Exploring the interplay between solid Earth tectonics and surface processes using community codes

CSDMS

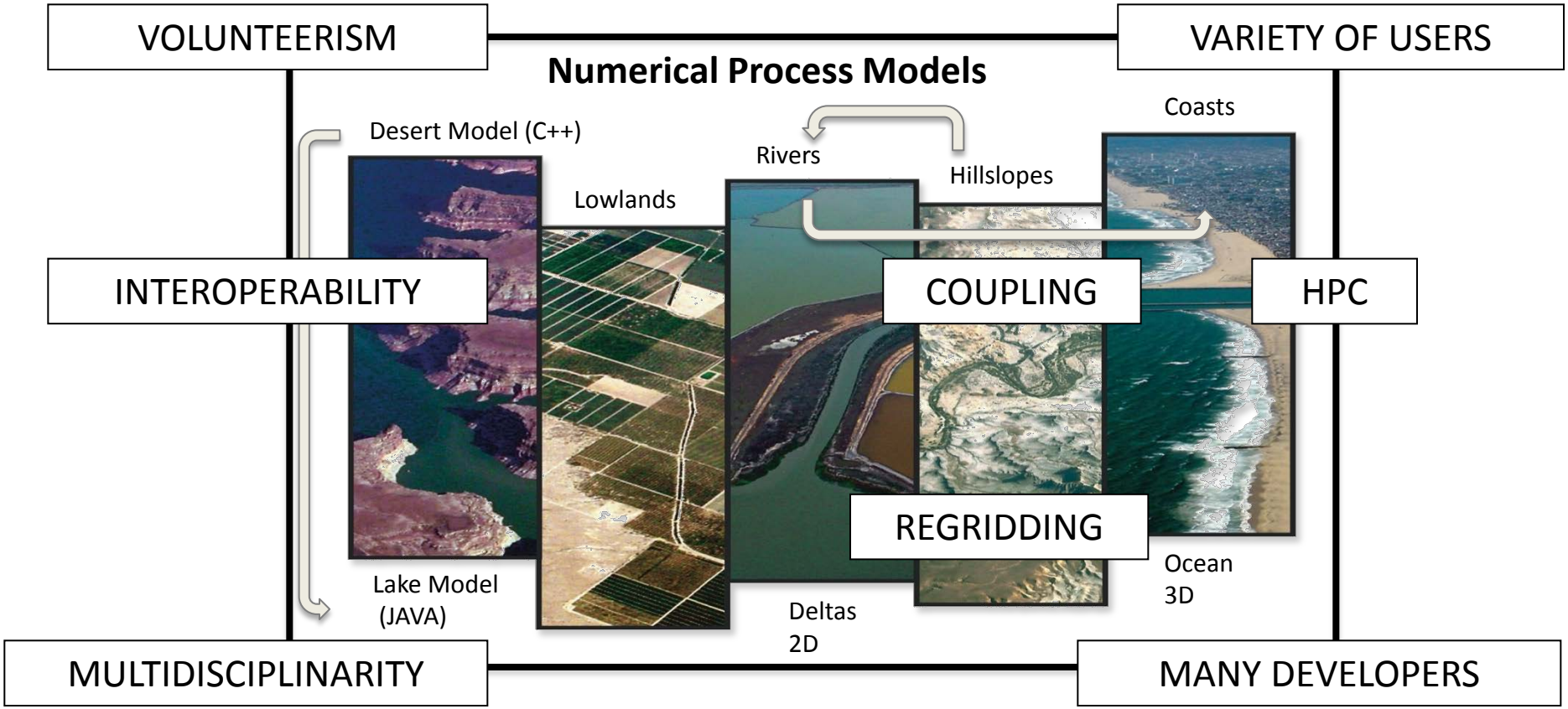
Community Surface Dynamics Modeling System

CSDMS – Community Surface Dynamics Modeling System

www.csdms.edu

The Community Surface Dynamics Modeling System (CSDMS) catalyzes new paradigms and practices in developing and employing software to understand the earth's surface — the ever-changing dynamic interface between lithosphere, hydrosphere, cryosphere and atmosphere. CSDMS focuses on the movement of fluids and the sediment and solutes they transport through landscapes, seascapes and sedimentary basins. CSDMS supports the development, integration, dissemination and archiving of community open-source software, that reflects and predicts earth-surface processes over a broad range of temporal and spatial scales.

CSDMS Grand Challenge: Coordinate a large community to build a toolbox of surface dynamics component models



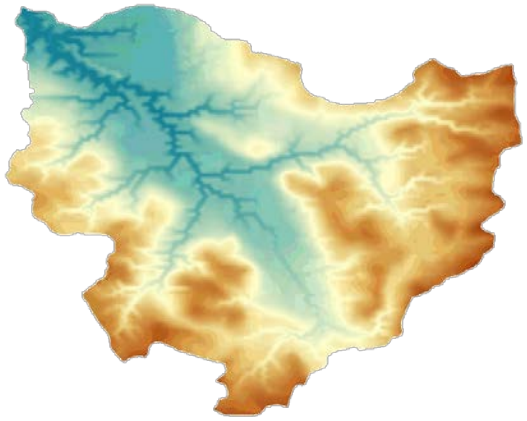
Slide from Syvitski (2013) Welcome to CSDMS 2.0

CSDMS
COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

Open-source Model Repository

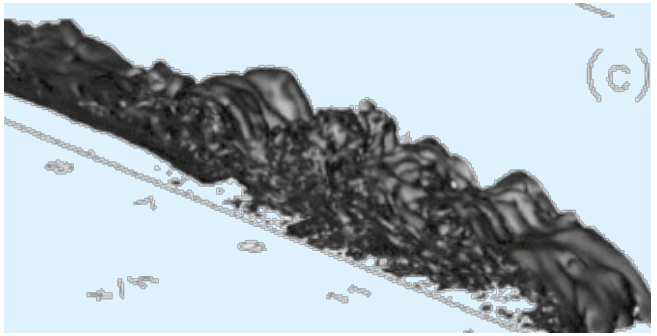
Model Domain:

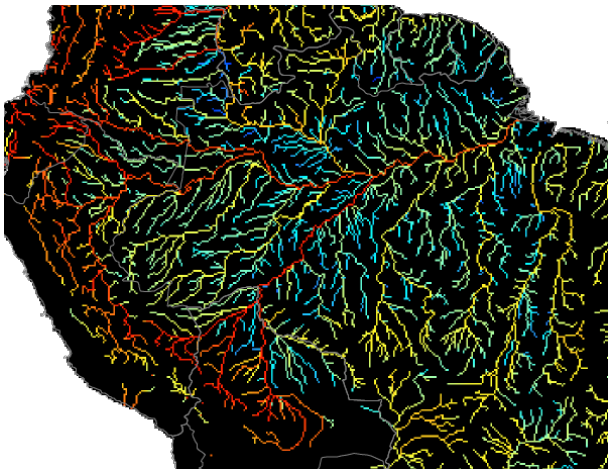
- Terrestrial incl. the Cryosphere
- Geodynamics & Stratigraphy
- Hydrology from reach to global
- Coastal & Marine
- Climate & Weather



Model Types:

- ✓ Landscape / Seascape Evolution Models
- ✓ Morphodynamic Models
- ✓ Transport / Circulation Models
- ✓ Agent-based Models
- ✓ GIS Models
- ✓ ADM, SWEM, RANS, LES & DNS Models
- ✓ Abiotic & Biotic Models





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CSDMS Geodynamics Focus Research Group

http://csdms.colorado.edu/wiki/Geodynamics_Focus_Research_Group

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Geodynamics Focus Research Group

Introduction

Welcome to the CSDMS Geodynamics Focus Research Group (FRG) page. The Geodynamics FRG is a research group (*currently **36** members*), that is additionally co-sponsored by GeoPRISMS, a legacy of the NSF MARGINS Program. It is a decadal program, funded by NSF, committed to the amphibious study of the origin and evolution of continental margins through interdisciplinary, community-based investigations. The group was initiated in March of 2013 and is led by co-chairs, Phaedra Upton and Mark Behn. The group's goals are to provide input to the CSDMS effort on how to best represent geodynamic processes and models within CSDMS. We welcome your participation in the Geodynamics FRG, and invite you to join at the link below.

Geodynamics FRG links

- Members
- Meetings & presentations
- Projects
- Reports

Chairs

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Announcements

AGU special session: EP009. Exploring the interplay between solid Earth tectonics and surface processes from mountains to the sea
Convenors: Phaedra Upton, Mark Behn, John Jaeger
Invited: Peter Koons, Becky Dorsey, Vincent Strak, Daniel Garcia-Castellanos

GeoPRISMS Mini-Workshop at AGU: Exploring the interplay between solid Earth tectonics and surface processes using community codes
Convenors: Phaedra Upton, Mark Behn, John Jaeger
Invited Speakers: Louis Moresi, Brian Yanites, Ritske Huismans

Geodynamics FGR

The Geodynamics FRG is new to CSDMS 2 and is co-sponsored by GeoPRISMS. It was formed with the aim of facilitating the understanding of the interplay between climatic, geomorphic, and geological/tectonic processes in governing Earth surface processes and landscape evolution. The Geodynamics FRG will move toward an integrated-coupled modeling suite that has the capability to account for paleo-topography, geology, substrate lithology, crustal deformation, climate, vegetation, runoff production, and ensuing sediment transport and storage. The FRG will be closely aligned to the CSDMS Terrestrial Working Group.

Our road map for the next five years is:

- Short-term goals focused on building up a community, determining key questions and identifying existing codes and how they might fit into the CSDMS framework;
- Intermediate-term goals focused on building on existing codes and developing a robust coupled geodynamic-landscape evolution model(s);
- Long-term goals will build a community around these model(s), benchmark models and train users.

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CSDMS mini-workshop - GeoPRISMS | Form:CSDMS annual meeting - csdms

csdms.colorado.edu/wiki/Form:CSDMS_annual_meeting

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COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

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Models CMT Supercomputing Education Data Community Meetings Help *Wiki tools*

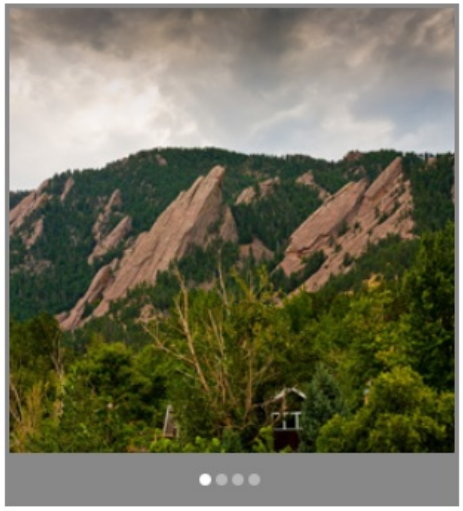
Welcome to the CSDMS 2014 annual meeting

The meeting will be held 2014, May 20 - 22nd (Tuesday till Thursday) in Boulder Colorado, USA

Registration

Registration will be open in the fall.

Additional information will be posted soon.



Possible discussion points

- Implementation plan
- Workshop ideas for CSDMS annual meeting
- CSDMS and CIG

Short-term goals (1-2 years, 2013-2015)

•Reach out to the geodynamic community through GeoPRISMS and CIG (Computational Infrastructure for Geodynamics). Seek feedback from the community on our goals and strategy for moving forward.

•Convene special sessions at large conferences such as AGU and run one or more workshops to engage the community. [One such session is planned for the 2013 Fall AGU and co-sponsored with GeoPRISMS.]

•Evaluate state-of-the-art understanding and modeling of coupled geodynamic and geomorphic systems. This includes identifying existing models, their potential for inclusion into CSDMS, research needs, and areas where models, datasets, and understanding of key processes are missing.

•Identify potential proof-of-concept applications and data sets. Develop a set of criteria for proof-of-concept applications. Where coupling is not seen as feasible in the short term, these criteria should address the barriers to that feasibility.

- Include a component of both surface dynamics and solid earth deformation
- Well-constrained boundary conditions

•Proof-of-concept applications could include:

- Modeling how one (or a system) of growing normal fault(s) evolve while simultaneously exposed to surface processes (erosion and deposition) or;
- Modeling simple two-sided mountain ranges such as Taiwan or the Southern Alps

•Evaluate available codes and their potential for inclusion in BMI (Basic Model Interface) and CMT (Component Modeling Tool).

•Define and prioritize education needs/training within the CSDMS framework.

Intermediate-term goals (3-4 years, 2015-2017)

•Stimulate proposals from the community for projects that will address important science questions while completing steps necessary for realizing the overall goals of CDSMS, including (1) developing and improving software for CSDMS, (2) developing proof-of-concept modeling applications, and/or (3) developing strategies to test model predictions. In particular, encourage proposals that integrate a landscape evolution model and a geodynamic model within the CSDMS framework.

•Identify one or two models to focus development efforts and work with the Integration Staff to refactor the code with a BMI. Add code to the CMT.

•Implement proof-of-concept application(s) identified above. The application(s) will include a component of both surface dynamics and solid earth deformation, well-constrained boundary conditions, be testable by field or experimental data, and (ideally) will be used for model benchmarking and inter-comparison.

•Begin model benchmarking and model inter-comparison. The way we go about this will depend on which models we have decided to focus on as well as what proof-of-concept applications we have chosen. Model benchmarking will assist users when determining which model/set of models to use for their research problem by highlighting the strengths and weaknesses of each model/set of models.

•Make modeling tools available for educational use. Including the contribution of simple model animations to the Quantitative Surface Dynamics Educational Toolbox.

Long-term goals (5 years and beyond, 2017-)

•Develop (as in couple in CMT or outside CMT) and test a fully coupled geomorphic/geodynamic problem. A framework problem would potentially include:

- Underlying geology and structure
- Tectonic boundary conditions
- Surface processes e.g., runoff production and ensuing sediment transport and storage

•Contribute to the EKT (Education and Knowledge Transfer) program with the aim of seeing a new generation of computationally literate graduate students, versed in how to take maximum advantage of CSDMS tools and capability, begin to join the research community.

•Continue contributing to the Quantitative Surface Dynamics Educational Toolbox with animations, 'Concept to Model' exercises, simplified models for students to 'play' with, and more complex models for students to explore dynamic coupling problems.

•Consider running hands-on training courses to build community involvement with specific codes and coupled modeling systems.