CSDMS

Community surface Dynamics Modeling system

Annual Report, February 1 2008

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CSDMS Annual Report, Feb. 1, 2008

1.0 CSDMS Mission: The Community Surface Dynamics Modeling System develops, supports, and disseminates integrated software modules that predict the erosion, transport, and deposition of sediment & solutes in landscapes and their sedimentary basins. CSDMS involves the Earth surface — the dynamic interface between lithosphere, atmosphere, cryosphere, and hydrosphere.

1.1 CSDMS integrated community of scientific and engineering experts.

1.1.1 The **CSDMS Executive Committee** (ExCom) is comprised of Organizational Chairs:

- Rudy Slingerland (April, 2007), Chair, CSDMS Steering Committee, Penn State Univ.
- Brad Murray (April, 2007), Chair, Coastal Working Group, Duke Univ.
- Pat Wiberg (April, 2007), Chair, Marine Working Group, Univ. of Virginia
- Greg Tucker (April, 2007), Chair, Terrestrial Working Group, CIRES, CU-B
- Tao Sun (April, 2007), Chair, Cyberinformatics & Numerics Working Group, ExxonMobil Upstream Research Company
- Lincoln Pratson (April, 2007), Chair, Education and Knowledge Transfer WG, Duke Univ.

The two ex-officio members of ExCom are

- James Syvitski (*ex-officio),* CSDMS Executive Director, INSTAAR, CU-B
- Scott Peckham (*ex-officio)* CSDMS Chief Software Architect, CSDMS Integration Facility, CU-B

The Executive Committee is the primary decision-making body of CSDMS**.** ExCom ensures that the NSF Cooperative Agreement is met, develops Bylaws & Operational Procedures, and sets up the annual science plan. ExCom approves the business reports, management plan, budget, partner memberships, and other issues that arise in the running of the CSDMS. Details of the governance are found in the Bylaws (Appendix 1).

1.1.2 The **CSDMS Steering Committee** (SC) includes representatives of the U.S. Federal agencies, industry, the U.S. National Academy of Science, and other learned scholars:

- Rudy Slingerland (April, 2007), Chair, CSDMS Steering Committee, Penn State Univ.
- Tom Drake (April, 2007), U.S. Office of Naval Research
- Bert Jagers (April, 2007), Delft Hydraulics,
- Rick Sarg (April, 2007), Colorado School of Mines,
- Gary Parker (April, 2007), Univ. Illinois Urbana-Champaign,
- Dan Tetzlaff (April, 2007), Schlumberger,
- Dave Furbish (April, 2007), Vanderbilt,
- Tom Dunne (April, 2007), UC-Santa Barbara.

The two ex-officio members of the SC are

- James Syvitski (*ex-officio),* CSDMS Executive Director, INSTAAR, CU-B
- Mike Ellis (*ex-officio),* National Science Foundation

The CSDMS SC assesses the competing objectives and needs of the CSDMS; progress of CSDMS in terms of science, management, outreach, and education; advises on revisions to the 5-year strategic plan; and approves the Bylaws and its revisions. Details of the governance are found in the Bylaws (Appendix 1).

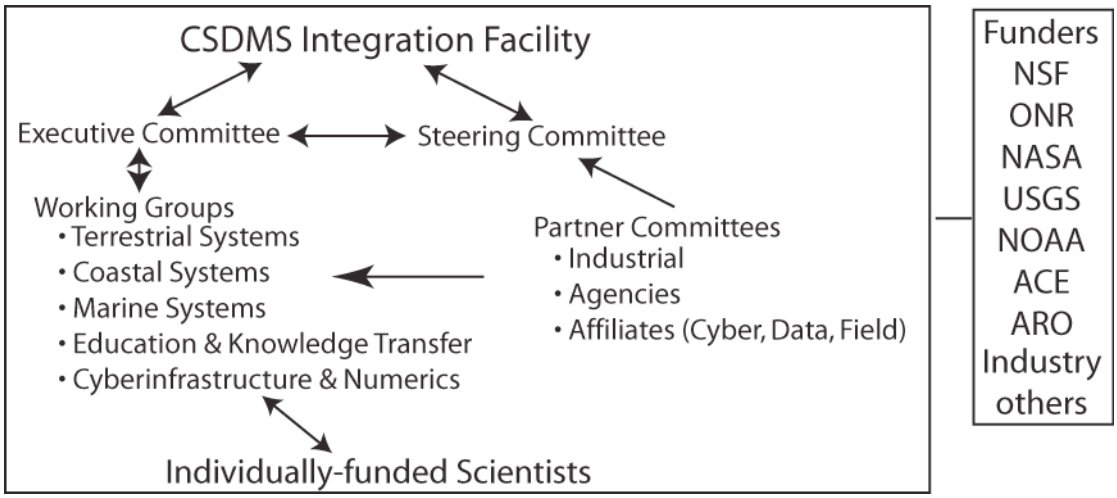
1.1.3 The **CSDMS Bylaws** were adopted June 14, 2007, reviewed by the CSDMS Steering Committee on Dec. 17, 2007, and revised on Jan 1, 2008, approved by the ExCom on Jan. 16, 2008 and waiting final mail in approval of the CSDMS Steering Committee --- see Appendix 1.

1.1.4 Protocols for joining the **CSDMS Working Groups** are established. As of Feb 2008, 163 participants from more than 80 institutions have joined the program (see Appendix 2). The following charge was developed and accepted by the Environmental Working Groups: 1) identify: processes that should be in their disciplinary toolkit, gaps in knowledge, and areas for numerical tool development; 2) develop both short and long term goals; 3) set scientific modeling priorities for their discipline; 3) recommend resource prioritization to the Executive Committee; 4) create and manage the environmental process modules related to their

discipline; 5) ensure: quality control for the algorithms and modules for their area of expertise (benchmark validation datasets); 6) coordinate the evaluation of numerical codes according to interoperability, scientific contribution, protocol compliance, and technical documentation; 7) ensure adequacy of supporting boundary conditions and boundary initializations; 8) address the CSDMS proof-of-concept challenges; 9) provide community continuity to meet long-term CSDMS objectives; 10) stimulate proposals and input from the community.
The Cyber and Numerics Working Group develops and prioritizes the CSDMS 5-year Cyber-Infrastructure including: 1) protocols for linking modules; 2) common data structures and interfaces to link transport processes; 3) incorporation of "legacy code" from the modeling community, 4) toolkits for pre- and post-processing, and model visualization; 5) standards for benchmarking and testing modules with the setup of standardized data sets; 6) standard computational tools, including low-level routines (I/O error handling and data exchange); as well as grid generators and PDE/flux solvers; 7) infrastructure to facilitate the proof-of-concept challenges undertaken by WG; and 8) graphical user interface (GUI).

1.1.5 **Industrial Consortium framework** is established (see Appendix 3). Industry partners, NGOs, and government agencies play an important role in contributing to the success of CSDMS through their financial or in-kind contributions. This sponsorship supports the CSDMS effort and thus the next generation of researchers and modelers working to develop innovative approaches towards modeling complex earth-surface systems. The primary goal of the CSDMS Consortium is to engage industry stakeholders in CSDMS research. Consortium members join with the CSDMS community to address key issues in the development and use of the models and tools produced by the CSDMS initiative. Consortium members 1) demonstrate corporate responsibility and community relations; 2) are provided opportunities to contribute to the direction of CSDMS research and products; 3) have access to research activities and product development; and 4) join an association of a diverse group of scientists, universities, agencies, and industries.

1.1.6 The **CSDMS organizational chart** was revised by the CSDMS Steering Committee (Dec. 17, 2007):



1.1.7 The **CSDMS Integration Facility** (IF) is established at INSTAAR, University of Colorado-Boulder, Rooms 205 through 221 at 3100 Marine Street, Boulder, with its own Campus Box and zip code http://csdms.colorado.edu/about/contact_us.html. As of Feb. 1, 2008, CSDMS IF staff includes http://csdms.colorado.edu/organization/personnel.html:
• Executive Director, Prof. James Syvitski (April, 2007) — CSDMS and CU support
• Chief Software Engineer, Dr. Scott Peckham (April, 2007) — CSDMS and other NSF support
• Software Engineer, Dr. Eric Hutton (April, 2007) — CSDMS and ONR support
• Executive Assistant Mr. Andrew Svec (Oct, 2007) — CSDMS support
• Accounting Technician Mary Fentress (April, 2007) — CSDMS and much other support

• Systems Administrator Mr. Chad Stoffel (April, 2007) — CSDMS and much other support
• Research Scientist & EKT expert Dr. Irina Overeem (Sept, 2007) — CSDMS, NOPP and ConocoPhilip support
• Research Scientist & Web Master, Dr. Albert Kettner (July, 2007) — CSDMS and NASA funds
• Ph.D. GRA Scott Bachman (April, 2007) — other NSF Funds
• Ph.D. GRA Mark Hannon (July, 2007) — ONR funds

The CSDMS Integration Facility also hosts visiting scientist and to date has hosted 1) Prof. Bjarte Hannisdal (U. Bergen) to work on protocols for adding animal-sediment interactions into a CSDMS framework, 2) Dr. Gywn Lintern (Geological Survey of Canada-Pacific) to work on flocculation dynamics, 3) Dr. Bert Jagers (Delft Hydraulics), senior Delft3D software architect, to discuss his company's philosophy and interactions with CSDMS, 4) Drs. Belasz Fekete (UNH) and John Harrison (OU) to work out a modeling framework for Global hydrological and biogeochemical modeling, and 5) BHP Billiton participants Dr. Gil Hansen and Dr. Mike Glinsky, to work on the incorporation of the QIWorkBench into the CSDMS framework.

The CSDMS Integration Facility maintains the CSDMS Repositories: 1) Data Repository; 2) Model/Tools Repository; 3) Education Repository; 4) Compliant Repository; 5) Membership Repository; 6) CSDMS Communication Repository & 7) CSDMS Governance. The CSDMS IF also facilitates CSDMS Communication: 1) Business Meetings (SC, ExCom, Partners, Directorate); 2) Working Group Meetings; 3) Workshops, 4) Short Courses; 5) Web Pages, 6) Teleconference, 7) Videoconferences, and 8) Email Communication. The IF also facilitates Community coordination, public relations, and product penetration. The IF conducts Tool/Model Protocol testing and evaluation on varied platforms, and evaluates hardware & software configurations with CSDMS products. The CSDMS IF develops the CSDMS cyber-infrastructure (e.g. coupling frameworks; licenses; protocols), and provides CSDMS software modeling guidance (expertise) to the community. The IF maintains the CSDMS vision and cooperation between disparate communities, & between field and modeling communities.

1.2 CSDMS protocols for community-generated, continuously evolving, open software.

• CSDMS employs the version control program *Subversion*. This free program allows the tracking of changes to any set of files with a complete record of all changes and when they were made. *Subversion* plays a key role in managing source code submissions to the CSDMS Project.
• CSDMS IF maintains documents on best programming practices, coding standards and software protocols. One of the best is an 81-page document produced by the GNU project called GNU Coding Standards.
• CSDMS IF stays abreast of methods for providing platform-independent graphical user interfaces in support of the CSDMS project. These included Gtk+, FLTK, Gnash (free and similar to Adobe Flash), Java with Swing or SWT, TCL/TK, wxPython, PyQT, and others.
• CSDMS IF has installed the complete set of CCA tools using the new (beta version) build system that has been developed by computer scientists Daniel Taylor and Boyana Norris at Argonne National Laboratory. The complete set of CCA tools uses several complete (and constantly changing) applications with complex dependencies that made installation very user-unfriendly with the former build system.
• The CSDMS Cyber Working Group supports the CSDMS Steering Committee in choosing MIT X11 for the underlying software license for the CSDMS Framework, and will provide CSDMS participants advice to ensure that their software is licensed via the Open Source Initiative http://www.opensource.org/licenses for their protection with GPL v.2 as the recommended choice.
• Specifications for the CSDMS Framework has been established: 1) Support for multiple operating systems: *Linux, Mac-OSX & Windows, 2)* Support for parallel computation *(via MPI standard), 3)* Language interoperability: *C, Fortran & object-oriented languages (e.g. Java, C++, Python), 4)* Support for both legacy (non-protocol) code and structured code (procedural and object-oriented), 5) Interoperable with other coupling frameworks, 6) Supports for both structured and unstructured grids, 7) platform-independent GUI *(e.g. via wxPython), 8)* Large offering of open-source tools, 9) Open source software license, industry-friendly, protection for authors, tracks modifications, GPL2 compatible OSI approved.

1.3 CSDMS architecture for linking landscape-basin evolution models

CSDMS investigated and analyzed a number of model coupling systems:

1.3.1 **Earth System Model Framework** (ESMF) www.esmf.ucar.edu, is a coupling system that is popular with some U.S. climate and ocean modelers. This system uses Fortran 90 as its base language, but is working to support components written in C. Most ESMF components consist of Initialize, Run and Finalize modules. ESMF is parallel-computing friendly (MPI), compatible with PRISM & CCA, provides many useful tools in its Infrastructure and Superstructure. ESMP mainly works with structured grids. CSDMS has written FORTRAN 90 code using ESMF able to link two CSDMS programs. For example SedFlux was broken into three separate functions: an initialize function, a run function, and a finalize function, to link SedFlux to ESMF. Wrappers were written to allow SedFlux's "c" code to communicate with ESMF's FORTAN code.

1.3.2 **Common Component Architecture** (CCA) www.cca-forum.org, includes a compiler called Babel (www.llnl.gov/CASC/components/babel.html) that allows individual components to be written in any of several programming languages, including FORTRAN 77/90/95/03, C, C++, python, and java, using SIDL / XML metadata. (Note that this list includes (a) procedural and object-oriented languages and (b) compiled and interpreted languages.) This language interoperability is achieved without a significant reduction in performance. CCA is interoperable with other modeling frameworks such as ESMF, PRISM and MCT. CCA supports single and multi-processor systems, and is compatible with most major operating systems (Windows, Mac OS X, Linux, other Unix). It also has proven interoperability with ESMF, MCT and OASIS4. CCA includes a powerful suite of tools 1) **Babel** — A "multi-language" compiler for building HPC applications from components written in different languages. (**http://www.llnl.gov/CASC/components/babel.html**), 2) **SIDL** — Scientific Interface Definition Language (used by Babel) to allow for language-independent descriptions of interfaces, 3) **Bocca** — A user-friendly tool for rapidly building applications from CCA components (RAD = Rapid Application Development) (**http://portal.acm.org/citation.cfm?id=1297390**), 4) **Ccaffeine** — A CCA component framework for parallel computing (**http://www.cca-forum.org/ccafe/ccaffeine-man**), and 5) an unnamed **CCA build system** for the complete CCA "tool chain". It uses a Python-based tool called Contractor. CCA is being used commercially (e.g. Tech-X www.txcorp.com, Fluent www.fluent.com), by academics and government agencies (e.g. DOE). CCA can be used for single or multiple-processor systems, distributed or parallel (via MPI), and supports high-performance computing (HPC). CCA supports structured, unstructured & adaptive grids. CCA has stable DOE / SciDAC (www.scidac.gov) funding. One of the key tasks that now faces the CSDMS community is how to best define the ***interfaces*** for our components (including models) in order to maximize their interoperability with each other and with components (e.g. PDE solvers, mesh routines, visualization tools) written by people outside of our community. The goal is to create the richest possible collection of shared "**plug-and-play**" components and to ensure that they can also be used in an **HPC context**. In an **object-oriented context**, this includes defining robust object classes and methods. (e.g. string class and associated methods, "grid class" and associated methods [total, average, histogram, smooth, regrid, rescale, display]). CSDMS has successfully linked SedFlux http://code.google.com/p/sedflux/ and HydroTrend http://instaar.colorado.edu/deltaforce/models/hydrotrend.html using CCA.

1.3.3 **OpenMI (**http://www.openmi.org) a standardized interface for programmers that allow them to link together components that conform to the standard. OpenMI emerged from the hydrologic community in Europe with corporate buy-in (e.g. Delft Hydraulics, DHI, HR Wallingford). The components should consist Initialize, Run and Finalize modules. OpenMI is based on Microsoft's C# programming language, which is very similar to the Java language developed by Sun Microsystems. A Java-based version of OpenMI is under development by a company in Italy called HydroloGIS, but is not as far along as the C# version. OpenMI does not appear to provide interoperability with components written in other languages, and OpenMI does not support multiple-processor (distributed or parallel) computing. OpenMI emphasizes support for data formats (e.g. WML). OpenMI is language and platform specific, and is currently incompatible with non-Windows computers. OpenMI is designed for a single-processor (PC) environment, and its funding future is currently uncertain beyond 2010.

1.3.4 **GEOFRAME** is an open-source modeling environment under development by Riccardo Rigon and colleagues. GEOFRAME proposes to use the following open-source tools:(a) Java as the base language, (b) the Java version of OpenMI as a model coupler, (c) Jgrass and Udig (GIS packages) for GIS and visualization, (d) ESMF as a possible modeling infrastructure, (e) Eclipse as a code development environment, (f) "R" as the main statistical analysis tool, (g) PostgreSQL/PostGIS for database access and (h) the EARTH System Curator for storing the results of simulations.

1.4 CSDMS cyber-infrastructure and repositories.

1.4.1 **CSDMS website** now includes information on its mission, history, publications, organization (working groups, partners, executive committee, steering committee, staff), meetings (upcoming, past, general info), models, tools, and other products. The website uses a tab-based interface, cascading style sheets (CSS) and server-side includes (SSI) to make it easy to maintain and update. The CSDMS web site has a searchable engine. By the end of February, the Web page will be relaunched as a *Wiki* to facilitate communication of its members and its working groups. The Web site supports the five main CSDMS Repositories: 1) Data Repository; 2) Model/Tools Repository; 3) Education Repository; 4) Compliant Repository; and 5) Membership Repository.

1.4.2 **CSDMS Data Repository** is designed to support useful data for boundary conditions, model initializations, benchmarking and validation experiments. As of Feb 1, 2008, the CSDMS site served the following types of data: 1) Bathymetric data, including GEBCO (General Bathymetric Chart of the Oceans), Smith & Sandwell (1 minute Global seafloor topography); 2) Climate data, including GCRP (Global Climate Resource Pages), GHCN (NOAA Global Historical Climate Network), GOBALSOD (NOAA Daily Global Summary of Day; 3) Hydrographic data, including DDM30 (Global 30-min Drainage Direction Map), HYDRO1k (Global Elevation Derivative Database), HydroSHEDS (Hydrological data and maps based on SHuttle Elevation Derivatives at multiple Scales), NHD (National Hydrography Dataset; USA), and SWBD (Shuttle Radar Topography Mission Water Body Dataset); and 4) Topographic Data, including ETOPO2 (Global 2-minute gridded elevation data), ETOPO5 (Global 5-minute gridded elevation data), GLOBE (Global Land One-km Base Elevation), GTOPO30 (Global 30 Arc-Second Elevation Data Set), NED (National Elevation Dataset; USA), SRTM (Shuttle Radar Topography Mission). A number of other datasets are in progress for community sharing, and include 1) seamless SRTM mosaics of world deltas and their contributed rivers, 2) a tidal database that contains statistical information of over 7,500 tidal stations, through an interface to the UNIX xtide program http://www.flaterco.com/xtide/xtide.html available as a kml (Google Earth) file, 3) a global wave database that contains 10 years of 3 hourly wave characteristics (height, period, winds) via the WaveWatch III model.

1.4.3 **CSDMS Model/Tools Repository** welcomes stand-alone models and tools relevant to surface dynamics, including novel computational strategies, moving boundary methods, distributed source terms, and nested modules. CSDMS will point to, or distribute legacy models/code and presently includes:

Software name	Company / Organization	Contact
ADCIRC	USACE / CHL	Rick Luettich
AquaTellus	INSTAAR, Univ. of Colorado, USA	Irina Overeem
BarSim	Tech. Univ. Delft, The Netherlands	Joep Storms
Caesar	Univ. of Hull, UK	Tom Coulthard
CASC2D	Col. Univ., USA	Fred Ogden
Cascade	ANU/RSES	Jean Braun
CHILD	CIRES, Univ. of Colorado, USA	Greg Tucker
Coaster	Univ. Colorado, USA	Scott Peckham
CST	URS Corp, Tallahassee, USA	Alan Niedoroda
Delft3D	WL | Delft Hydraulics, Netherlands	Delft3D Team
DeltaSIM	Delft U Technology, The Netherlands	Hoogendoorn, Overeem
Dionisos	IFP, France	Didier Granjeon

DR3M	USGS, USA	W.M. Alley, P.E. Smith
DRAINAL	Dalhousie Univ., Canada	Chris Beaumont
Erode	INSTAAR, CU Boulder, USA	Scott Peckham
FLO-2D	FLO-2D Software, Inc., USA	Jimmy O'Brien
FunWave	Univ. of Delaware, CACR	James T. Kirby
GENESIS	USACE / CHL, USA	multiple
Global NEWS (GNE)	Rutgers, NJ, USA	Sybil Seitzinger
GOLEM	MIT, USA	Greg Tucker
GSSHA	US Army, CERL, USA	Fred Ogden
HEBEM	Colorado State Univ., USA	Jeffrey Niemann
HydroTrend	Univ. of Colorado, USA	Albert Kettner
Hyper	Univ. of South Carolina, USA	Jasim Imran
MARSSIM	Univ. of Virginia	Alan Howard
MIKE SHE	DHI, USA	DHI
Murray Model	Duke Univ., USA	Brad Murray
NearCOM	Univ. Delaware / CACR, USA	James T. Kirby
Nearshore POM	Univ. Delaware, USA	James T. Kirby
Physprop	Duke Univ., USA	Lincoln Pratson
POM	Princeton Univ., USA	Tal Ezer
QDSSM	Utrecht University, The Netherlands	George Postma
RCPWAVE	USACE / CHL, USA	Ebersole, 1986
REF/DIF	Univ. of Delaware, CACR, USA	James T. Kirby
ROMS / TOMS	USGS Woods Hole, USA	Christopher Sherwood
SBEACH	USACE / CHL, USA	multiple
SedFlux 2.0	Univ. of Colorado, USA	Eric Hutton
SeisimID	Duke Univ., USA	Lincoln Pratson
SEOMS	Rutgers University, USA	Dr. Hernan G. Arango
Sequence4	Columbia Univ., USA	Michael Steckler
SHORECIRC	Univ. Delaware, USA	James T. Kirby
Shoreline	Univ. of Colorado, USA	Scott Peckham
SiAM3D	IFREMER, France	Florence Cayocca
SIBERIA	Univ. of Leeds	Garry Willgoose
STWAVE	USACE / CHL, USA	Resio, 1981, 1987, 1988, 1993
SWAN	Delft Univ. of Tech., Netherlands	SWAN Team
Symphonie	Pole d'oceanographie cotiere, France	Claude Estournel
TopoFlow	INSTAAR, CU, Boulder, USA / UAF	Scott Peckham
TOPOG	CSIRO, Australia	Tony Butt
Tremp	Shell, The Netherlands	Quintijn Clevis
WAM	USACE / CHL, USA	Robert Jensen
WaveWatch3	NOAA / NCEP, USA	Hendrik Tolman
WILSIM	N. Illinois Univ., USA	Wei Luo
WSGFAM	Virginia Institute of Marine Science, USA	Carl Friedrichs
ZScape		Densmore & Connor

The CSDMS site also points to important GIS tools (ArcGIS, Grass, IDRISI, ILWIS, Kronos, Geo-3D, MapWindow, SAGA), and network extraction tools (GIS Weasel, RiverTools, TARDEM, TauDEM, TOPAZ, Watershed Analyst, WMS).

CSDMS has investigated a number of methods to distribute software to users. As a proof-of-concept various methods were tested out on SedFlux: RPM, Debian, and PackageMaker. Both Debian and RPMs are typical on many Linux operating systems, while PackageMaker produces an installer for OSX. Each distribution contains binaries that have been precompiled for a specific operating system. This is the preferred method of

distributing software since a user need not compile anything. The downside for CSDMS is that it will need to compile code on a range of operating systems. For *SedFlux*, this has been done with Fedora (Linux), Solaris, Windows XP, and OS X. A Python-based program called Contractor can be used to simplify the build process when it is necessary to install a large number of separate packages with complex (e.g. package version) dependencies. For example, it has been used to create an installer program for the complete set of CCA tools.

1.4.4 **CSDMS Education Repository** is designed to distribute: 1) model simulations, 2) educational presentations, 3) reports and publications, 4) short course materials, 5) images, and 6) meeting presentations. Educational presentations can be found on http://csdms.colorado.edu/products/products.html and presently includes the following **presentations** and **tutorials**:

1) J. P. M. Syvitski, 02/04/08: "The Charge of the CSDMS Working Groups", CSDMS Cyberinformatics and Numerics Working Group meeting, Boulder, Colorado. Abstract: The presentation provides an overview of the CSDMS project, its scope, promise, and the role and charge of the various working groups.

2) S. Peckham, 02/04/08: "Advantages of the Common Component Architecture (CCA) for CSDMS", CSDMS Cyberinformatics and Numerics Working Group meeting, Boulder, Colorado. Abstract: The presentation provides a discussion of features that are considered desirable for the CSDMS "component coupling framework" and examines the extent to which these features are provided by the ESMF, OpenMI and CCA frameworks.

3) E. Hutton, 02/04/08: "Comparing Model Coupling Systems: an Example", CSDMS Cyberinformatics and Numerics Working Group meeting, Boulder, Colorado. Abstract: The presentation provides a case study comparting the use of ESMF and CCA to couple two model components.

4) S. Peckham, 01/07/08: "CCA Recommended Reading List". This document contains annotated links to publications, talks and web pages that are helpful for learning about the Common Component Architecture (CCA).

5) S. Peckham, 04/17/07: "Mini-tutorial on Subversion". The following document is a "mini-tutorial" on how to perform common tasks with a popular version-control system called Subversion. Subversion provides a powerful and convenient method of tracking changes made to an arbitrary set of files and is particularly useful for large software development projects that involve multiple authors.

Reports and documents can be found on http://csdms.colorado.edu/about/csdms_docs.html

• **CSDMS Documents**: 1) CSDMS Bylaws (June 2007, PDF format); 2) CSDMS Science Plan (August 2004, PDF format), 3) CSDMS Implementation Plan (August 2004, PDF format), 4) CSDMS Rationale and Strategy (April 2004, PDF format), 5) CSDMS 2002 Workshop Agenda (February 2002, PDF format), 6) Pre 2002 Workshop Document (PDF format).

• **CSDMS Reports**: 1) CSDMS press release (April 2007, PDF format); 2) CSDMS semiannual report (November 2007, PDF format).

• CSDMS offers **educational and meeting presentations** through its web site http://csdms.colorado.edu/meetings/past.html and presently includes 1) Sep. 2007, Dynamics and Vulnerability of River Delta, Boulder, CO; 2) Sep. 2007, Mechanisms of Sediment Retention in Estuaries , Boulder, CO, 3) May 2004, CSDMS Implementation Plan Workshop, Minneapolis, MN, 4) July 2003, CSDMS Presentation to NSF, Washington, DC, and 6) Feb. 2002, CSDMS Planning Workshop, Boulder, CO. Information on this website is provided as a public service and is intended for educational and research purposes. Materials developed by CSDMS, its members, participants and partners, are the intellectual property of those respective individuals, who reserve all applicable rights to their respective intellectual property. CSDMS is an organization devoted to the creation, discovery, dissemination and sharing of knowledge and research, CSDMS holds a strong commitment to comply with all applicable laws regarding

intellectual property. It is not the intent of CSDMS to violate or infringe upon any copyrights. Our use is presumed to be appropriate and in accordance with "Fair Use" provisions. If any copyrighted material has been inappropriately included on these pages, please inform us. Immediate action will be taken to rectify the situation, either by removing the materials or obtaining appropriate permission.

• The **CSDMS Image Gallery** http://csdms.colorado.edu/products/gallery.html are designed to illustrate aspects of environments that the CSDMS Project tries to capture by a suite of models. Participants generously contribute these freely downloadable images.

1.4.5 **The first CSDMS Special Issue** Predictive Modeling in Sediment Transport and Stratigraphy is presently in press as a *Special Issue of Computers & Geosciences: edited by James P. M. Syvitski*

Fluvial & Coastal Environment

• HydroTrend3.0: a Climate-Driven Hydrological Transport Model that Simulates Discharge and Sediment Load leaving a River System: A. J. Kettner (Delft U. Technology) and J. P.M. Syvitski (INSTAAR)
• Geolocation of man-made reservoirs across terrains of varying complexity using GIS. D. M. Mixon (INSTAAR), D.A. Kinner (Western Carolina U.), R.F. Stallard (USGS), and J.P.M. Syvitski (INSTAAR)
• A New Method for Estimating Suspended Sediment Concentrations and Deposition Rates from Satellite Imagery Based on the Physics of Jets and Plumes: S.D. Peckham (INSTAAR)

Marine Environment

• Sedtrans05: An improved sediment-transport model for continental shelves and coastal waters: U. Neumeier (U. Québec-Rimouski), C. Ferrarin (ISMAR-CNR Venice), C. L. Amos (NOC U. Southampton), G. Umgiesser (ISMAR-CNR Venice) and M. Z. Li (GSC)
• Calculating wave-generated bottom orbital velocity from surface wave parameters. P.L. Wiberg (U. Virginia) and C.R. Sherwood (USGS)
• Modeling a dynamically varying sediment bed with resuspension, deposition, bioturbation, consolidation, and armoring: L. P. Sanford (U. Maryland)
• Development of a 3D Regional Coupled Wave-current-sediment Transport Model: J.C. Warner, C.R. Sherwood & R.P. Signell (USGS), C.K. Harris (VIMS), H.G. Arango (Rutgers U)
• Effect of Particle Inertia on the dynamics of depositional turbidity currents: M.I. Cantero & M.H. Garcia (U. Illinois, Urbana-Champaign), and S. Balachandar (U. Florida)

Morphology and Stratigraphy

• *Sedflux 2.0*: an advanced process-response model that generates three-dimensional stratigraphy: E.W.H. Hutton & J.P.M Syvitski (INSTAAR)
• Response To Loading And Subsidence Of The Rhône Deltaic Margin During The Last Climatic Cycle (Gulf Of Lions, Nw Mediterranean): G. Jouet (IFREMER), E.W.H. Hutton & J.P.M Syvitski (INSTAAR), S. Berné (IFREMER)
• Mathematical Methods for Predicting the Form and Stability of Continental Shelf Profiles: S.D. Peckham (INSTAAR)
• Sub-grid parameterization of fluvio-deltaic basin filling models: R.A.F. Dalman & G. J. Weltje (Delft U. Technology)
• The Role of Equilibrium Conditions on Fluvial Incision of Continental Shelves During Sea Level Cycles: S. Fagherazzi (Boston U.), A. D. Howard & P. L. Wiberg (U. Virginia)
• Assessing variability of fluvio-deltaic stratigraphy using process-response modeling: R.M. Hoogendoorn (Delft U. Technology), I. Overeem (INSTAAR) Joep Storms (Delft U. Technology)

1.4.6. **CSDMS Compliant Repository**

CSDMS has developed a wiki-based website that is home to the CSDMS-CCA development project (http://csdms-cca.googlecode.com) to present CSDMS latest developments on model protocols, model components, and instructive information about how scientists can use CCA in this environment. The website allows members of the CSDMS community to easily add information to the website, allowing them to stay current and to further foster community around the project. The website contains a description on how to install the CCA development tools on various platforms (platforms include *fedora, ubuntu*, OSX10.5, and

Solaris 8). Installation scripts for the various platforms are available in the downloads section. As users successfully build on other platforms, have problems building, or solve building problems they are encouraged to submit their experiences for the community to use. The community is also able to submit issues under the issue tracker section. This gives users the ability to see what current issues, as well as what issues have been solved with respect to the CSDMS CCA project.

A series of examples is also provided. Documentation for the examples can be viewed under the wiki section and the code used for the examples obtained in the download section. Several existing models have been made into CCA components. The models range from large coupled models, to small single-process models. Several of these models have also been linked with one another within the CCA. *SedFlux* is a process-response model that simulates the growth of a continental margin by a wide range of process models. As a CCA component, *SedFlux* is now able to easily communicate with other CCA models that share like interfaces. This allows easy communication through interfaces, and between CCA-supported programming languages (c, c++, F77, F9x, java, python). Other processes that have been 'componentized' are flexural subsidence, river discharge, and buoyant plumes. In addition, interface converters are also being developed. Currently, a converter exists that allows a *SedFlux* interface to communicate with a subsidence interface.

The issue of interface definition is a large part of the CSDMS effort. The CSDMS has begun to explore the interfaces that models will present to other component models. Initial interfaces have been developed to define the previously discussed components. These interfaces are not final but will be further developed by the CSDMS-IF with advice from the five working groups. The *SedFlux* component presents an interface that is a handle to the *SedFlux* environment as well as a series of functions that query that environment (wave height, water depth, for example). The single-process components use more general interfaces. For instance, the river component provides an interface that allows another components to query current river conditions, or to get the next river event. The final set of interfaces will be some combination of the two approaches and will contain converters that allow non-like ports to communicate.

1.5 CSDMS partners with related computational and scientific programs.

1.5.1 **CSDMS support for national or international initiatives**

- Data Management System for NSF-MARGINS Sedimentological Datasets
- NSF Surface Process Cyberinfrastructure workshop
- NSF High Performance Computing in the Geosciences & Moving Toward a GeoCollaboratory
- MARGINS Source-to-Sink Theoretical Institute: Teleconnections Between Source and Sink in Sediment Dispersal Systems
- NSF-CMG grant number EAR-0621199: LEM framework advances
- Envisioning a National Geoinformatics System for the United States
- NSF/CUASHI Humans Transforming the Water Cycle: Community-Based Activities in Hydrologic Synthesis
- The Science Museum of Minnesota (SMM) WATER PLANET, a 5,000 square-foot traveling exhibition, web site, and associated programs focusing on the new and evolving field of Earth-system science.
- NSF/GEON 2.0: A Geoinformatics Facility to Develop An Open Multidimensional Framework for Integration of Earth Sciences Data
- NSF Boulder Creek Critical Zone Observatory: Weathered profile development in a rocky environment and its influence on watershed hydrology and biogeochemistry
- NOPP Coastal Sediment-Transport Model CSTM http://woodshole.er.usgs.gov/project-pages/sediment-transport/NOPP_Project.htm

1.5.2 **CSDMS intellectual support for international initiatives**

- ONR Tidal Flats DRI to develop predictive knowledge and computational tools for understanding muddy tidal flat environments
- New Zealand Margin Source-to-Sink Terrestrial Landscape Change
- Global Water Systems Project: Dams and Reservoirs Database

- Scott Polar Research Institute, Cambridge University to develop CSDMS Glacimarine Modules
- INDO-US Joint Center: 'Large river systems in monsoonal settings: response to climate change'. INSTAAR, VanderBilt Univeristy, University of Technology, Kanpur, India.
- International Polar Year (IPY) project 'Arctic Circum-Polar Coastal Observatory Network', multi-institutions collaboration led by Alfred Wegener Institute, Germany.

1.5.3 **CSDMS hosted / organized / sponsored workshops**

• **Mechanisms of Sediment Retention in Estuaries** Sept. 23-25, 2007, Boulder, CO; http://csdms.colorado.edu/meetings/estuaries_2007.html

Perillo, G.M.E, Syvistki, J.P.M., Amos, C.L., Depetris, P., Milliman, J., Pejrup, M., Saito, Y., Snoussi, M., Wolanski, E., Zajaczkowski, M., Stallard, R., Hutton, E., Kettner, A., Meade, R., Overeem, I., Peckham, S., 2007, Estuaries and their Sediments: How they Deal with Each Other. Inprint Newsletter of the IGBP/IHDP Land Ocean Interaction in the Coastal Zone 2007/3: 3-5.

• **Deltas at Risk**, Sept. 26 to 28, 2007, Boulder, CO; http://csdms.colorado.edu/meetings/deltas_2007.html

Saito Y., Chaimanee N., Jarupongsakul, T., and Syvitski, J.P.M. 2007. Shrinking megadeltas in Asia:Sea-level rise and sediment reduction impacts from case study of the Chao Phraya delta. Inprint Newsletter of the IGBP/IHDP Land Ocean Interaction in the Coastal Zone 2007/2: 3-9.

Syvitski, J.P.M., in press. Deltas at Risk. Sustainability Science

Kelman, I., and Endejan, M. 2007. Dynamics and Vulnerability of River Delta Systems: Developing a Research Agenda and Implementation Plan, *Joint GWSP-LOICZ-CSDMS Workshop in Boulder, Colorado, USA, September 2007.* Global Water News No. 5/6, pg. 13-14.

Kelman, I., and Syvitski, J.P.M. 2007. GWSP/LOICZ/CSDMS Workshop "Dynamics and Vulnerability of River Delta Systems" in Boulder: Developing a Research Agenda and Implementation Plan for Vulnerable Deltas, 26–28 September, 2007. Inprint Newsletter of the IGBP/IHDP Land Ocean Interaction in the Coastal Zone 2007/3: pg. 10-11

• **Arctic Coasts at Risk**, Oct. 1 to 3, 2007, Tromsø, Norway; http://csdms.colorado.edu/meetings/arctic_2007.html

Syvitski, J.P.M., Brigham, L., Bring, A., Douglas, T., Lippmann, T., Solomon, S., Sulisz, W., Ziaja, W., Zockler, C., 2007, Prognosis and Modeling. In: G. Flöser, H. Kremer, V. Rachold, (Eds.) Arctic Coasts at Risk, publ. LOICZ and IASC, Geesthacht, Germany and Stockholm, Sweden, p. 27-30

• CSDMS will soon host the **Community Sediment Model for Carbonate Systems**, Feb. 27-29, 2008, Golden, CO; http://csdms.colorado.edu/meetings/CSM_for_carbonate_systems.html;
• CSDMS is a co-sponsor with SEPM for the research conference **Clinoform sedimentary deposits: The processes producing them and the stratigraphy defining them**, Aug. 15-18, 2008, Rock Springs, WY

1.6 Dedicated CSDMS Experimental Computer

High-performance computing (HPC) has provided numerous advances to ocean and atmospheric science, but these advantages are not well exploited by land-surface dynamics (LSD), basin evolution (BE), and distributed transport (DT) models. LSD-BE-DT models (e.g. spatially-distributed hydrologic and fluvial landscape evolution models, ice-sheet dynamic models, coastal dynamic models) are similar to atmosphere and ocean models in that the time evolution of several spatial grids is modeled for one or more vertical layers by solving a set of coupled PDEs. However, the physically important spatial scales are much smaller than those of coupled ocean–atmosphere models, where 5m to 100m grid cells (vs. 1km to 100km cells) are required to resolve surface dynamic processes. In addition, coupled land-surface and subsurface processes are often integrated at different time scales, from seconds - minutes for channelized surface flow, to hours - days for overland and subsurface flows.

At the 2006 NSF-sponsored workshop on HPC in Geosciences, six HPC applications were identified by the hydrology, sedimentology, and paleoclimate communities: 1) Fast turn around on end-to-end prediction in aid

of natural disaster mitigation (e.g., flash flood forecasting that combines ensemble weather/hydrologic forecasting at high resolution); 2) Global simulations for water budgets and sediment/carbon delivery; 3) High resolution land surface processes in global cloud resolving models in support of sub-grid parameterizations; 4) Complex interactions in water, carbon, and nutrients within major river basins, where Earth system components (atmosphere, dynamic vegetation, biogeochemistry) are better coupled to predict at seasonal to decadal time scales, 5) Data assimilation of remote sensing data and other heterogeneous datasets to better assess land surface states at high spatial resolution, and 6) Longer geological simulations (10^3 - 10^4 yrs) of key Earth history events.

The CSDMS Integration Facility has recently secured funding, largely through the University of Colorado but with additional support from the U.S.G.S and possibly NOAA, to acquire a CSDMS-operated and dedicated Experimental Supercomputer (ES). The ES will support the CSDMS community to migrate their surface-dynamic models into the HPC world, accessing the benefits of component-based software engineering. CSDMS choice of the DoE's Common Component Architecture (CCA) with its supporting tools (e.g. Babel, Bocca, Ccaffeine) provides a mature HPC framework. Vendor details of the CSDMS ES are still in flux, but initial estimates suggest it will comprise between 256 - 400 cores offering 3 to 5 teraflops of computing power, and configured with two HPC approaches — 1) massive shared memory among fewer processors, and 2) the more typical parallel configuration — each running Linux with Fortran, C and C++ compilers. The CSDMS ES will then be linked to an NSF-proposed Front Range HPC with 7000 core, >100 teraflops, which in turn will be linked to the US TerraGrid, and/or the proposed Cheyenne NCAR/UCAR Petascale HPC dedicated to support the NSF Geoscience Collaboratory.

2.0 2007 Community Involvement

Many participants provided valuable time to the CSDMS effort, often with time underwritten by their host organization, or through the support of funds secured from participating funding agencies and partners (NSF, NOAA, USGS, NASA, ONR, ARO, ACE, NCAR, NCED, industry). Employment hours are only known for certain for those working at the CSDMS Integration Facility. The list below does not include those that otherwise participated in the three CSDMS sponsored workshops (see section 1.5.3), involving 110 participating scientists. The list below also does not include the individually funded efforts of an additional 120 working group participants who are working in aid of numerical model development (see Appendix 2 for a full listing of members for each respective working group).

Participant's Name(s)	Project Role(s)	Project role >160 Hours Help
James P. Syvitski	Principal Investigator	Yes
Mark Hannon	Graduate student	Yes
Scott Bachman	Graduate student	Yes
Eric Hutton	Software Engineer	Yes
Chad Stoffel	Systems Administrator	Yes
Scott D. Peckham	Chief Software Engineer	Yes
Vicky Nelson	Executive Assistant	Yes
Andrew Svec	Executive Assistant	Yes
Irina Overeem	Research Scientist	Yes
Albert Kettner	Research Scientist	Yes
Gywn Lintern	Visiting Scientist	Yes
Mary Fentress	Accounting Technician	Yes
Tom Drake	Steering Committee Member	No
Tom Dunne	Steering Committee Member	No
Rick Sarg	Steering Committee Member	Yes
Bjarte Hannisdal	Visiting Scientist	Yes
Bert Jagers	Steering Committee Member	Yes
Gary Parker	Steering Committee Member	No
Pat Wiberg	Chair - Marine Working Group	No

David Furbish	Steering Committee Member	No	
Michael Ellis	Steering Committee Member	No	
Daniel Tetzlaff	Steering Committee Member	No	
A. B. Murray	Chair Coastal Working Group	No	
Rudy Slingerland	Chair - Steering Committee	Yes	
Greg Tucker	Chair - Terrestrial W.G.	Yes	
Tao Sun	Chair - Cyberinformatics W.G.	Yes	
Lincoln Pratson	Chair - Education W.G.	No	
Eric Kirby	Member - Terrestrial W.G.	No	
Fred Ogden	Member - Terrestrial W.G.	No	
Guohong Duan	Member - Terrestrial W.G.	No	
J. T. Perron	Member - Terrestrial W.G.	No	
Joe Galewsky	Member - Terrestrial W.G.	No	
Mikael Attal	Member - Terrestrial W.G.	No	
Audrey Huerta	Member - Terrestrial W.G.	No	
Gil Hansen	Member - Cyberinformatics W.G.		No
Ewa Deelman	Member - Cyberinformatics W.G.		No
Jon Goodall	Member - Cyberinformatics W.G.		No
William Dietrich	Member - Terrestrial W.G.		No
Edward Johnson	Member - Terrestrial W.G.		No
Stephen Lancaster	Member - Terrestrial W.G.		No
Alexey Voinov	Member - Cyberinformatics W.G.		No
Balazs Fekete	Member - Cyberinformatics W.G.		No
Michael Pyrcz	Member - Cyberinformatics W.G.		No
Erkan Istanbulluoglu	Member - Terrestrial W.G.		No
David Maidment	Member - Cyberinformatics W.G.		No
Henry Tufo	Member - Cyberinformatics W.G.		No

2.1 2007 Involvement of Partners: Organizations involved as CSDMS partners in 2007.

- **Office of Naval Research (ONR)**

[X] Financial support: funded individual scientists whose model development research is of specific Navy interest and relevance while at the same time a contribution to the CSDMS program

[X] Collaborative research (organization's staff work with project staff on the project): cooperation focused on developing/supporting the simulation of muddy environments in the coastal zone with an emphasis on tidal flat environments

[X] Additional detail on partner and contribution (optional, but valued by NSF): ONR staff (Dr. Tom Drake) are contributing time in the organizational structure of CSDMS

- **National Aeronautics and Space Administration (NASA)**

[X] Financial support: funded research by individual scientists whose model development effort is of relevance to the CSDMS program

- **National Oceanic and Atmospheric Administration (NOAA)**

[X] Financial support: May contribute $40K towards the CSDMS Experimental Supercomputer dedicated to surface dynamic simulations.

[X] In-kind support (software, computers, equipment, etc. available to project staff) NOAA is also providing data sets to support the success of the 'proof of concept' challenges. All three challenges (carbon cycle, the Anthropocene, glacial-interglacial cycles) address aspects of the Earth system that change too slowly to be fully resolved in the short instrumental record, and paleoclimate data can be used by CSDMS participants to understand and model the changes that occur on these longer multi-decade to century to millennial time scales. NOAA operates the World Data Center for Paleoclimatology in Boulder to provide

time series, and time-slice reconstructions of glacial-interglacial change and aspects of the carbon cycle. NOAA also distributes many of the data sets that bear on the Anthropocene hypothesis, and also distribute the boundary condition data sets needed by atmospheric general circulation model experiments. Finally, NOAA provides data sets that can be used for data model intercomparisons.

[X] Facilities (project staff use organization's facilities for project activities): WRF model applications to Wild Fires

[X] Collaborative research (organization's staff work with project staff on the project)

[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site) Drs. Dave Anderson and Robin Webb are the NOAA contacts

- **U.S Geological Survey (USGS)**

[X] Financial support: The CSDMS Integration Office has secured $40K in contribution to a CSDMS Experimental Supercomputer dedicated to surface dynamic simulations. USGS staff are also contributing to ≈$2M in in-kind staff support of related numerical modeling efforts

[X] In-kind support (organization makes software, computers, equipment, etc. available to project staff)

[X] Facilities (project staff use organization's facilities for project activities): WRF model applications to Arctic Coastal Dynamics

[X] Collaborative research (organization's staff work with project staff on the project)

[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site) Gary Clow, Rich Signell, Dane Hanes are the principal USGS contacts

- **U.S. Army Corps of Engineers (ACE)**

[X] Financial support: funded individual scientists whose model development research is of specific ACE interest and relevance while at the same time contributing to the CSDMS program (contact Dr. Bill Goran).

[X] In-kind support (software, computers, equipment, etc. available to project staff) GSSHA model

- **U.S. Army Research Office (ARO)**

[X] Financial support: funded individual scientists whose model development research is of specific Army interest and relevance while at the same time a contribution to the CSDMS program (contact Dr. Russell Harmon)

- **National Oceanographic Partnership Program (NOPP)**

[X] Financial support: funding (≈$1M/yr) of research to develop the Community Sediment Transport Model with applications to coastal zone dynamics (contacts Tom Drake ONR, Chris Sherwood USGS).

[X] In-kind support (software, computers, equipment, etc. available to project staff)

[X] Collaborative research (organization's staff work with project staff on the project)

[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site)

- **Consortium of Universities for the Advancement of Hydrologic Sciences (CUAHSI)**

[X] Financial support: NSF funding of individual scientists whose model development research is contributing to the CSDMS program. This includes the NE Digital Drainage Basin modeling effort (contact Charles Vorosmarty), and the Hydrological Information System effort (contact David Maidment).

[X] In-kind support (software, computers, equipment, etc. available to project staff)

[X] Facilities (project staff use organization's facilities for project activities)

[X] Collaborative research (organization's staff work with project staff on the project)

[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site)

- **Scientific Committee on Oceanic Research (SCOR)**

[X] Financial support: Co-funded the CSDMS's hosted, organized and sponsored Mechanisms of Sediment Retention in Estuaries

- **National Center for Earth-surface Dynamics (NCED)**

[X] Financial support: NCED will provide funding for 2 liaison postdocs to work jointly between NCED and CSDMS in adapting existing codes and methods for CSDMS and to insure that new results are transferred efficiently between NCED and CSDMS. NCED will develop 1-3 shared short courses with CSDMS, including full or partial support for development and participant costs from NCED funds. NCED will include CSDMS people and research themes in our existing teacher-training programs (NCED ESTREAMS and Science Museum of Minnesota Teacher Institutes). NCED will work closely with CSDMS to develop jointly a 3D movie on surface dynamics with the Science Museum of Minnesota, and will investigate possibilities for incorporating CSDMS products into our existing and highly successful EarthScapes hands-on exhibits at the Museum. Contacts Chris Paola, Efi Foufoula-Georgiou.

[X] In-kind support (software, computers, equipment, etc. available to project staff)
[X] Facilities (project staff use organization's facilities for project activities)
[X] Collaborative research (organization's staff work with project staff on the project)
[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site)

- **National Center for Atmospheric Research (NCAR)**

[X] Financial support: Match on a NSF MRI proposal for a community High Performance Computer to address HPC needs of the CSDMS community (contacts Larry Winter, Henry Tufo)

[X] In-kind support (software, computers, equipment, etc. available to project staff); Community Climate System Model

[X] Facilities (project staff use organization's facilities for project activities)
[X] Collaborative research (organization's staff work with project staff on the project)

- **NSF MARGINS**

[X] Financial support: funded individual scientists whose model development research and observational data and theories are of specific interest and relevance to the CSDMS program through its Source to Sink initiative.

- **Global Water System Project (GWSP)**

[X] Financial support: Co-funded the CSDMS's hosted, organized and sponsored Dynamics and Vulnerability of River Deltas

[X] In-kind support (software, computers, equipment, etc. available to project staff) HydroSheds

[X] Collaborative research (organization's staff work with project staff on the project) (contact Marcel Endejan)

- **Land-Ocean Interactions in the Coastal Zone (LOICZ)**

[X] Financial support: Co-funded the CSDMS's hosted, organized and sponsored Mechanisms of Sediment Retention in Estuaries workshop. Co-funded the CSDMS's hosted, organized and sponsored Dynamics and Vulnerability of River Deltas workshop. Co-funded the CSDMS's supported Arctic Coasts at Risks workshop Contact Dr. Hartwig Kemer

[X] In-kind support (software, computers, equipment, etc. available to project staff) LOICZ data
[X] Collaborative research (organization's staff work with project staff on the project)

- **International Arctic Science Committee (IASC)**

[X] Financial support: Co-funded the CSDMS's supported Arctic Coasts at Risks workshops

- **Delft Hydraulics (Deltares)**

[X] Financial support: Deltares staff are contributing to ≈$100K of in-kind staff activities of related numerical modeling efforts, including participation on CSDMS Working Groups and the CSDMS Steering Committee (Contact Dr. Bert Jagers)

[X] In-kind support (software, computers, equipment, etc. available to project staff) NSF & ONR supported CSDMS participants are given access to the numerical model DELFT-3D.

[X] Collaborative research (organization's staff work with project staff on the project)

[X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site)

- **URS Corporation**

  [X] Collaborative research (organization's staff work with project staff on the project)

  [X] Personnel exchanges (project staff and/or organization's staff use each other's facilities, work at each other's site) (Contact Dr. Alan Niedoroda)

- **Japan Agency for Marine-Earth Science and Technology (JAMSTEC)**

  [X] Collaborative research (organization's staff work with project staff on the project) (contact Dr. Yusuke Kubo)

  [X] In-kind support (software, computers, equipment, etc. available to project staff) Sakura model

- **Schlumberger**

  [X] Collaborative research (organization's staff work with project staff on the project) participation on CSDMS Working Groups and the CSDMS Steering Committee (Contact Dr. Dan Tetzlaff)

- **ExxonMobil Research and Engineering Company**

  [X] Financial support: EM staff are contributing ≈$50K in in-kind staff support related to CSDMS numerical modeling efforts, and participation on CSDMS Working Groups and Executive Committee. Contributed $30K in gift funds for the CSDMS effort.

  [X] Collaborative research (organization's staff work with project staff on the project) (contact Dr. Tao Sun)

- **ConocoPhillips**

  [X] Financial support: CP staff are contributing ≈$10K in in-kind staff support related to CSDMS numerical modeling efforts, including participation on CSDMS Working Groups. Contributed $50K in gift funds for the CSDMS effort.

  [X] Collaborative research (organization's staff work with project staff on the project) (contact Dr. John Suter)

- **Chevron Energy Technology Company**

  [X] Financial support: have agreed to join the CSDMS Industrial Consortium with a financial contribution

  [X] Collaborative research (organization's staff work with project staff on the project) (contact Dr. Michael Pyrcz)

- **Shell International Exploration**

  [X] Collaborative research (organization's staff work with project staff on the project)

- **BHP Billiton Petroleum (Americas)**

  [X] Financial support: have agreed to join the CSDMS Industrial Consortium with a financial contribution

  [X] In-kind support (software available to project staff): QI WorkBench contribution

  [X] Collaborative research (organization's staff work with project staff on the project) (contacts Dr. Mike Galinsky, Dr. Chris Lerch, Dr. Gil Hansen)

2.2 2007 Presentations and Posters

Hutton, E W, Kettner, A J, Kubo, Y, Gomez, B, Syvitski, J P M, 2007, Simulating the effects of hyperpycnal events on the stratigraphy of Poverty Shelf, New Zealand. *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract H41B-0503

Hutton, EWH, 2008, Comparing Model Coupling Systems: an Example. CSDMS Cyberinformatics and Numerics Working Group meeting, Fen 4-5, 2008, Boulder, Colorado.

Kettner, A J, Syvitski, J P M, 2007, Fluvial responses to environmental perturbations since the Last Glacial Maximum. *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract H21G-0820

Kettner, A.J., Hannon, M., Hutton, E., Syvitski, J.P.M. 2007, Working towards a delta-base. Dynamics and Vulnerability of River Delta Systems – A GWSP/LOICZ/CSDMS Scoping Workshop, Sept. 26 - 28, 2007, Boulder, CO.

Kettner, A.J., Syvitski, J.P.M., Vörösmarty, C., 2007, Evolution of the Po Delta, Italy. Dynamics and Vulnerability of River Delta Systems - A GWSP/LOICZ/CSDMS Scoping Workshop, Sept. 26 - 28, 2007, Boulder, CO.

Murray, B., 2007. The Community Surface Dynamics Modeling System Initiative. Rivers, Coastal and Esturaine Morphodynamics, Twente Netherlands.

Murray, B., 2007. The Community Surface Dynamics Modeling System Initiative. CUAHSI Fall 2007 Regional Meeting Chicago, Il.

Overeem, I, Briner, J P, Kettner, A J, Syvitski, J P M, 2007, River Response to Deglaciation: a Case-Study of Clyde Fjordhead, Baffin Island, Arctic Canada, *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract C51C-07

Peckham, S D, 2007, A Brief Introduction to the CSDMS Initiative, CUAHSI Fall 2007 Regional Meeting Boise, Idaho.

Peckham, S D, 2007, An Overview of Several Model Coupling Packages, June 14, 2007, CSDMS Web Address.

Peckham, S D, 2007, An Overview of Several Model Coupling Packages. CSDMS Terrestrial Working Group, U. California – Berkeley, Dec. 9, 2007.

Peckham, S D, Syvitski, J P M, 2007, Evaluation of Model Coupling Frameworks for Use by the Community Surface Dynamics Modeling System (CSDMS), *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract H53C-1407.

Peckham, S D2008, Advantages of the Common Component Architecture (CCA) for CSDMS. CSDMS Cyberinformatics and Numerics Working Group meeting, Fen 4-5, 2008, Boulder, Colorado.

Slingerland, R., 2007, The Community Surface Dynamics Modeling System Initiative. NOPP Community Sediment Modeling System Meeting, Woods Hole Oceanographic Institute.

Syvitski, J.P.M., 2007, Community Surface Dynamics Modeling System, CSDMS. Dynamics and Vulnerability of River Delta Systems - A GWSP/LOICZ/CSDMS Scoping Workshop, Sept. 26 - 28, 2007, Boulder, CO

Syvitski, J.P.M., 2007, Community Surface Dynamics Modeling System – a Working Group Overview. CSDMS Terrestrial Working Group, U. California – Berkeley, Dec. 9, 2007.

Syvitski, J.P.M., 2007, Community Surface Dynamics Modeling System – a Steering Committee Overview. CSDMS Steering Committee Annual Meeting, U. Colorado, Boulder, Dec. 17, 2007.

Syvitski, J.P.M., 2007, Community Surface Dynamics Modeling System, CSDMS. Idaho National Lab Visit to U. Colorado Boulder CO, Nov. 27, 2007.

Syvitski, J.P.M., 2007, Community Surface Dynamics Modeling System, Faculty Dept. Geological Sciences, U. Colorado Boulder CO, Nov. 27, 2007.

Syvitski, J.P.M., 2007, Dams and Sedimentation. Third GWSP Workshop on Global Dams and Reservoirs: Information Needs on a Global Scale. U. New Hampshire, 16–17 May 2007

Syvitski, J.P.M., 2007, Deltas at Risk. 2007 China-US Relations Conference: Development, Energy, Security. Washington DC, October 22-25, 2007

Syvitski, J.P.M., 2007, Deltas at Risk. Duke U., Nov. 2, 2007

Syvitski, J.P.M., 2007, Deltas: An Environmental Perspective. Dynamics and Vulnerability of River Delta Systems - A GWSP/LOICZ/CSDMS Scoping Workshop, Sept. 26 - 28, 2007, Boulder, CO

Syvitski, J.P.M., 2007, Deltas: Combining History and Space Age Science. Dynamics and Vulnerability of River Delta Systems - A GWSP/LOICZ/CSDMS Scoping Workshop, Sept. 26 - 28, 2007, Boulder, CO.

Syvitski, J.P.M., 2007, Discharge and sediment flux from Korean Rivers. Korean Tidal Flats US-Korea Planning Workshop, ONR, Honolulu, HI, March 26-30, 2007.

Syvitski, J.P.M., 2007, Global predictions of river discharge and sediment load under human influence. In: 2nd Annual Hydrologic Sciences Student Research Symposium March 16-17, 2007 University of Colorado at Boulder Conference Program and Abstracts, p. 29-30

Syvitski, J.P.M., 2007, Prognosis and Modeling. "Arctic Coastal Zones at Risk" – a physical and socio-ecological perspective on Arctic Coastal Change, 1st LOICZ/IASC Workshop in Tromsø, Norway, 1–3 October, 2007

Syvitski, J.P.M., Hutton, E W, 2007, New Closure Schemes in 3D SedFlux for the Simulation of Deltas, Abstracts, AAPG Annual Meeting, April 1-4, 2007, Long Beach, CA, Search and Discovery Article #90063 (2007)

Syvitski, J.P.M., Hutton, E.W.H., Saito, Y., 2007, Near Term Sea Level Change on Sediment Retention in Estuaries. Mechanisms of Sediment Retention in Estuaries, a SCOR/LOICZ/CSDMS Workshop, Sept 23 - 25, 2007, Boulder, CO.

Syvitski, J.P.M., M. Hannon, A. J. Kettner, C. Jenkins & E.W.H. Hutton. 2007 Morphodynamics of River Lowlands and Deltas: Combining Historical Maps with Satellite Data. *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract H34C-02

Syvitski, J.P.M., Milliman, J.D., 2007, Geology, Geography, and Humans Battle for Dominance over the Delivery of Fluvial Sediment to the Coastal Ocean. Mechanisms of Sediment Retention in Estuaries, a SCOR/LOICZ/CSDMS Workshop, Sept 23 - 25, 2007, Boulder, CO.

2.3 2007 Papers

In addition to the papers listed below, section 1.4.5 (above) provides the list of 14 papers from the first CSDMS Special Issue.

Kettner A.J., Gomez, B., and Syvitski, J.P.M., 2007. Modeling suspended sediment discharge from the Waipaoa River system, New Zealand: the last 3000 years. Water Resources Research 43, W07411, doi:10.1029/2006WR005570.

Kettner, A.J., Syvitski, J.P.M., in press, Predicting Discharge and Sediment Flux of the Po River, Italy since the Late Glacial Maximum. In: P.L. de Boer, G. Postma, C.J. van der Zwan, P.M. Burgess and P. Kukla (Eds.) Analogue and Numerical Forward Modelling of Sedimentary Systems: from Understanding to Prediction. IAS Special Publication 39 in press.

Nittrouer, C., Austin, J., Field, M., Steckler, M., Syvitski, J.P.M., Wiberg, P., 2007. Continental-Margin Sedimentation: From Sediment Transport to Sequence Stratigraphy. IAS Spec. Publ. No. 37: 1-549.

Nittrouer, C.A., Austin Jr., J.A., Field, M.E., Kravitz, J.H., Syvitski, J.P.M., and Wiberg, P.L. 2007, Writing a Rosetta stone: insights into continental-margin sedimentary processes and strata. In: Nittrouer, C., Austin, J., Field, M., Steckler, M., Syvitski, J.P.M., Wiberg, P., (Eds.) Continental-Margin Sedimentation: From Sediment Transport to Sequence Stratigraphy. IAS Spec. Publ. No. 37: 1-48.

Overeem, I., Briner, J.P., Kettner A.J., Syvitski, J.P.M., in press, Valley filling during deglaciation: a case-study of Clyde fjordhead, Baffin Island, Arctic Canada. Sedimentary Geology.

Parsons, J. Friedrichs, C., Garcia, M., Imran, J., Mohrig, D., Parker, G., Pratson, L., Puig, P., Syvitski, J.P.M., Traykovski, P. 2007. Sediment gravity flows: Initiation, transport and deposition. In: C.A. Nittrouer, J.A. Austin, M.E. Field, J.H. Kravitz, J.P.M. Syvitski, and P.L. Wiberg (Eds.) Continental-Margin Sedimentation: From Sediment Transport to Sequence Stratigraphy. IAS Spec. Publ. No. 37: 275-338.

Perillo, G.M.E, Syvistki, J.P.M., Amos, C.L., Depetris, P., Milliman, J., Pejrup, M., Saito, Y., Snoussi, M., Wolanski, E., Zajaczkowski, M., Stallard, R., Hutton, E., Kettner, A., Meade, R., Overeem, I., Peckham, S., 2007, Estuaries and their Sediments: How they Deal with Each Other. Inprint Newsletter of the IGBP/IHDP Land Ocean Interaction in the Coastal Zone 2007/3: 3-5.

Pratson, L.F., Hutton, E.W.H. Hutton, A.J. Kettner, J.P.M. Syvitski, P.S. Hill, Douglas A.G., T.G. Milligan, 2007, The Impact of floods and storms on the acoustic reflectivity of the inner continental shelf: A modeling assessment. Continental Shelf Research. 27: 542–559.

Saito Y., Chaimanee N., Jarupongsakul, T., and Syvitski, J.P.M. 2007. Shrinking megadeltas in Asia: Sea-level rise and sediment reduction impacts from case study of the Chao Phraya delta. Inprint Newsletter of the IGBP/IHDP Land Ocean Interaction in the Coastal Zone 2007/2: 3-9.

Syvitski, J.P.M. and Milliman, J.D., 2007, Geology, geography and humans battle for dominance over the delivery of sediment to the coastal ocean. J. Geology 115: 1–19.

Syvitski, J.P.M., Brigham, L., Bring, A., Douglas, T., Lippmann, T., Solomon, S., Sulisz, W., Ziaja, W., Zockler, C., 2007, Prognosis and Modeling. In: G. Flöser, H. Kremer, V. Rachold, (Eds.) Arctic Coasts at Risk, publ. LOICZ and IASC, Geesthacht, Germany and Stockholm, Sweden, p. 27-30

Syvitski, J.P.M., in press. Deltas at Risk. Sustainability Science

Syvitski, J.P.M., Kettner, A., 2007, On the flux of water and sediment into the Northern Adriatic. Continental Shelf Research. 27: 296-308.

Syvitski, J.P.M., Pratson, L.F., Wiberg, P.L., Steckler, M.S., Garcia, M.H., Geyer, W.R., Harris, C.K., Hutton, E.W.H., Imran, J., Lee, H.J., Morehead, M.D., and Parker, G., 2007. Prediction of margin stratigraphy. In: C.A. Nittrouer, J.A. Austin, M.E. Field, J.H. Kravitz, J.P.M. Syvitski, and P.L. Wiberg (Eds.) Continental-Margin Sedimentation: From Sediment Transport to Sequence Stratigraphy. IAS Spec. Publ. 37: 459-530.

Syvitski, J.P.M., Saito, Y. 2007, Morphodynamics of Deltas under the Influence of Humans. Global and Planetary Changes 57: 261-282.

Wollheim, W. M., C. J. Vorosmarty, B. J. Peterson, P. A. Green, S. Seitzinger, J. Harrison, A. F. Bouwman, and J. P. M. Syvitski. In press. Global N removal by freshwater aquatic systems: a spatially distributed within basin approach. Water Resources Research

2.4 2007 Major Findings

Sections 1.1 through 1.6 review the Cyber-infrastructure supporting CSDMS, and the decisions related to the modeling environment and framework, and the organization and participation of the community supporting the CSDMS effort. Below we briefly report a few of the CSDMS workshop findings related to surface dynamic modeling.

2.4.1 **Arctic Coastal Zone at Risk: Prognosis and Modeling**

Significant, directed research effort is required to attain a level of sophistication and computational efficiency necessary to address complex anthro-bio-geo-physical interactions inherent in modern Arctic Coast Zone (ACZ) models. Because of high socio-economic impacts associated with projected Arctic climate change, particular importance should be placed on understanding model uncertainty, limitations, and quantifying outcomes. In addition to known processes (such as those associated with permafrost, sea ice, and surface waves), such error propagation considerations should become part of the model framework development. The ACZ provides an opportunity given the comparatively trophic-level simplification and minimum level of direct human impact, yet the simplification points to the limited level of data to adequately validate ecosystem models. No long-term coastal morphodynamic model is identified suitable to the ACZ, e.g. one that takes into account permafrost or other ice-sediment interactions. A modeling framework system for the ACZ is not yet implemented. Model integration is thus at the earliest stages for the ACZ. The present limited observation stations are not adequate for data assimilation schemes.

2.4.2 **Mechanisms of Sediment Retention in Estuaries**

Present numerical models are not capable of predicting estuarine evolution over long periods (hundreds to thousands of years), as there remain many problems in defining and quantifying the conditions at the open boundaries. Future progress should advance toward coupling models operating across different spatial and temporal scales. Behind each model lies commonly used concepts like tidal pumping and scour and settling lags that require further improvements. A hybrid model may facilitate a better solution to the sediment transport problem. Boundary conditions are the biggest problem in modeling, whereas calibration and verification require detailed synoptic-scale data. Bedform predictions are very difficult or but cannot be up-

scaled. Model "coupling systems" like CCA and ESMF, are an important solution to advancing our understanding of how estuaries, for example, can change from exporter to importer of sediment.

2.4.3 **Dynamics and Vulnerability of River Delta Systems**

As a result of human development and global changes, deltas are now perilously out of dynamic equilibrium, being maintained at lower elevations and farther offshore than in natural conditions. While providing separation from quotidian delta dynamics, human stabilization of naturally dynamic deltaic systems is likely to result in less frequent, but catastrophic failures of delta system components following extreme events. Compounding chronic problems of deltas, extreme events may contribute to the collapse of entire deltaic systems. Although delta ecosystems are among the most productive and provide environmental goods and services of regional and global importance, human development within deltas and further upstream in the drainage basin may push deltas over ecological collapse thresholds. Our ability to preserve deltas depends strongly on a better understanding of the fundamentals of system-scale sediment, nutrient, and ecological dynamics from the watershed to the receiving basin. Research must be designed to address the full range of responses of this complex dispersal system to external forcing, and to assess its internal controls. Future programs should focus on (1) developing modeling methods for coupling biological, geochemical, physical, and human dynamics, and (2) acquisition of detailed information on forcing factors such as paleodischarge, high resolution sea level and subsidence histories, and past records of energy regimes in the receiving basin.

2.4.4 **Prediction of margin stratigraphy**

A new generation of predictive, process–response models provide insight about how sediment-transport processes work to form and destroy strata, and interact to influence the developing architecture along continental margins. The spectrum of these models ranges from short-term sedimentary processes (river discharge, surface plumes, hyperpycnal plumes, wave-current inter-actions, subaqueous debris flows, turbidity currents), to the filling of geological basins where tectonics and subsidence are important controls on sediment dispersal (slope stability, compaction, tectonics, sea-level fluctuations, subsidence). The CSDMS effort coordinates individual modeling studies and catalyzed Earth-surface research by: 1) empowering scientists with computing tools and knowledge from interlinked fields; 2) streamlining the process of hypothesis testing through linked surface dynamics models; 3) creating models tailored to specific settings, scientific problems and time-scales. The extreme ranges of space- and time-scales that define Earth history demand an array of approaches, including model nesting, rather than a monolithic modeling structure. Numerical models that simulate the development of landscapes and sedimentary architecture are the repositories of our understanding about basic physics underlying the field of sedimentology.

Appendix 1: By-Laws of the Community Surface Dynamics Modeling System Version 4 Approved by the Executive Committee, Jan. 16, 2008

PREAMBLE

The Community Surface Dynamics Modeling System (CSDMS) assumes responsibilities to develop, support, and disseminate to the earth-science research and teaching community integrated software modules that are aimed at predicting the erosion, transport, and deposition of sediment and solutes in landscapes and their repository sedimentary basins. The goal of CSDMS is to enable the rapid development and application of linked dynamical models tailored to specific landscape-basin evolution (LBE) problems at time scales that range from years to thousands of years or longer, and spatial scales that include global, regional and local aspects of the earth's surface — from the mountain tops covered in glaciers to the deep seafloor and their sediments. To foster longer-term progress in surface modeling, CSDMS gathers and makes available models designed to elucidate poorly understood aspects of landscape and seascape dynamics. CSDMS develops and maintains a high-level of community participation to ensure:

a) Well-documented and user-friendly LBE software that keeps pace with both hardware and scientific developments;

b) Partnerships with related computational and scientific programs in order to eliminate duplication of effort, leverage mutual progress, and provide and benefit from an intellectually stimulating environment;

c) Appropriate training for both the users and teaching communities;

d) Hardware and personnel resources to support and facilitate software development and its use by the community;

e) Strong linkage between what is predicted by CSDMS codes and what is observed both in nature and in physical experiments.

CSDMS develops and maintains the computational system to ensure the portability and interoperability of modules, the computational efficiency of system code, and the clarity and consistency of documentation. CSDMS offers pedagogically evaluated LBE technology to enhance and inform education in environments of high school, undergraduate programs, and science museums.

These By-Laws of the Community Surface Dynamics Modeling System (CSDMS) are adopted by its Members for the purpose of conducting CSDMS business in a collegial manner. They do not override the standard responsibilities and prerogatives of Principal Investigator and his/her institution.

Articles

ARTICLE I. NAME

Section 1. Name: The name of the Organization is *Community Surface Dynamics Modeling System (CSDMS).*

ARTICLE II. WORKING GROUPS, MEMBERS AND THEIR INSTITUTIONS

Section 1. Working Groups: The five Working Groups to support the CSDMS program include three (3) Environmental Working Groups and two (2) Integrative Working Groups. The three key Environmental Working Groups are:

i) Terrestrial WG: weathering, hillslope, fluvial, glacial, aeolian, lacustrial;

ii) Coastal WG: delta, estuary, bays and lagoons, nearshore;

iii) Marine WG: shelf, carbonate, slope, deep marine.

The two key Integrative Working Groups are:

iv) Education and Knowledge Transfer (EKT) WG: includes marketing to gain end-users, workshops to provide training for end-users, web-based access to simple models (e.g. K-12 teaching), access to archives of simulations. This WG will interact closely with its Partner Committees (Industry, Agency), field programs, and cyberinformatic partners.

v) Cyber-Infrastructure and Numerics WG: includes technical computational aspects of the CSDMS, ensures that the modeling system properly functions and is accessible to users; software protocols are maintained, along with model standardization and visualization.

Section 2. **Membership:** Working Group members shall be holders of an academic or research appointment, with major responsibilities for instruction and/or research in the earth, environmental and engineering sciences, in a department, program, or other organizational unit of their Institutions (academic institutions, not-for-profit organizations, state and federal labs, and consulting and industrial companies), and have demonstrated a major commitment to research in Earth System Science with a particular emphasis on computational earth-surface dynamics, and related fields (hydrology, fluvial processes, biogeochemistry, sedimentology, stratigraphy, geomorphology, glaciology, oceanography, marine geology, climate forcing, active tectonics, surface geophysics, remote sensing, geomathematics, computational fluid dynamics, computational science, and environmental engineering). Applicants may apply to the CSDMS Integration Facility to join one or more of the CSDMS Working Groups. The CSDMS Integration Facility shall maintain a list of Members and their Institutions. Working Group membership requires a two-thirds majority approval of the CSDMS Executive Committee. A membership fee may be levied on for-profit organizations. Working Group Chairs may appoint a Coordinating Committee.

Section 3. Responsibilities/Activities:

iv) **Group Discussion:** Stay current in the processes and models associated their disciplinary toolkit, and identify gaps in knowledge and areas where numerical tools need to be developed. Set scientific modeling priorities for their discipline. Make recommendations for resource prioritization and facilitate the movement of these priorities up the hierarchy from technology group to steering committee.

v) **Review Activities:** Ensure quality control for the algorithms and modules for their area of expertise (benchmarking and model testing). Coordinate the evaluation of numerical codes according to interoperability, scientific contribution, and technical documentation. Ensure adequacy of supporting boundary conditions and boundary initializations.

iv) **Group Project:** Address a CSDMS proof-of-concept challenge, if appropriate.

v) **Individually and collectively:** Stimulate proposals and input from the community. Create and/or manage the various environmental process modules related to their discipline. Provide community continuity to meet long-term CSDMS objectives.

vi) **Meetings:** Working Groups will coordinate much of their activity via remote communication systems, but are encouraged to meet as resources and interests permit.

vii) **Reporting:** Working Groups will report annually on their progress.

Section 4. Foreign Membership: Working Group members from foreign academic institutions, not-for-profit organizations, foreign government labs, and consulting and industrial companies, are offered all of the privilege of U.S. working group members, except for the privilege of voting for the Chairs of the Working Groups that reside on the governing body of CSDMS — the CSDMS Executive Committee.

Section 5. Resignation or Removal: Any Member may resign at any time by giving written notice to the Chairperson of the Steering Committee, or to the CSDMS Executive Director. Such resignation shall take effect at the time of receipt of the notice, or at any later time specified therein. Given sufficient cause, any Member may be removed by the affirmative vote of two-thirds of the Members of the CSDMS Executive Committee.

Section 6. Quorum: Except as may be otherwise expressly required by these By-Laws, at all CSDMS Working Group meetings, attendance and/or a notification of intent to attend by thirty percent (30%) of the members then serving shall constitute a quorum. For the purpose of the election of their Executive Committee member (Working Group Chair), a quorum shall be determined by a simple majority.

Section 7. Voting: Each CSDMS WG member shall be entitled to one vote. Except as otherwise expressly required by law or these By-Laws, all matters shall be decided by the affirmative vote of a majority of the Working Group members present at the time of the vote, if a quorum is then present.

Section 8. Action without a Meeting: Any action required or permitted to be taken by the CSDMS members, or the Executive Committee, may be taken without a meeting if the CSDMS members, or the Executive Committee, consent in writing to the adoption of a resolution authorizing the action. The resolution and the written consents thereto shall be filed with the minutes of the proceedings of the CSDMS members or the Executive Committee.

ARTICLE III. CSDMS EXECUTIVE COMMITTEE

Section 1. Executive Committee of CSDMS: The Executive Committee (ExCom) will comprise a) Executive Director and PI of the award as Chair, (non-voting, except to break a tied vote), b) Chair of the Steering Committee (voting); c) Chief Software Architect (non-voting), d) Chairs of the defined working groups (voting): (i) Terrestrial, (ii) Coastal, (iii) Marine, (iv) Cyber-infrastructure and Numerics, and (v) Education and Knowledge Transfer. The elected members of ExCom shall have terms not to exceed three years or until his or her successor is chosen and qualified. Members of ExCom other than the chair of the Steering Committee may not simultaneously serve on the Steering Committee.

Section 2. Powers of the Executive Committee of CSDMS: The ExCom is the primary decision-making body of the CSDMS, and will meet twice a year to approve the annual science plan, the semi-annual reports, the management plan, budget, partner membership, and other day-to-day issues that arise in the running of the CSDMS. The Executive Committee will ensure that the objectives of the Cooperative Agreement are met. The ExCom will develop the By-Laws and Operational Procedures, to be co-approved by the Steering Committee. At all meetings of ExCom, the presence of a simple majority of its members then in office shall constitute a quorum for the transaction of business. So long as they do not conflict with the responsibilities of the Principal Investigator (the CSDMS Executive Director), power in the management of the affairs of the CSDMS Organization is vested in the CSDMS Executive Committee. To this end and without limitation of the foregoing or of its powers expressly conferred by these By-Laws, the CSDMS Executive Committee shall have power to authorize such action on behalf of the Organization, make such rules or regulations for its management, and create additional offices or special committees. The Executive Committee shall have the power to fill vacancies in, and change the membership of, such committees as are constituted by it. Appointments of Working Group membership shall rest with the Executive Committee.

The CSDMS Executive Committee will co-share authority with the CSDMS Steering committee to amend or repeal the By-Laws, or the adoption of new By-Laws.

Section 4. Executive Director: The Executive Director shall, when present, preside at all meetings of the Executive Committee and shall perform such other duties and exercise such other powers as shall from time to time be assigned by the Executive Committee. The Executive Director shall be an *ex officio* member of all CSDMS committees. The Director is the Chief Executive Officer of the Organization, and unless authority is given by the Executive Committee to other officers or agents to do so, he or she shall execute all contracts and agreements on behalf of the Organization. The Director shall be the Principal Investigator on proposals, which fund the core CSDMS Facility. It shall be his or her duty, insofar as the facilities and funds furnished to him or her by the Organization permit, to see that the purposes, orders and voting within the CSDMS Organization are carried out. The Director shall preside at CSDMS-wide town-hall meetings.

Section 5. Chairperson of the Steering Committee: The SC Chairperson when present shall preside at all meetings of the Steering Committee and perform such other duties and exercise such other powers as shall from time to time be assigned by the Executive Committee. The Chairperson of the Steering Committee shall be an ex officio member of all CSDMS committees. After the Chair's term is complete, they will be offered the honorary title of Past-Chair and provided with travel funds, when available, to attend CSDMS meeting as appropriate to their interest and CSDMS need.

Section 6. Chief Software Architect: The Chief Software Architect will act as the chief advisor to the CSDMS Director and Executive Committee on matters of software development and integration. The Chief Software Architect shall be a non-voting member of the Executive Committee.

Section 7. Chairs of Working Groups: Chairs of the defined working groups will be full voting members of the Executive Committee and will represent the following areas of surface dynamics expertise: (i) Terrestrial Systems, (ii) Coastal Systems, (iii) Marine Systems, (iv) Cyber-infrastructure & Numerics, and (v) Education and Knowledge Transfer. They will have the authority to call meetings of the working groups they are responsible for, and to meet the collective long-term CSDMS objectives.

Section 8. Election and Term of Office: Appointments of the Executive Committee, for the first start-up year only, shall rest with the Principal Investigator. All members of the Executive Committee must stand for election thereafter. The Chairperson of the Steering Committee shall be elected by a virtual vote of the CSDMS membership orchestrated and recorded by the CSDMS Executive Assistant, for a term not to exceed three years or until his or her successor is chosen and qualifies. Chairs of the Working Groups shall be elected by the members of the respective working groups, orchestrated and recorded by the CSDMS Executive Assistant, for terms not to exceed three years or until their successors are chosen and qualify, and they shall be eligible for re-election.

Section 9. Resignation: Any Officer may resign at any time by giving written notice to the Chairperson of the Steering Committee, or the CSDMS Executive Director. Such resignation shall take effect at the time of receipt of the notice, or at any later time specified therein.

Section 10. Vacancies: Any vacancy in any Office may be filled for the unexpired portion of the term of such office by the Executive Director.

Section 11. Removal: Any officer may be removed at any time with cause by a vote of the Executive Committee.

ARTICLE IV. OPEN MEETINGS

Section 1. Annual CSDMS Meeting: An annual open meeting of the CSDMS membership will be held to solicit comment and feedback from the community. Comments from the community will be recorded and forwarded to the CSDMS Executive Committee and the CSDMS Steering Committee.

Section 2. Special Meetings: Special meetings may be called by the Chairperson of the Steering Committee, or by the CSDMS Executive Director, upon written request of at least one-fifth (1/5) of the membership of the CSDMS Working Groups.

Section 3. Place of Meetings: The CSDMS Executive Director shall designate the place and forum (face-to-face or virtual) of the annual meeting or any special meeting and which shall be specified in the notice of meeting or waiver of notice thereof. The meeting venue will be chosen to maximize community participation, for example, to be in conjunction with a popular science meeting (AGU, Ocean Sciences, GSA, etc)

Section 4. Notice of Meetings: Notice of such meeting of the CSDMS members shall be given at least sixty (60) days before the date fixed for the meeting.

ARTICLE V. STEERING COMMITTEE AND OTHER COMMITTEES

Section 1. Steering Committee: In order to carry out and oversee CSDMS operations, a Steering Committee (SC) shall be established. The Steering Committee will comprise eight (8) members: five (5) selected by the ExCom to represent the spectrum of relevant Earth science and computational disciplines, and one (1) from each of the three Partner Sub-Committees. The cognizant NSF program officer or his/her designate, and the Executive Director or his/her designate, will serve as *ex officio* members of the SC. During SC meetings, there may be occasions when these *ex officio* members would exclude themselves from discussions.

The SC members will serve terms up to three years duration. The Steering Committee will meet once a year to assess the competing objectives and needs of the CSDMS; will comment/advise on the progress of CSDMS in terms of science (including the development of working groups and partner memberships), management, outreach, and education; and will comment on and advise on revisions to the 5-year strategic plan. The Steering Committee will provide a timely report to the Executive Director who is to respond within four weeks.

Section 2. Partner Committees: The Partner Committees (PCs) will comprise a U.S. Federal Agencies Committee, and separately, an Industrial Partners or consortium committee. The PCs will be provided with all relevant documents in order to provide meaningful feedback to the Executive Committee and to the NSF Program Director.

Section 3. Special or Standing Committees: The ExCom may create such special or standing committees as may be deemed desirable, the members of which shall be appointed by the Executive Director from among the Membership, with the Membership approved by the Executive Committee. Each such committee shall have only the lawful powers specifically delegated to it by the Executive Committee.

ARTICLE VI. ELECTIONS

Section 1. Executive Committee: After the first year, with the exception of the Executive Director and the Chief Software Architect, the Executive Committee members will be elected by the CSDMS Membership in accordance with the procedures established in this Article.

Section 2. Nominations for the Executive Committee: In consultation with the Steering Committee, the Executive Director will nominate candidates for each position to be filled. The Membership is encouraged to suggest nominees to the Executive Director.

Section 3. Election: Election shall be conducted electronically. Electronic or Paper votes must be received by the CSDMS Integration Facility by the deadline specified in the ballot. The outcome of the election will be decided by a simple majority of the votes cast.

Section 4. Counting of ballots: Ballots shall be counted by the Steering Committee Chair or his/her designated representative.

ARTICLE VI. COMPENSATION

Section 1. Compensation: No Member shall be paid any compensation for serving on the CSDMS Executive Committee, Steering Committee or other committees and Working Groups. Representatives may be reimbursed for the actual expenses incurred in performing duties assigned to them, within limitations of the host Institution's budget associated with the NSF Cooperative Agreement 0621695.

ARTICLE VII. AMENDMENTS TO THE BY-LAWS

Section 1. Amendments: All By-Laws of the Organization shall be subject to amendment or repeal and new By-Laws may be made by the affirmative vote of two-thirds of the Executive Committee and the Steering Committee.

Appendix 2: CSDMS Working Group participants (as of Feb 1, 2008)

Cyber-Infrastructure and Numerics Working Group

First Name	Last Name	Institution	Institution
Philip	Allen	Imperial College London	UK
Ewa	Deelman	University of Southern California	USA
Jay	Famiglietti	University of California, Irvine	USA
Balazs	Fekete	University of New Hampshire	USA
Efi	Foufoula-Georgiou	University of Minnesota	USA
David	Furbish	Vanderbilt University	USA
Jon	Goodall	University of South Carolina	USA
Didier	Granjeon	Institut Francais due Petrole	France
Gil	Hansen	BHP Billiton Petroleum	USA
Alan	Howard	University of Virginia	USA
Eric	Hutton	University of Colorado - Boulder	USA
Matthias	Imhof	Exxon Mobil Company	USA
G. Walker	Johnson	University of Texas at El Paso	USA
Wei	Luo	Northern Illinois University	USA
David	Maidment	University of Texas	USA
Eckart	Meiburg	University of California, Santa Barbara	USA
Helena	Mitasova	North Carolina State University	USA
Scott	Peckham	University of Colorado - Boulder	USA
Michael	Pyrcz	Chevron Energy Technology Company	USA
Eugene	Rankey	University of Miami	USA
Ettore	Salusti	INFN-Sincrotrone	IRAN
Mark	Schmeeckle	Arizona State University	USA
Dogan	Seber	University of Calfifornia - San Diego	USA
Rich	Signell	USGS	USA
Kenneth	Skene	Exxon Mobil Upstream Research Company	USA
Jordan	Slott	Duke University	USA
Tao	Sun*	Exxon Mobil Upstream Research Company	USA
David	Tarboton	Utah State University	USA
Daniel	Tetzlaff	Schlumberger Information Solutions	USA
Alexey	Voinov	Chesapeake Community Modeling Program	USA

Education and Knowledge Transfer Working Group

First Name	Last Name	Institution	Institution
Karen	Campbell	University of Minnesota	USA
Patrick	Hamilton	Science Museum of Minnesota	USA
G. Walker	Johnson	University of Texas at El Paso	USA
Wei	Luo	Northern Illinois University	USA
Paul	Morin	University of Minnesota	USA
Damian	O'Grady	Exxon Mobil Company	USA
Irina	Overeem	University of Colorado - Boulder	USA
Chris	Paola	University of Minnesota	USA
Jon	Pelletier	University of Arizona	USA
Lincoln	Pratson*	Duke University	USA
Alexey	Voinov	Chesapeake Community Modeling Program	USA
Charles	Vorosmarty	University of New Hampshire	USA

Terrestrial Working Group

First Name	Last Name	Institution	Institution
Philip	Allen	Imperial College London	UK
Bob	Anderson	University of Colorado	USA
Suzanne	Anderson	University of Colorado	USA
Mikael	Attal	University of Edinburgh	UK
Andreas	Baas	King's College London	UK
Mike	Blum	Louisiana State University	USA
Susan	Brantley	Penn State University	USA
Philippe	Davy	CNRS / University of Rennes I	France
Bill	Dietrich	University of California - Berkeley	USA
Tom	Drake	Office of Naval Research (ONR)	USA
Jennifer	Duan	University of Arizona	USA
Michael	Ellis	National Science Foundation, EAR	USA
Tom	Farr	Jet Propulsion Lab	USA
David	Furbish	Vanderbilt University	USA
Joe	Galewsky	University of New Mexico	USA
Basil	Gomez	Indiana State University	USA
William	Goran	Army Corp of Engineers	USA
Laurel	Griggs Larsen	University of Colorado	USA
John	Harrison	Washington State University	USA
Jens	Hartmann	Darmstadt University of Technology	Germany
Audrey	Heurta	Penn State University	USA
Michael	Hofmockel	Duke University	USA
John	Holbrook	University of Texas-Arlington	USA
Alan	Howard	University of Virginia	USA
Erkan	Istanbulluoglu	University of Nebraska, Lincoln	USA
Bert	Jagers	WL Delft Hydraulics Lab	Netherlands
Edward	Johnson	University of Calgary	Canada
Albert	Kettner	University of Colorado - Boulder	USA
David	Kinner	Western Carolina University	USA
Eric	Kirby	Penn State University	USA
Maarten	Kleinhans	Utrecht University	Netherlands
Jim	Kubicki	Penn State University	USA
Venkat	Lakshmi	University of South Carolina	USA
Stephen	Lancaster	Oregon State University	USA
Gwyn	Lintern	Geological Survey of Canada, Pacific	Canada
Nicola	Litchfield	GNS Science	New Zealand
Wei	Luo	Northern Illinois University	USA
Shawn	Marshall	University of Calgary	Canada
Thomas	Meixner	University of Arizona	USA
Paul	Morin	University of Minnesota	USA
Simon	Mudd	University of Edinburgh	UK
Jeff	Niemann	Colorado State University	USA
Fred	Ogden	University of Wyoming	USA
Irina	Overeem	University of Colorado - Boulder	USA
Chris	Paola	University of Minnesota	USA
Thanos	Papanicolaou	University of Iowa	USA
Gary	Parker	University of IL-Urbana-Champaign	USA
Scott	Peckham	University of Colorado - Boulder	USA

Jon	Pelletier	University of Arizona	USA
Taylor	Perron	Harvard University	USA
Tad	Pfeffer	University of Colorado	USA
George	Postma	Utrecht University	Netherlands
Josh	Roering	University of Oregon	USA
James	Selegean	U.S. Army Corps of Engineers	USA
Rudy	Slingerland	Penn State University	USA
Péter	Sólyom	Berzsenyi Dániel College	Hungary
John	Swenson	University of Minnesota-Duluth	USA
David	Tarboton	Utah State University	USA
Arnaud	Temme	Wageningen University	Netherlands
Greg	Tucker*	Cooperative Institute for Research in Environmental Sciences	USA
Craig	Tweedie	University of Texas at El Paso	USA
Gert Jan	Weltje	Delft University of Technology	Netherlands
Brian	Yanites	University of Colorado - Boulder	USA

Coastal Working Group

First Name	Last Name	Institution	Institution
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Andreas	Baas	King's College London	UK
Marcos	Bernardes	Federal University of Itajuba	Brazil
Christian	Bjerrum	University of Copenhagen	Denmark
Mike	Blum	Louisiana State University	USA
Joseph	Calatoni	Naval Research Laboratory	USA
Florence	Cayocca	IFREMER	France
Giovanni	Coco	National Institute of Water and Atmosphere (NIWA)	New Zealand
Peter	Cowell	The University of Sydney Institute of Marine Science	Australia
Andrea	D'Alpaos	University of Padova	Italy
Philippe	Davy	CNRS / University of Rennes I	France
Tom	Drake	Office of Naval Research (ONR)	USA
Sergio	Fagherazzi	Boston University	USA
Rocky	Geyer	Woods Hole Oceanographic Inst. (WHOI)	USA
Liviu	Giosan	Woods Hole Oceanographic Inst.	USA
Daniel	Hanes	USGS Pacific Science Center	USA
Jeff	Harris	University of Rhode Island	USA
John	Harrison	Washington State University	USA
Shawn	Harrison	ASR Ltd.	New Zealand
Susan	Hazlett	University of Alaska Fairbanks	USA
Piet	Hoestra	Utrecht University	Netherlands
Alan	Howard	University of Virginia	USA
Tom	Hsu	University of Florida	USA
Bert	Jagers	WL Delft Hydraulics Lab	Netherlands
Felix	Jose	Louisiana State University	USA
Maarten	Kleinhans	Utrecht University	Netherlands
Stefano	Lanzoni	University of Padova	Italy
Gwyn	Lintern	Geological Survey of Canada, Pacific	Canada
Tom	Lippman	Ohio State University	USA
Marco	Marani	University of Padova	Italy
Dylan	McNamara	Duke University	USA
Laura	Moore	Oberlin College	USA

Simon M.	Mudd	University of Edinburgh	UK
Brad	Murray*	Duke University	USA
Alan	Niedoroda	URS Corp	USA
Andrea	Ogston	University of Washington	USA
Scott	Peckham	University of Colorado - Boulder	USA
Will	Perrie	Bedford Institute of Oceanography	Canada
George	Postma	Utrecht University	Netherlands
Marina	Rabineau	University of Brest	France
Gerben	Ruessink	Utrecht University	Netherlands
Yoshiki	Saito*	Geological Survey of Japan	JAPAN
Larry	Sanford	University of Maryland	USA
Steve	Scott	U.S. Army Eng. Research & Development Center	
Sybil	Seitzinger	Rutgers University	USA
John	Swenson	University of Minnesota-Duluth	USA
Daniel	Tetzlaff	Schlumberger Information Solutions	USA
Torbjörn	Törnqvist	Tulane University	USA
George	Voulgaris	University of South Carolina	USA
Ping	Wang	University of South Florida	USA
Gert Jan	Weltje	Delft University of Technology	Netherlands
Matthew	Wolinsky	University of Minnesota	USA

Marine Working Group

First Name	Last Name	Institution	Institution
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John	Andrews	University of Colorado	USA
Steve	Bergman	Shell International Exploration	USA
Christian	Bjerrum	University of Copenhagen	Denmark
James	Buttles	Massachusetts Institute of Technology	USA
Florence	Cayocca	IFREMER	France
Tom	Drake	Office of Naval Research (ONR)	USA
Federico	Falcini	University of Rome "LaSapienza"	Italy
Andrea	Fildani	Chevron Energy & Technology Company	USA
Carl	Friedrichs	Virginia Institute of Marine Science (VIMS)	USA
Marcelo	Garcia	University of IL-Urbana-Champaign	USA
Bjarte	Hannisdal	University of Bergen	Norway
Courtney	Harris	William & Mary	USA
Susan	Hazlett	University of Alaska Fairbanks	USA
Jasim	Imran	University of South Carolina	USA
Bert	Jagers	WL Delft Hydraulics Lab	Netherlands
Chris	Jenkins	University of Colorado	USA
Philippe	Joseph	Institut Francais du Petrole	France
Chris	Kendall	University of South Carolina	USA
Yusuke	Kubo	JAMSTEC	JAPAN
Steven	Kuehl	William & Mary	USA
Gwyn	Lintern	Geological Survey of Canada, Pacific	Canada
Eckart	Meiburg	University of California, Santa Barbara	USA
David	Mohrig	University of Texas	USA
Ruth	Mugford	University of Cambridge	UK
Thierry	Mulder	Universite Bordeaux 1	France
Chuck	Nittrouer	University of Washington	USA
James	O'Donnell	University of Connecticut	USA
Andrea	Ogston	University of Washington	USA

Thanos	Papanicolaou	University of Iowa	USA
Ross	Powell	Northern Illinois University	USA
David	Pyles	Colorado School of Mines	USA
Marina	Rabineau	University of Brest	France
Eugene	Rankey	University of Miami	USA
Chris	Reed	URS Greiner Corporation	USA
Rick	Sarg	Colorado School of Mines	USA
Christopher	Sherwood	USGS	USA
Rudy	Slingerland	Penn State University	USA
Michael	Steckler	Lamont-Doherty Earth Observatory	USA
John	Suter	Conoco Phillips	USA
Bill	Ussler	Monterey Bay Aquarium Research Inst.	USA
Benoit	Vincent	Institut Francais du Petrole	France
Pat	Wiberg*	University of Virginia	USA
Matthew	Wolinsky	University of Minnesota	USA

Appendix 3: CSDMS Industry Consortium (Feb, 2008)

CSDMS is an integrated community of experts that promotes the understanding of earth-surface processes through numerical simulation experiments. The experiments employ an open-source library of community-generated, continuously evolving software. CSDMS is partnered with related scientific programs in order to provide a strong linkage between predictions and observations. The CSDMS Integration Facility provides the cyber-infrastructure to help develop and distribute software tools and models of use to the academic communities, and to those engaged in industrial applications and environmental assessments. The CSDMS program operates under a cooperative agreement with the U.S. National Science Foundation (NSF), and a community-generated set of Bylaws (Appendix 1). Industry partners, NGOs, and government agencies play an important role in contributing to the success of CSDMS through their financial or in-kind contributions. This sponsorship supports the CSDMS effort and thus the next generation of researchers and modelers working to develop innovative approaches towards modeling complex earth-surface systems.

The CSDMS Consortium of Industry Partners

The primary goal of the CSDMS Consortium is to engage industry stakeholders in CSDMS research. Consortium members join with the CSDMS community to address key issues in the development and use of the models and tools produced by the CSDMS initiative.

Benefits of Membership in the CSDMS Industry Consortium

1) Corporate responsibility and community relations

In addition to hard products such as code, or gaining new insights into earth-surface dynamics, members of the CSDMS Consortium demonstrate their corporate commitment to improving quality of life and promoting optimal natural resource management through the more accurate modeling of earth surface processes. The CSDMS Industry Consortium supports the imperatives in Earth-science research: 1) discovery, use, and conservation of natural resources; 2) characterization and mitigation of natural hazards; 3) geotechnical support of commercial and infrastructure development; 4) stewardship of the environment; and 5) terrestrial surveillance for global security. Member companies are recognized for their commitment and support within various CSDMS publications, promotional materials, presentations, and on our website.

2) Opportunities to contribute to the direction of CSDMS research and products

The CSDMS Consortium provides an opportunity for its members to help guide CSDMS research and product development in directions relevant to their respective activities, thus directly benefiting their companies. By identifying needs for information and processes not available elsewhere, providing input on product development, and organizing activities around new research paths, members help focus CSDMS research in respect to their industries' short- and long-term needs, while avoiding some of the related costs of in-house research infrastructure, facilities and staff. Rigorous and objective Consortium feedback strengthens the CSDMS research and products, and provides a higher level of overall credibility.

3) Access to research activities and product development

CSDMS Consortium members are provided access to current advances in CSDMS research and products — data, tools, models, papers, presentations and status reports on progress. Members are encouraged to provide feedback on these models, tools, and other products. CSDMS uses MIT X11 as its software license. MIT X11 is OSI approved, GPL v. 2 compatible, and allows for the distribution of derivative works (with minimum requirements to shield the original author from liability). MIT X11 is user-friendly, compatible with most other open source licenses, and third party developers may keep derivative works proprietary.

Consortium members can request/suggest fee-based short courses, organized through the Integration Facility and instructors chosen from the CSDMS Working Groups, offering expertise in terrestrial dynamics (e.g. flood plain models), coastal dynamics (e.g. delta development), marine dynamics (e.g. turbidity currents), computation and cyber-infrastructure (e.g. coupling science behind the linking of models across time and space).

Consortium members are invited to attend CSDMS events, in addition to an annual site visit for insight into the latest research activities, experimental data and approaches, and demonstrations of products in development. Members receive a copy of the CSDMS annual report.

4) Association with a diverse group of scientists, universities, agencies, and industries

CSDMS actively works with international scientists, both from academic and research institutions, government agencies, and industry partners. As of February 2008, over 160 scientists and engineers from 80 institutions support the CSDMS effort. The CSDMS Consortium offers its members opportunities to develop connections and gain insight with this diverse group of participants. The result is an open exchange of state-of-the-art information in aid of problem solving, allowing companies to increase their effectiveness through application of CSDMS research and products. The CSDMS connection with NSF and other agencies — the U.S. Office of Naval Research, National Aeronautics and Space Administration, U.S. Geological Survey, U.S. Army Research Office, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, U.S. Dept of Energy, and U.S. Environmental Protection Agency — gives CSDMS products an immediate level of professional credibility, increasing their impact, acceptance and application in practice. Consortium members gain new knowledge with, for one example, direct application to subsurface stratigraphy, sedimentology, and reservoir characterization.

CSDMS Consortium Sponsorship

Consortium partners are asked to contribute to the success of CSDMS through either a financial contributions (larger companies), or as an in-kind contribution (smaller companies).

Large multinational (e.g. petroleum and mining) companies are asked for an annual tax-deductible gift contribution in the range of $30,000 to $100,000. The CSDMS Steering Committee, comprised of representatives of U.S. funding agencies (e.g. NSF and ONR), the U.S. National Academy of Science, academic leaders, and the petroleum and environmental industry itself, hope for Consortium contributions to grow to the million dollar level, wherein the Consortium could become a true strategic partner — rising closer to the level of NSF funding (>$1M/yr) and multi-agency CSDMS-related funding of Working Group member research (>$5M/yr). An overall longer-term goal is to obtain larger investments from corporate foundations. Gifts to the CSDMS initiative are to the CSDMS Integration Facility through the CU Foundation Corporation, due April 1, or by special arrangement to suit members' accounting cycles.

Smaller companies, typified by environmental or engineering firms, are asked for in-kind support, such as covering the cost of their employees and officers participating in the CSDMS effort (CSDMS meetings and events, Working Group activities, code development, code-sharing arrangements, and program advertising), and where possible gift support.

Professional staff supported with Consortium funds will be either post-doctoral research scientists or professional software engineers. These staff will work to contribute to the CSDMS efforts, while providing intimate liaison between the Consortium and the CSDMS Integration Office. The staff would support the development of models/modules/tools that meet the prioritized needs of the Consortium, and conduct numerical experiments suggested by the consortium members.

Consortium funds could also contribute to the developing of the cyber-infrastructure. The CSDMS IF is hoping to soon acquire a CSDMS-operated Experimental Supercomputer (ES) offering >256 cores for >3 teraflops of computing power, and configured with two HPC approaches — 1) massive shared memory among fewer processors, and 2) the more typical parallel configuration — running Linux with Fortran, C and C++ compilers. This CSDMS ES will be linked to the proposed Front Range High Performance Computer (HPC) with 7000 core, >100 teraflops, that in turn linked to the US TerraGrid and the proposed Cheyenne

NCAR/UCAR Petascale HPC dedicated to the NSF Geoscience Collaboratory. The Professional staff supported with Consortium funds would have access to these High Performance Computers.

Request by a Consortium member, for directed and company-specific research, must be negotiated separately with the Environmental Computation and Imaging (ECI) Facility, at the University of Colorado — Boulder. If an ECI employee is associated with CSDMS and its Integration Facility, then: 1) the generalized topic must be transparent to other members of the Consortium, and 2) is not in conflict with CSDMS goals. Results and products could be proprietary for an agreed, predetermined time.