New Landlab release! Webinars, CSDMS Office Hours.

Fri, Apr 7, 2023 at 11:23 AM

ON THE SURFACE

CSDMS Newsletter
April 2023

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New Landlab Release 2.6

Landlab v2.6 has been released! The new version brings many new components, features, tutorial notebooks, and even some bug fixes. **The release notes** provide an overview of all of these new features. Among these, three of the new components are: You can have a look at the release notes for a detailed description of all the new contributions but we would like to highlight two new contributions,

PriorityFloodFlowRouter (Benjamin Campforts)
Built on the RichDEM package, the PriorityFloodFlowRouter will fill or breach a DEM, accumulate flow, and calculate drainage area using the priority flood algorithm.

DimensionlessDischarge (Sarah Lundell)
The DimensionlessDischarge component calculates dimensionless discharge over a landscape and determines the thresholds above which debris flow will be initiated.

AreaSlopeTransporter (Greg Tucker)
The AreaSlopeTransporter is a simple, generic transport-limited landscape evolution component that models the time rate of change of elevation at a set of grid nodes, in the spirit of the Garry Willgoose's famous SIBERIA model.

Links:
Landlab docs: https://landlab.readthedocs.io
RichDEM: https://richdem.readthedocs.io/en/latest/intro.html

CSDMS Spring Webinar Series

Register Now!

Please join us for the final CSDMS 2023 Spring Webinar. Registration is required and link/details are provided below.

BASEMENT: a not-so-basic simulation environment for river process modeling
April 18th, 2023 @ 9:00AM MDT
Davide Vanzo, ETH Zurich, Switzerland

Modelling river physical processes is of critical importance for flood protection, river management and restoration of riverine environments. Because of the continuous increment of computational power and the development of novel numerical algorithms, numerical models are nowadays widely and standardly used. The freeware BASEMENT is a flexible tool for one and two-dimensional river process simulations that bundles solvers for hydrodynamic, morphodynamic, scalar advection-diffusion and feedbacks with riparian vegetation. The adoption of a fully costless workflow and a light GUI facilitate its broad utilization in research, practice and education. In this seminar I introduce the different tools within the BASEMENT suite, present some domains of application and ongoing developments.

REGISTER

Roadshows

The goal of the CSDMS Roadshows is to provide expanded training opportunities to Minority

Serving Institutions and other groups that may not be able to travel to the CSDMS Annual Meetings or ESPIn. CSDMS Roadshow #1 was held March 7-9 at **Montclair State University, hosted by Prof. Jorge Lorenzo Trueba** of the Department of Earth and Environmental Studies. Eleven participants, mostly graduate students, learned about shell commands, version control with git, Python programming, and Landlab. Dr. Trueba noted that *"The roadshow gave the students and me the right mix of lectures, questions, and patience to learn how to use a wide range of computational tools. A significant challenge, given the diversity of backgrounds. Being a student again felt great after learning so much from Mark and Eric!"* It was an entertaining, interactive event, with many questions from the participants. A special shout-out to the MSU students in the class who attended during their spring break!

Roadshow #2 is planned for this summer at the **University of Minnesota, hosted by Prof. Andy Wickert** of the Department of Earth and Environmental Sciences. Learn more about Roadshows (attending and hosting!) at https://csdms.colorado.edu/wiki/Roadshows.

Office Hours with a CSDMS RSE

Are you troubled by questions like:

- How can I change the boundary conditions on a Landlab grid?
- Can I convert an equation from a paper into a Python function?
- What is the best way to organize code and data in a GitHub repository?

If so, CSDMS Office Hours can help!

In Office Hours, CSDMS Research Software Engineers (RSEs) are available for a live Zoom meeting. Bring your questions! We'll do the best we can to answer them.

Office Hours are open every Wednesday from 9-10 AM US Mountain Time**. Sign up link here:** https://csdms.colorado.edu/wiki/OfficeHours

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Community Member News

The recipient of the 2023 CSDMS Lifetime Achievement Award is **Professor Courtney Harris**,

Virginia Institute of Marine Science! Courtney is recognized for her outstanding intellectual leadership in understanding of sediment transport in shelf and estuarine environments. She currently leads the VIMS Sediment Transport Modeling Lab.

Congratulations to **Kyle Wright**, Coastal Modeler, Texas Water Development Board, winner of the 2023 Syvitski Student Modeler Award for his submission entitled "*From Grains to Plastics: Modeling Nourishment Patterns and Hydraulic Sorting of Fluvially Transported Materials in Deltas"* using the Anuga and Dorado software packages. Kyle received his PhD from the University of Texas, Austin in December 2022 (Advisor Paola Passalacqua).

The first runner-up of the 2023 Syvitski Student Modeler Award is **Chris Tasich**, Vanderbilt University for his submission entitled **"**A *simple model of a tidal platform"*. Chris is currently a PhD student, Advisor Jonathan Gilligan.

CSDMS is pleased to welcome two new Group Chairs! **Sagar Gutam**, Research Scientist, Sandia National Laboratory, has joined the leadership team as Chair of the Critical Zone Focus Research Group.
Sagar develops/utilizes process, machine learning, and Earth system models to explore ecosystem processes and assess impacts of land use and climate change.

Candice Piercy, US Army Corps of Engineers, has joined the leadership team as Co-chair of the Ecosystem Dynamics Focus Research Group. Candice is a research environmental engineer with 12 years of experience working with the Integrated Ecological Modeling team at USACE-ERDC.

New Community Teaching Resource: Landscape Evolution and Numerical Modeling with Landlab

CSDMS community member **Luke McGuire, University of Arizona,** has made the teaching notebooks "Geomorphology and Landscape Evolution" with tutorials and homework assignments available on the hydroshare resource making them easy for others to access and run. The notebooks are designed to facilitate learning about landscape evolution and numerical modeling with Landlab. Thanks Luke!!

Summer Reading List

For your summer reading pleasure (you didn't have anything else to do, right?) take a look at these recent community publications using CSDMS products.

Basic Model Interface and PyMT

Guillaumot, L., Smilovic, M., Burek, P., de Bruijn, J., Greve, P., Kahil, T. and Wada, Y. (2022). **Coupling a large-scale hydrological model (CWatMv1.1) with a high-resolution groundwater flow model (MODFLOW 6) to assess the impact of irrigation at regional scale.** *Geosci. Model Dev.*, 15, 7099-7120, https://doi.org/10.5194/gmd-15-

7099-2022, 2022.

Aerts, J. P. M., Hut, R. W., van de Giesen, N. C., Drost, N., van Verseveld, W. J., Weerts, A. H., and Hazenberg, P. (2022): **Large-sample assessment of varying spatial resolution on the streamflow estimates of the wflow_sbm hydrological model.** *Hydrol. Earth Syst. Sci.,* 26, 4407–4430, https://doi.org/10.5194/hess-26-4407-2022, 2022.

Ling, Z., Chen, Q., Cohn, N., Johnson, C. and Johnson, B. (2023). **Modeling Long-Term Evolution of a Beach-Dune System: Caminada Headlands, Louisiana.** *Coastal Sediments 2023*, pp. 782-796, https://doi.org/10.1142/9789811275135_0073.

Van Western, B., Leijnse, T., De Schipper, M., Cohn, N. and Luijendijk, A. (2023). **Integrated Modelling of Coastal Landforms.** *Coastal Sediments 2023*, pp.760-771, https://doi.org/10.1142/9789811275135_0071.

Landlab

Nudurupati, S., Istanbulluoglu, E., Tucker, G., Gasparini, N., Hobley, D., Hutton, E., Barnhart, K., and Adams, J. (2023). **On Transient Semi-Arid Ecosystem Dynamics Using Landlab: Vegetation Shifts, Topographic Refugia, and Response to Climate.** *Water Resources Research,* V59, i4, https://doi.org/10.1029/2021WR031179

Fiolleau, S., Uhlemann, S., Falco, N., & Dafflon, B. (2023). **Assessing probability of failure of urban landslides through rapid characterization of soil properties and vegetation distribution.** *Geomorphology,* 423, 108560, https://doi.org/10.1016/j.geomorph.2022.108560.

Rosier, I., Diels, J., Somers, B., & Van Orshoven, J. (2023). **The impact of vegetated landscape elements on runoff in a small agricultural watershed: A modelling study.** *Journal of Hydrology,* 129144, https://doi.org/10.1016/j.jhydrol.2023.129144.

Campforts, B., Shobe, C.M., Overeem, I., and Tucker, G.E. (2022) **The art of landslides: how stochastic mass wasting shapes topography and influences landscape dynamics.** *Journal of Geophysical Research: Earth Surface,* v. 127(8), e2022JF006745, https://doi.org/10.1029/2022JF006745.

Cardenas, B. T., Lamb, M. P., & Grotzinger, J. P. (2022). **Martian landscapes of fluvial ridges carved from ancient sedimentary basin fill.** *Nature Geoscience,* 1-7. https://www.nature.com/articles/s41561-022-01058-2.

Cullen, C., Anders, A. M., Lai, J., & Druhan, J. L. (2022). **Numerical modeling of groundwater-driven stream network evolution in low-relief post-glacial landscapes.** *Earth Surface Processes and Landforms,* 47(2), 658-671, https://doi.org/10.1002/esp.5278.

Gray, H. J., DuRoss, C. B., Nicovich, S. R., & Gold, R. D. (2022). **A geomorphic-process-based cellular automata model of colluvial wedge morphology and stratigraphy.** *Earth Surface Dynamics,* 10(2), 329-348, https://doi.org/10.5194/esurf-10-329-2022.

Kwang, J. S., Thaler, E. A., Quirk, B. J., Quarrier, C. L., & Larsen, I. J. (2022). **A Landscape Evolution Modeling Approach for Predicting Three-Dimensional Soil Organic Carbon Redistribution in Agricultural Landscapes.** *Journal of Geophysical Research: Biogeosciences,* 127(2), e2021JG006616, https://doi.org/10.1029/2021JG006616.

Litwin, D. G., Tucker, G. E., Barnhart, K. R., & Harman, C. J. (2022). **Groundwater affects the geomorphic and hydrologic properties of coevolved landscapes.** *Journal of Geophysical Research: Earth Surface,* 127(1), e2021JF006239, https://doi.org/10.1029/2021JF006239.

Maneerat, P., Bürgmann, R., & Betka, P. M. (2022). **Thrust Sequence in the Western Fold-and-Thrust Belt of the Indo-Burma Range Determined from Fluvial Profile Analysis and Dynamic Landform Modeling.** *Tectonophysics,* 845, 229638, https://doi.org/10.1016/j.tecto.2022.229638.

Reitman, N. G., Mueller, K. J., & Tucker, G. E. (2022). **Surface slip variability on strike-slip faults.** *Earth Surface Processes and Landforms,* 47(4), 908-935, https://doi.org/10.1002/esp.5294.

Tucker, G. E., Hutton, E. W., Piper, M. D., Campforts, B., Gan, T., Barnhart, K. R., … & Syvitski, J. (2022). **CSDMS: a community platform for numerical modeling of Earth surface processes.** *Geoscientific Model Development,* 15(4), 1413-1439, https://doi.org/10.5194/gmd-15-1413-2022.

Uhlemann, S., Dafflon, B., Wainwright, H. M., Williams, K. H., Minsley, B., Zamudio, K., … & Hubbard, S. (2022). **Surface parameters and bedrock properties covary across a mountainous watershed: Insights from machine learning and geophysics.** *Science Advances,* 8(12), eabj2479.`https://doi.org/10.1126/sciadv.abj2479 <https://doi.org/10.1126/sciadv.abj2479>`__.

Xi, C., Hu, X., Ma, G., Rezania, M., Liu, B., & He, K. (2022). **Predictive model of regional coseismic landslides' permanent displacement considering**

uncertainty. *Landslides,* 19(10), 2513-2534, https://doi.org/10.1007/s10346-022-01918-3.

Zhao, H., Lin, Y., Zhou, J., Delang, C. O., & He, H. (2022). **Simulation of Holocene soil erosion and sediment deposition processes in the Yellow River basin during the Holocene.** *Catena,* 219, 106600, https://doi.org/10.1016/j.catena.2022.106600.

Kim, D., Weber, J., Seong, Y., Reminga-de Young, K. and Yu, B. (2023). **Late Quaternary-Recent intraplate topographic uplift of the St. Francois Mountains (Ozark Plateau), Missouri (USA), driven by differential density and erosion.** *Geology*, V51, #4, https://doi.org/10.1130/G50585.1.

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