter or email).

We're excited to work with you and we look forward to chatting about how the CSDMS Integration Facility can most usefully contribute to your research next summer!

CSDMS Community News

The recipient of the 2024 CSDMS Lifetime Achievement Award is **Randy LeVeque**, Department of Applied Mathematics, University of Washington. Randy is recognized for his remarkable contributions to numerical computing and its applications to problems in geophysical fluid mechanics and conservation laws, open research software, and community engagement. Professor LeVeque has also had a powerful impact as an educator and science communicator.

CSDMS is also happy to announce that **Sean Gallen**, Department of Geosciences, Colorado State University, has agreed to serve as Co-Chair of the Geodynamics Focus Research Group. Sean's research focus includes process-based geomorphology, active tectonics, geodynamics and the influence of natural hazards

on continental erosion and sediment transport.

GRASS GIS Announces Two New Programs for Students and Researchers

Students are invited to apply to a grant program to get hands-on coding experience, mentoring and a financial award while contributing to GRASS GIS, an open source geoprocessing and modeling engine! Suggested projects include development of documentation, tests and new features.

Not a student? The recently announced development-oriented GRASS Mentoring Program connects you with a GRASS developer to help you integrate GRASS GIS into your research projects and models. Mentors' time in both programs is financed by the U.S. National Science Foundation, award 2303651. Interested? Please contact Anna Petrasova (akratoc@ncsu.edu).

Critical Zone Data-Model Integration Workshop

Are you an early-career researcher who collects critical zone (CZ) field date and is interested in learning more about numerical modeling of CZ processes? The goal of this workshop is to bring together early-career scientists with data and more-senior scientists with modeling expertise to enhance data-model integration in the CZ sciences. The workshop will be held at the Colorado School of Mines in Golden, CO from July 28-30, 2024. There is no registration cost and travel grants are available to those accepted. Details and to apply: https://sites.google.com/view/czrcn/2024-meeting.

CSDMS Community Teaching and Research Resources

CSDMS Workbench - https://csdms.colorado.edu/wiki/Workbench
CSDMS Model Repo - https://csdms.colorado.edu/wiki/Model_download_portal
Open Earthscape Jupyter Hub - https://csdms.colorado.edu/wiki/JupyterHub
CSDMS EKT Labs - https://csdms.colorado.edu/wiki/Labs_portal

Office Hours (via Zoom) with a CSDMS Research Software Engineer - 9AM on Wednesdays. To register - https://csdms.colorado.edu/wiki/OfficeHours
CSDMS Help Desk - https://csdms.github.io/help-desk/

Join us on Bluesky, Mastadon and X!

Be the first to know about all the new resources!! For new products, job postings, events, breaking science, training opportunities and more, please follow us **@CSDMS.bsky.social** on Bluesky, @CSDMS@fediscience.org on Mastodon and **@CSDMS** on X.

CSDMS is an NSF sponsored program