CSDMS Newsletter - 2025 Annual Meeting Registration Open!

CSDMS/Greg Tucker <csdms@colorado.edu> Thu, Jan 30, 2025 at 10:23 AM
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ON THE SURFACE

CSDMS Newsletter
January 2025

Join CSDMS

CSDMS Annual Meeting Registration Now Open!

Join us in Boulder this year for a meeting focused on scaling the peaks of creative computing from PDEs to machine learning and beyond!

The CSDMS 2025 Annual Meeting will be broad in scope, bringing together CSDMS members to present new scientific insights in the modeling of surface dynamics and the impact of time and process scales, new advances in cyber-infrastructure, examples on coupling models, how social and ecological models can inform management, and more. Also, this is the 3nd year that you can submit Electronic Publications (Epubs); Jupyter notebooks that contain e.g. a scientific hypotheses description, a numerical solution, and some findings that are investigated by

numerical algorithms or model. We reserved time during one of the plenary sessions for presentations of Epubs, so don't hold back and submit your Epubs! The meeting will further include:

- *State-of-the art keynote presentations* in earth-surface dynamics
- *Hands-on clinics* related to community models, tools and approaches
- *Transformative software products and approaches* designed to be accessible, easy to use, and relevant
- *Breakout sessions*
- *Poster and Epubs Sessions*

Important Deadlines:

- **Registration Deadline** April 1st, 2025.
- A limited number of **Travel Scholarships** will be available and the deadline to apply is February 9th, 2025. Application information will be available on the meeting web page in mid-January.

REGISTER

CSDMS Spring 2025 Webinar Series
Register Now!

Please join us for the CSDMS 2025 Spring Webinar Series. Registration link/details are provided below.

Docker, or What to Do When Software Has Betrayed You
February 13th, 2025 @ 10:00AM MST
Daniel Shapero, University of Washington
Have you ever needed to use a software package and it won't build on your machine? Have you ever needed to distribute a set of software packages but your collaborators are grumbling that installing all of them is too much of a pain? These are common problems and there are tools that can help to take the pain away. Docker allows you to (1) prepare operating system images with software pre-installed on them, (2) run code inside these containerized OSes independent of the host machine, and (3) share these images online. Additionally, there are ready-made Docker images available for many popular software packages. In this webinar, I'll show how to use ready-made Docker images, how to make your own images, and how this tool can solve some of the more annoying problems that we encounter in scientific software development. If, like me, you viscerally hate learning to use new software tools, I get it, but I swear this one will get you out of a horrible jam some time.

REGISTER

How to Use Convolutional Neural Networks (CNN) for Spacial Data

April 15th, 2025 @ 10:00AM MST

Jo Martin, University of Colorado, Boulder

Convolutional Neural Networks have driven a revolution in computer vision and "AI" due to their ability to recognize complex spatial patterns. They are also finding more and more use in the geosciences. In this webinar we will go through what a CNN is, how to implement one using the PyTorch library, and some of the ways that we can interpret them to help our science.

REGISTER

Demystifying Modelling: An Interactive, Educational and Exploratory Approach

May 7th, 2025 @ 9:00AM MST

Penuela Fernandez, Universidad de Cordoba, Spain

Addressing environmental challenges requires models that are not only scientifically robust but also accessible to diverse stakeholders, including non-technical users. However, for many, these models remain "black boxes," creating barriers to understanding and trust. These barriers hinder effective collaboration between modellers and decision-makers, ultimately limiting the impact of scientific insights.

This webinar introduces an innovative approach to modelling that emphasizes accessibility and understanding through learning-by-doing. We will explore an interactive toolbox (impact-erosion.github.io) built using Jupyter Notebooks, designed to guide users through essential modelling concepts and processes—from basic initial tasks such as data pre-processing to advanced techniques like uncertainty and sensitivity analysis.

By integrating interactive elements and visualization, iMPACT-erosion promotes an easier and more fluent user-model conversation, making models approachable for students, professors, researchers, and decision-makers. Beyond showcasing the toolbox, the webinar also empowers attendees to create their own accessible and interactive tools by integrating Jupyter Notebooks, interactive visualizations, and basic Python programming. Participants will learn how to deploy these tools on the cloud at no cost, making them easily shareable and usable by anyone with a web browser.

While the webinar focuses on hydrology and soil erosion, the underlying philosophy of interactive, educational and exploratory modelling is highly transferable across disciplines, offering a pathway to democratize modelling in various scientific domains.

REGISTER

Solving PDEs with DUNE-FEM

Time and Date TBD

Robert Klöfkorn, Lund University and Andreas Dedner, University of Warwick

For about two decades the Distributed and Unified Numerics Environment (DUNE) has been an active part in the scientific development of computational software and technology and it's C++ routines are the basis for several other well established open source projects, for example DuMux.

Although the C++ interfaces of DUNE are highly flexible and customizable, a solid knowledge of C++ is necessary to make use of this powerful tool. In this talk we give an overview on recent development towards a Python interface for for DUNE and in particular DUNE-FEM, a module which provides highly efficient implementations of hp-adaptive Discontinuous Galerkin (DG) methods for solving a wide range of nonlinear

partial differential equations. Providing easier user interfaces based on Python and the Unified Form Language (UFL) opens DUNE-FEM to a broader audience, for example, Bachelor and Masters students. This talk will also briefly discuss how Python and DUNE are embedded in teaching of Scientific Computing courses at Lund and Warwick Universities.

REGISTRATION TBD

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 Computing Updates

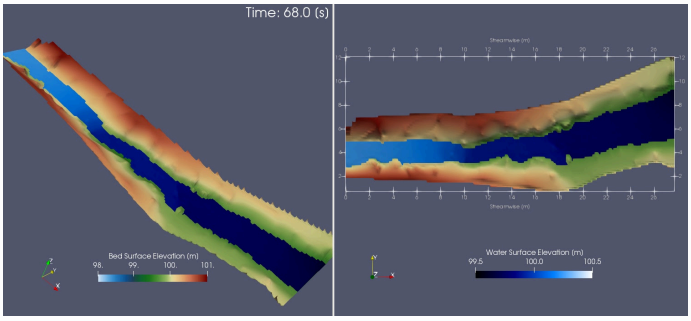
Landlab Version 2.9 Released!
We're excited to announce the release of Landlab version 2.9, which introduces new components, enhancements, and bug fixes contributed by our incredible community. Here are some highlights:

- SharedStreamPower Component: A new tool for modeling mixed bedrock-alluvial erosion in channels (contributed by Annie Thompson).
- NetworkSedimentTransporter Enhancements: Now supports transport-dependent bed material abrasion, inspired by Pfeiffer et al. (2022) (contributed by Allison Pfeiffer).
- ConcentrationTrackerForDiffusion: A new component for tracking hillslope sediment properties (contributed by Laurent Roberge).
- MassWastingRunout Component: Predicts hazard extents, sediment transport, and topographic changes associated with landslide runouts (contributed by Jeff Keck).
- IcosphereGlobalGrid: A new grid type for global-scale modeling (contributed by Greg Tucker).

To explore tutorials and examples for these and other Landlab components, visit our new Landlab Gallery of Notebooks.

For a detailed summary of all updates in version 2.9, check out the Release Notes.

Flow Dynamics - RiverFlowDynamics, a new Landlab component, introduces a powerful two-dimensional flow model for simulating complex river systems and flood dynamics. Built on the depth-averaged Saint-Venant equations, this model offers sophisticated capabilities for handling subcritical and supercritical flows, hydraulic jumps, and intricate channel-floodplain interactions, making it particularly valuable for applications ranging from urban flood modeling to mountainous river systems. The model's semi-implicit and semi-Lagrangian numerical scheme ensures both stability and accuracy while maintaining computational efficiency, addressing a critical gap in Landlab's modeling capabilities for advection-dominated problems in complex topographies.



CSDMS Forum Relaunch

Let's talk about earth surface processes, numerical modeling, and geoscientific software development!

We're excited to announce the relaunch of the CSDMS Forum at https://forum.csdms.io.
The Forum relaunch arose from discussions at the EuroCSDMS Workshop: a group, led by Will Kearney at the University of Potsdam, wanted a better place to share ideas, ask questions, and discuss current work with others in the community. Funding for the new Forum is generously provided by the Institute of Computing for Climate Science at the University of Cambridge. Since its relaunch in November 2024, the Forum has gained 30 users, spawned multiple topic threads, and generated over 5000 pageviews.

Please check out the new Forum. Ask a question or share an idea. Sign-up is easy, with an institutional email address, or through GitHub or Google. Join us at https://forum.csdms.io!

CSDMS/OpenEarthscape
2025 Visiting Scholars Program

Application window opens December 1st, 2024 (deadline February 16th, 2025). 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, 2023 and 2024 were resounding successes and we hope to make the 2025 program even more beneficial for your research progress. We anticipate 1-2 students will be selected for the 2025 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 $5,400 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 February 16, 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!

Envisioning the Future of Environmental Modeling

Last October, CSDMS participated in a four-day workshop as part of the Euro-CSDMS initiative hosted by the UK Centre for Ecology and Hydrology to explore "what the next generation of environmental models should look like". Read more about the effort **HERE**.

CSDMS Bylaws and Strategic Plan

The CSDMS Executive and Steering Committees have recently revised our community Bylaws and Strategic Plan. These documents are available for reference here:

- CSDMS4.0 revised strategic Plan (November 2024, PDF format)
- CSDMS4.0 Bylaws (August 2024, PDF format)

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/
CSDMS Forum - https://forum.csdms.io
CSDMS YouTube Channel - https://www.youtube.com/@CSDMSmovie/videos

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CSDMS is an NSF sponsored program