CSDMS

COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

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.

BY-LAWS OF THE COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

Version 4 Approved by the Executive Committee, January 16, 2008

As approved by the Steering Committee, February 12, 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: six (6) selected by the ExCom to represent the spectrum of relevant Earth science and computational disciplines, and one (1) from each of the two Partner 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.