CSDMS

COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

ON THE SURFACE

CSDMS QUARTERLY NEWSLETTER *November 2018*

WELCOME TO CSDMS 3.0!

Thanks to a new core operating grant from the National Science Foundation that took effect in October, 2018 (EAR-1831623), CSDMS 3.0 is now underway! This award will enable a variety of new initiatives and activities, while allowing the Integration Facility to continue supporting you, the earth-surface science community, through computing resources, community engagement, and educational opportunities. Read the award abstract **HERE.**

COMMUNITY CYBER UPDATES - NEW REPOSITORY TOOLS

CSDMS maintains a repository of tools that assist with the coupling and running of models. Current CSDMS tools can be found **HERE**. New repository models for 2018 are summarized as follows:

The CSDMS Permafrost Benchmark System

The Permafrost Benchmark System (PBS) combines the power of CSDMS Web Modeling Tool with the benchmarking capabilities of the International Model Benchmarking (ILAMB) project. The ILAMB project seeks to improve performance and reduce uncertainty in land surface models by statistically confronting model outputs with observational data. The ILAMB team has developed a software package, written in Python, that allows investigators to perform model benchmarking studies through a command-line interface on Linux and macOS machines.

The Permafrost Benchmark System (PBS) wraps the command-line ILAMB software with a customized version of the CSDMS Web Modeling Tool (WMT). It adds tools for uploading CMIP5-compatible model outputs and benchmark datasets for storage and access on a computational resource at CSDMS. The PBS allows users to access and run ILAMB remotely, without having to install software, model outputs, or benchmark data locally;

a web browser on a desktop, laptop, or tablet computer is all that's needed. A screenshot of ILAMB in the PBS is shown below.

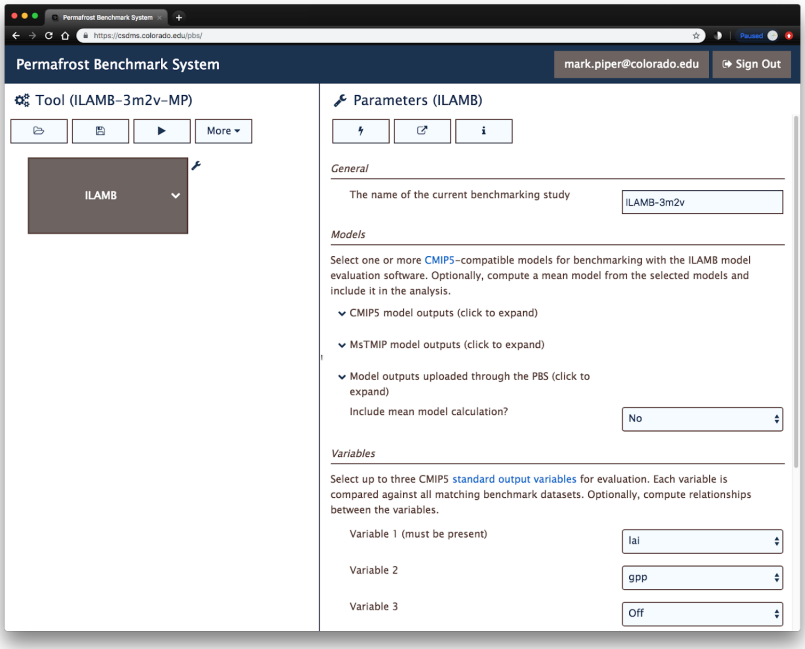


Figure 1. The graphical interface to the ILAMB benchmarking software presented in the PBS.

The home page for the PBS is https://permamodel.github.io/pbs. It includes a link for registering as PBS user, as well as documentation for users and developers. The PBS project is supported by NASA award 14-CMAC14-NNX16AB19G, A Permafrost Benchmark System to Evaluate Permafrost Models. All content developed for the project is open source, released under the Apache 2.0 license.

Other new repository tools:

CMIP *lead developer: Irina Overeem, CSDMS/University of Colorado, Boulder.* Data component processed from the CRU-NCEP Climate Model Intercomparison Project - 5, also called CMIP 5. Data presented include the mean annual temperature for each gridcell, mean July temperature and mean January temperature over the period 1902 -2100. This dataset presents the mean of the CMIP5 models, and the original climate models were run for the representative concentration pathway RCP 8.5.

Drainage Density *lead developer: Charles Shobe, University of Colorado, Boulder.* The Landlab Drainage Density component calculates landscape-averaged drainage density, defined as the inverse of the mean distance from any pixel to the nearest channel. The component follows the approach defined in Tucker et al (2001, Geomorphology). The drainage density component does not find channel heads, but takes a user-defined channels mask.

Note: New models submitted to the CSDMS repository January 1 to August 1, 2018 were summarized in the ***August Quarterly Newsletter.*** *Adding your open-source model to the CSDMS repository is a highly effective option for broadening participation. To add a model to the CSDMS repository, please click here:*

Submit Model

HPC Resource for Community Members

CSDMS is pleased to announce that the capacity of the new HPC Blanca has doubled!! HPC Blanca is a free resource available for use by CSDMS members. Access is even faster now when you use your XSEDE credentials. For more information, click **HERE**.

CSDMS 2018 Webinar Series

Please join us for the remaining webinar in the Fall 2018 CSDMS Webinar Series. The Spring 2019 Webinar Series will be announced soon! Registration link provided below.

CSDMS Basic Model Interface (BMI) - When a model is equipped with a Basic Model Interface (BMI), it acquires a common set of functions for querying and evolving its state. Further, if a BMI-enabled model is incorporated into a modeling framework, it can share information and couple with other models, possibly from other authors in different disciplines, which may in turn open new paths to scientific discovery. In this webinar, we'll provide an overview of BMI and the functions that define it. This webinar is appropriate for new users of BMI, although experienced users may also benefit. Instructor: **Mark Piper**, Research Software Engineer, University of Colorado, Boulder - November 13th, 12PM Eastern Time - Register

Note: Previous Webinars (*Landlab Toolkit Overview* and *Using CSDMS in the Classroom*) are now archived on the CSDMS Web site and can be accessed anytime **HERE.**

CSDMS Member Sessions at AGU 2018 Fall Meeting!

Session Title: NH026: "Predicting Extreme Events to Build Resilience to Natural Hazards" Presentations focus on research that improves our understanding of the fundamental processes underlying natural hazards and leads to improved predictability and risk assessment of extreme events in the geosciences. Hazards include extreme weather such as floods, droughts, hurricanes and tornadoes, or geophysical hazards due to earthquakes, landslides or geomagnetic storms. Session Conveners: Raymond Schmitt (WHOI), Albert Kettner (CSDMS/University of Colorado, Boulder) and Michael Liemohn (University of Michigan).

Session Title: EP53B: "Modeling Earth Surface Processes Using Computational Fluid Dynamics Across Scales I eLightning" CFD has been applied to understand processes relevant to geomorphology and earth surface

dynamics. In addition, it has been increasingly utilized to assess the impact of geophysical processes on society, such as the impact of hurricanes, storm surges, tsunamis, debris flows, and landslides. One of the grand challenges is to effectively integrate key processes of different scales through parameterizations, model coupling, adaptive mesh refinement, and assimilative methodology. This session includes contributions from researchers who use CFD or relevant computational models to tackle earth surface process problems. Session Conveners: Xiaofeng Liu (Penn State), Tian-Jian Hsu (University of Delaware), Joe Calantoni (US Naval Research Lab)

CSDMS 2019 Annual Meeting - "Bridging Boundaries"

May 21st - 23rd, 2019

in Boulder, Colorado

Syvitski Student Modeler Competition - Submission deadline January 7th, 2019. Registration opens in January.

Additional information coming soon!

Thesis - 2019 Symposium

Two-p**H**ase mod**E**ling for **S**ediment dynam**I**c**S**

The 4th symposium on two-phase modelling for sediment dynamics in geophysical flows will be held on September 17 - 19, 2019 at University of Delaware. We invite studies of fundamental understanding of sediment transport dynamics and other multiphase phenomena and their geophysical applications through theoretical/numerical modeling and laboratory/field observation. Due to a support from National Science Foundation, we offer significantly reduced registration fee for student/early career researchers.

More information can be found from the THESIS-2019 website:

http://www.ce.udel.edu/news-events/thesis-symposium/

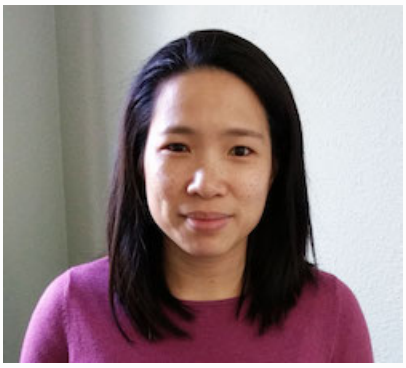
1st Regional Conference on Environmental Modeling & Software

"Modeling for Environmental Sustainability: Asia's Next Great Challenge"

The abstract submission system is now open for the 1st Regional Conference on Environmental Modeling and Software (May 18-20, 2019). Student and Early Career Scholarship and Conference Travel Grants information is now available. Please kindly check http://geomodeling.njnu.edu.cn/iEMSsRegion/ .

CSDMS MEMBER HIGHLIGHT

Lejo Flores, Associate Professor, Department of Geosciences, Boise State University and CSDMS Critical Zone Co-Chair has been appointed by the National Academies of Sciences, Engineering and Medicine to the committee for their study - Catalyzing Opportunities for Research in the Earth Sciences (CORES): A Decadal Survey for NSF's Division of Earth Sciences. More information on this study can be found **HERE.**



Leslie Hsu, Coordinator of the Community for Data Integration at the US Geological Survey, has been elected to Co-Chair the CSDMS Terrestrial Working Group. Leslie is currently serving as the 2017-2018 Chair of the Geoinformatics Division of GSA. She has also been involved with the Interdisciplinary Earth Data Alliance and was a co-PI of the Sediment Experimentalist Network Research Coordination Network. Her research has focused on fluvial seismology, debris flow erosion, creeping faults, alluvial fans and atmospheric chemistry. Leslie's interests also include data and information technology and facilitation of communities of practice.

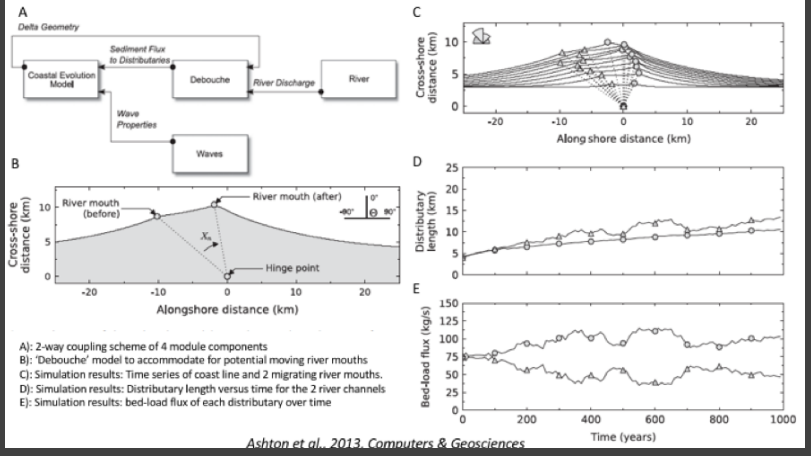
NSF Coastlines and People (CoPe) Emerging Effort

During September 2018, an initial workshop was convened in four US locations to discuss the emerging CoPe effort at NSF. The CoPe Workshops, attended by over 400 researchers (including CSDMS members) solicited feedback on potential future *Coastal Research Hubs* that address the "nexus between coastal sustainability, human dimensions, and coastal processes to transform understanding of interactions among natural, human-built, and social systems in coastal populated environments".

CSDMS is poised to provide important contributions to this effort given that the organization is "a diverse community of experts promoting the modeling of earth surface processes." Coastal processes and their human dimensions are among the key focal areas in CSDMS, where they are represented by the **Coastal Working Group** (641 members) and the **Human Dimensions Focus Research Group** (133 members), as well as the **Coastal Vulnerability Initiative** (153 members) and the location-focused **Chesapeake Focus Research Group** (88 members). Given that numerical modeling of coastal processes, human impacts, and adaptations is already central to research and management, it seems natural for CSDMS to play a role in the emerging Coastal Research Hubs.

CSDMS Community Capabilities

- CSDMS Model Repository hosts 78 coastal process models and cybertools, and 59 marine models and tools. These models address processes such as coastal circulation, storm surge, waves, and sediment transport, among others.
- The **CSDMS Modeling Framework (CMF)** enables coupling of models to study feedbacks and system dynamics. Built on the CMF are:
    - The graphical **Web Modeling Tool** for coupling and running models in a browser interface
    - The new **Python Modeling Tool** for running and coupling models and tools using the Python language and its powerful data analysis and plotting libraries.



River Model + Coastline Evolution Model (CEM) + River Avulsion are coupled to simulate how deltas with multiple distributaies would behave from an evolution point of view when distributaries provide sediment to the ocean based on slope + channel length.

- For building new models and tools, the **Landlab Toolkit** offers efficient Python-language model construction, with extensive support for gridding, I/O, and plug-and-play component modeling.
- The CSDMS Web Portal provides access to over 300 models and tools in its **Model Repository**, and a rich library of learning resources in its **Education Repository**.

As this important effort develops, please keep **CSDMS resources** and these compelling opportunities in mind:

- Coastal populations are growing even as vulnerability is rising and climate is changing.
- Accurate models are critically needed not only to address fundamental scientific questions, but also for management, scenario analysis, engineering design, and ultimately impact forecasting.
- Models and theories that were previously untested can now be rigorously evaluated and improved, thanks to the ongoing earth-surface data revolution.

CSDMS Resources!

Are you writing a proposal which would benefit from input from the CSDMS integration facility? For example, would you like to use a CSDMS modeling tool for a future project? Or are you planning to build a new model or model component and you would like advice on best practices for testing and naming conventions? Do you need software engineering support? Do you need a way to permanently make your developed model, data or EKT materials available to your community? The CSDMS integration facility can help. The first step is to get a letter of support for your proposal. Please contact CSDMS at CSDMS@colorado.edu for help with the process.

Coupled Tectonic and Surface Processes Whitepaper

Now Available!

The Whitepaper reporting the outcomes from the 2018 NSF-sponsored CTSP workshop can be found **HERE.** The workshop was convened by CSDMS and Computational Infrastructure for Geodynamics (CIG).

Publications of Interest

- Auad, G., Blyhte, J., Coffman, K. and Fath, B., 2018. *A Dynamic Management Framework for Socio-Ecological System Stewardship: A Case Study for the United States Bureau of Ocean Energy Management.* Journal of Environmental Management, V225, Pages 32-45
- Barnhart, K., Glade, R., Shobe, C. and Tucker, G., *in review* 2018. *Terrainbento 1.0: a Python Package for Multi-Model Analysis in Long-Term Drainage Basin Evolution.* Geoscientific Model Development
- Vila-Concejo, A., et al., 2018. *Steps to Improve Gender Diversity in Coastal Geoscience and Engineering.* Palgrave Communications/Nature, https://doi.org/10.1057/s41599-018-0154-0
- Ratliff, K., Hutton, E. and Murray, B., 2018. *Exploring wave and sea-level rise effects on delta morphodynamics with a coupled river-ocean model.* Journal of Geophysical Research, https://doi.org/10.1029/2018JF004757
- Kettner, A., Overeem, I and Tucker, G., 2018. *Can We Build Useful Models of Future Risk from Natural Hazards?* Eos, 99, https://doi.org/10.1029/2018EO105239. Published on 10 September 2018.
- Overeem, I., Jafarov, E., Wang, K., Schaefer, K., Stewart, S., Clow, G., Piper, M. and Elshorbany, Y., 2018. *A Modeling Toolbox for Permafrost Landscapes.* Eos, 99, https://doi.org/10.1029/2018EO105155. Published on 28 September 2018.
- National Academies of Sciences, Engineering, and Medicine. 2018. *Understanding the Long-Term Evolution of the Coupled Natural-Human Coastal System: The Future of the U.S. Gulf Coast.* Washington, DC: The National Academies Press. https://doi.org/10.17226/25108.
- McDonald, R., Nelson, J., Kinzel, P. and Conaway, J., 2018. *Modeling Surface Water Flow and Sediment Mobility with the Multi-Dimensional Surface-Water Modeling System (MD_SWMS).* USGS Fact Sheet 2005-3078.

Reach your community! To submit publications or resources of interest for a future CSDMS "On the Surface", please contact csdms@colorado.edu.

CSDMS is an NSF sponsored program