CSDMS

COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

ON THE SURFACE

CSDMS QUARTERLY NEWSLETTER August 2018

COMMUNITY CYBER UPDATES - NEW REPOSITORY MODELS

1D Particle-Based Hillslope Evolution Model *lead developer: Jacob Calvert, University of California, Berkeley.* 1D probabilistic, particle-based model of hillslope evolution for studying hillslope equilibration and response to perturbations.

Barrier Inlet Environment (BRIE) Model *lead developer: Jaap Nienhuis, Florida State University.* Coastal barrier island transgression model.

CVPM *lead developer: Gary Clow, University of Colorado.* Multidimensional heat-transfer modeling system for permafrost with advanced unfrozen water physics.

ErosionDeposition *lead developer: Charles Shobe, University of Colorado.* Landlab component for fluvial erosion/deposition.

GEOMBEST++ *lead developer: Rebecca lauzon, Duke University.* Geomorphic model of barrier, estaurine, and shoreface translations plus dynamic marsh plus waves.

GrainHill *lead developer: Greg Tucker, University of Colorado.* Cellular automaton model of hillslope evolution.

MarshMorpho2D *lead developer: Giulio Mariotti, Louisiana State University.* 2D long-term marsh evolution model based on tidal dispersion.

Nitrate Network Model *lead developer: Jonathan Czuba, Virginia Tech.* Nitrate and organic carbon dynamics on a wetland-river network.

OTTER *lead developer: Brian Yanites, Indiana University.* Evolution of a river profile with dynamic width.

OlaFlow *lead developer: Pablo Higuera.* Wave generation and active absorption interaction with porous structures framework.

OverlandFlow *lead developer: Jordan Adams, University of Colorado.* Component simulating overland flow using a 2-D numerical approximation of the shallow-water equations following the de Almeida et al., 2012 algorithm for storage-cell inundation modeling.

RiverMUSE *lead developer: Jon Schwenk, Los Alamos National Laboratory.* Simulates freshwater mussel populations' response to changes in suspended sediment

SPACE *lead developer: Charles Shobe, Univeristy of Colorado.* Landlab component for 2-D calculation of fluvial sediment transport and bedrock erosion

SoilInfiltrationGreenAmpt *lead developer: Francis Rengers, USGS.* Landlab component that calculates soil infiltration based on the Green-Ampt solution.

To add a model to the CSDMS repository, please click here:

Submit Model

New! CSDMS 2018 Webinar Series

Please join us for the Fall 2018 CSDMS Webinar Series. Registration links are provided below.

Landlab - This webinar presents an overview of the Landlab Toolkit: a Python package that makes it much easier to create two-dimensional grid-based models of various earth-surface processes. The webinar will provide a basic overview of Landlab, and illustrate some of its key capabilities in creating grids and working with modular "process components". The webinar will also present some example applications of Landlab for model-building, and provide pointers to tutorials, user guides, and other resources for those who wish to learn more. Instructor: **Greg Tucker**, CSDMS Executive Director, University of Colorado, Boulder - September 14th, 12PM Eastern Time - Register

Using CSDMS in the Classroom - Learn about CSDMS software for running a suite of earth surface models through a web-based modeling tool (WMT). This webinar will share improved ways of using this tool in the classroom, gives a quick reminder demo, and points in detail to the resources online. Instructor: **Irina Overeem**, CSDMS Deputy Director, University of Colorado, Boulder - October 9th, 12PM Eastern Time - Register

CSDMS Basic Model Interface (BMI) - When equipped with a Basic Model Interface, a model is given a common set of functions for configuring and running the model (as well as getting and setting its state). Models with BMIs can communicate with each other and be coupled in a modeling framework. The coupling of models from different authors in different disciplines may open new paths to scientific discovery. In this first of a set of webinars on the CSDMS BMI, 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 find it useful. Instructor: **Mark Piper**, Research Software Engineer, University of Colorado, Boulder - November 13th, 12PM Eastern Time - Register

EKT Highlight

ANUGA Jupyter Notebooks - ANUGA is a well-established model for the hydrodynamics for flow problems in complex 2 D geometries. It has been applied to dam breaks, river floods, storm surges and tsunamis. Steven Roberts of Geoscience Australia and Mariela Perignon of University of Texas taught a clinic at the CSDMS May meeting in Boulder. If you missed it, online Jupyter Notebooks are available for new learners HERE.

Are you interested in using ANUGA, but need to incorporate beta versions of sediment transport and vegetation drag for your specific research, look at additional hands-on labs that were designed by Mariela Perignon HERE.

CSDMS 2019 Annual Meeting

May 21st - 23rd, 2019 in Boulder, Colorado

Syvitski Student Modeler Competition - Submission deadline

January 7th, 2019

Meeting theme and additional information coming soon!

New CSDMS Artificial Intelligence & Machine Learning Initiative

The CSDMS Cyberinformatics and Numerics Working Group has recently launched an AI & ML Initiative led by Jeff Obelcz (NRL Stennis), Chris Jenkins (INSTAAR, CU Boulder), Kelly Kochanski (CU Boulder), Evan Goldstein (UNC Chapel Hill). The Initiative resulted from the Forum "With Artificial Intelligence & Machine Learning - What Lies Ahead for Earth Surface Modeling?" which was convened as part of the Geoprocesses, Geohazards - CSDMS 2018 meeting in May 2018. The proceedings are available online: Wiki, Agenda and Notes. Further developments will be announced soon!

CSDMS MEMBER HIGHLIGHT

The winner of the CSDMS 2018 Poster Award is **Austin Chadwick,** Caltech, for his presentation *"Predicting the location of avulsion hazards on deltas in the face of changing discharge regimes and relative sea-level rise".* He presented a predictive model of delta-

lobe morphodynamics and repeated avulsion that is applicable to deltas over a range of spatial scales, sediment supplies, flood regimes, and relative-sea-level-rise conditions. More on Austin's research can be found HERE.

SCIENCE HIGHLIGHTS

A Model Ensemble for Projecting Multidecadal Coastal Cliff Retreat During the 21st Century

Californian coastal cliffs will see more erosion with rising sea levels. A study by CSDMS member Patrick Limber, together with a team of USGS scientists, demonstrates a dramatic increase in cliff retreat rates. A paper in Journal of Geophysical Research Earth Surface presents an ensemble of model simulations – a novel approach for earth surface dynamics modeling.

Models predict 20-40 m of landloss by 2100 with rising sea level (Limber et al., 2018).

See HERE for the CSDMS Science Highlight.

Read the paper: Limber, P., Barnard, P., Vitousek, S., Erikson, L., 2018. A model ensemble for projecting multidecadal coastal cliff retreat during the 21st century. Journal of Geophysical Research: Earth Surface 123. https://doi.org/10.1029/2017JF004401

Modeling Feedbacks Between Human and Natural Processes.

Since humans use of Earth's resources is taking place at an unprecedented rate, the evolution of the Earth surface is no longer dominated only by natural processes. Developing and using models to formalize and test our understanding of (and quantify) complex societal and natural processes, their interactions and potential future trajectories systematically seems logical. However, a common

conceptual framework to model human-natural-system feedbacks is lacking. Robinson et al. (2018) highlight the challenges faced by four research teams to successfully modeling coupled human-natural systems. In addition to providing critical lessons learned by the international author team working at scales from individuals (e.g., agent-based models) to global (e.g., integrated assessment models), the study suggests that major advances can be made in this interdisciplinary field by: using wrapper container software, developing standardized applications programming interfaces (API), incorporating standard names across disciplines, creating interfaces to multiple coupling frameworks, and by adopting reproducible workflow environments. Robinson et al. (2018) is the outcome of an inspiring workshop "Linking Earth System Dynamics and Social System Modeling" held in 2016, that was jointly sponsored by CSDMS, the National Science Foundation (NSF); and Future Earth's Analysis, Integration and Modeling the Earth System (AIMES) Project.

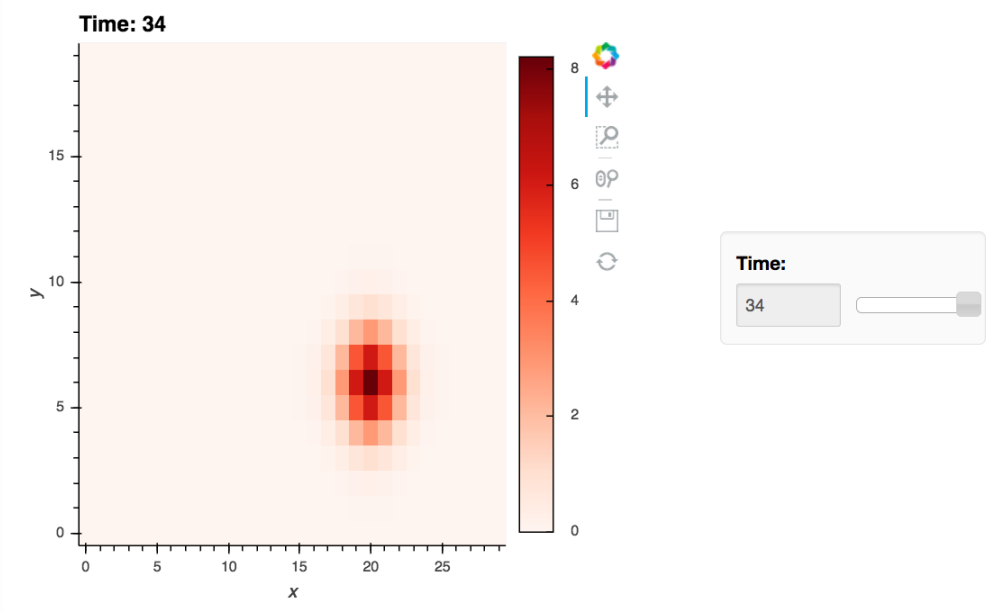
See HERE for workshop outcomes.

Read the paper: Robinson, D.T., Vittorio, A.D., Alexander, P., Arneth, A., Barton, C.M., Brown, D.G., Kettner, A.J., Lemmen, C., O'Neill, B.C., Janssen, M., Pugh, T.A.M., Rabin, S.S., Rounsevell, M., Syvitski, J.P.M., Ullah, I., and Verburg, P.H., 2018. Modelling feedbacks between human and natural processes in the land system. *Earth System Dynamics*, 9, 895-914. https://doi.org/10.5194/esd-9-895-2018.

Tips and Tricks - HoloViews

Jupyter Notebooks are a great way to present information. What's even better than a Jupyter Notebook? A Jupyter Notebook with interactive graphics!

HoloViews is a Python library with an interactive plotting system that uses Matplotlib and Bokeh as visualization engines. HoloViews is more than a visualization library, though; it melds data analysis and visualization to provide an intuitive description of data. To learn more, check out the HoloViews home page (http://holoviews.org). It has installation instructions, several layers of examples, a reference gallery of visualizations, and API documentation.



Temperature diffusion example in 2018 BMI Live clinic

HoloViews was successfully used to provide an interactive Jupyter Notebook visualization in the *BMI Live* clinic at the 2018 CSDMS Annual Meeting.

Coastlines and People (CoPE) Scoping Sessions Applications Due August 12, 2018

NSF is convening scoping sessions to identify priorities for a research initiative focused on coastal regions. Applications are due by August 12, 2018 (11:59pm local time) and the workshops will be held September 26-28, 2018. More information is available on the CoPe scoping session website https://coastlinesandpeople.org/.

Publications of Interest

- Katz, D.S., Druskat, S., Haines, R., Struck, A., 2018. ***The State of Sustainable Research Software: Results from the Workshop on Sustainable Software for Science: Practice and Experiences,(WSSSPE5.1)***
- Kettner, A.J., Cohen, S., Overeem, I, Balazs, F., Brakenridge, G.R., and Syvitski, J.P.M., 2018. ***Estimating Change in flooding for the 21st century Under a Conservative RCP Forcing: A global Hydrological Modeling Assessment*.** In (eds: Guy J-P. Schumann, Paul D. Bates, Heiko Apel, Giuseppe T. Aronica): Global Flood Hazard: Applications in modeling, mapping and forecasting, AGU books, 157-167.
- National Academies of Sciences, Engineering, and Medicine. 2018. ***Open Science by Design: Realizing a Vision for 21st Century Research.*** Washington, DC: The National Academies

Press.

- Scheidt, C., Li, L., Caers, J. (editors), 2018. ***Quantifying Uncertainty in Subsurface Systems.*** John Wiley & Sons, 304 pp.
- Wright, L.D., and Nichols, C.R. (editors), 2018. ***Tomorrow's Coasts: Complex and Impermanent.*** Springer, 374 pp.

ONLINE RESOURCES

Coupling of Tectonic and Surface Processes keynote addresses now available online.

Geoprocesses, Geohazards - CSDMS 2018 keynote presentations, clinic materials and posters now available online.

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

CSDMS Privacy Policy Updated

CSDMS has updated it's privacy policy to bring it in compliance with Europe's new General Data Protection Regulations (GDPR), which became effective May 25, 2018. Although CSDMS is a based in the USA, we do offer membership to other countries, including within the EU and therefore will be compliant with the EUs GDPR. This policy aims to make transparent exactly what we do, and cannot do with your information. New members, or members that would like to change their member profile will be required to indicate that they have read and agreed to CSDMS Privacy Policy. We encourage current members to review the policy and update their user profile (you can also update your institution, email or sign up for other groups within CSDMS). To access your user profile, log in to the CSDMS wiki, click on the small blue person icon on the right side of the top menu bar, then click on your username and start editing your user information. A checkbox indicating that you agree to the privacy policy will appear once you have updated or confirmed your information. The CSDMS privacy policy can be accessed here: https://csdms.colorado.edu/wiki/CSDMS:Privacy_policy.

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