EXECUTIVE SUMMARY: WORKSHOP RESULTS

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Earth Cube Workshop Title: MYRES V: The Sedimentary Record of Landscape Dynamics

Introduction: Meetings of Young Researchers in Earth Science (MYRES) is a community-driven initiative aimed at promoting interdisciplinary research efforts among early-career scientists from across the world. MYRES V: The Sedimentary Record of Landscape Dynamics brought together a wide range of early-career geomorphologists, sedimentologists, stratigraphers, and geodynamicists interested in bridging Earth-surface and solid-Earth research in order to better understand the evolution of Earth's environments over a range of temporal and spatial scales, and in response to a variety of tectonic and climatic forcing events.

Workshop participants (54 in total) were dominantly from the US (80%) represented a variety of disciplines including geomorphology (32%), sedimentology (32%), stratigraphy (27%), and geodynamics (9%). Main outcomes of the EarthCube workshop discussions are summarized below.

SCIENCE ISSUES AND CHALLENGES

1. **Important science drivers and challenges:** Participants identified several high-priority science questions that will be the focus of interdisciplinary efforts during the next 5-15 years.
   - What processes are relevant to understanding landscapes and mass flux (i.e. sediment budgets) in the past, present, and future across different temporal and spatial scales?
   - How is sediment generated and changed as it moves through the landscape?
   - How does downstream transmission of Earth-surface materials filter and record the frequency and magnitude of Earth's environmental changes?
   - How does life influence surface processes and transform environmental signals preserved in the sedimentary archive?
   - To what extent do extreme events control landscape evolution and stratigraphy?
   - How do the effects of tectonic and climate conditions propagate through the landscape and depositional system? At what scales?

2. **Current challenges to high-impact, interdisciplinary science:** Several themes emerged as consistent challenges faced across disciplines.
   - Many researchers approach data collection and data comparison individually, compiling datasets for use in their own research group. Often this includes tracking down other researchers willing to share data, digitizing legacy data from older publications, and spending tremendous amounts of time looking for proper metadata and checking data quality. A community effort to make data available for download, along with thorough metadata would save researchers tremendous amounts of time.
   - It is currently difficult to integrate across disparate datasets (e.g., field, experimental, and modeling data) and across disciplines (e.g., geophysics, atmospheric science, oceanography, etc.). Existing databases and online modeling resources often require a high level of insider

knowledge for the resources to be fully utilized; this is a barrier to entry for researchers trying to collaborate from other disciplines.

- Inconsistent formatting, file types and metadata make compiling interdisciplinary datasets difficult.
- The culture of collaborative science in which data are openly and easily shared is only just being established. Many researchers were not trained to collect and report data in a format that would be usable for other researchers (particularly those they do not know), and currently it can be very difficult to access others' data (this is, perhaps, particularly true of field observations). NSF's data-gathering requirements are an opportunity to establish a new framework and new vehicles for data sharing among researchers.

TECHNICAL INFORMATION/ISSUES/CHALLENGES

1. **Desired tools, databases, etc. needed for pursuing key science questions with brief elaboration:**

- There was a quickly realized consensus that a Google-Earth-like data clearinghouse would be tremendously helpful. This would be a place where existing community datasets could be searched both by topic/index and geographically (as well as temporally, for historical and stratigraphic data). (For example a search for "suspended sediment" and "discharge" might return datasets from the USGS, the Army Corps of Engineers, individual PIs, local/state and international agencies.) Ideally, once desirable datasets are identified, a researcher could then download them in a similar file format/structure. Physical and numerical modeling results could also be included and geographically cross-referenced by the lab of origin and a specific location (if a model were related to a field case, for example), and model codes could be shared (in a similar manner to what is currently done through CSDMS).
- Participants agreed that Google Earth (or similar intuitive geospatial interface) itself would be a desirable backdrop for this type of community resource and there was no need to reinvent the wheel in terms of user interface, for example. Access to linked datasets via a large, searchable data clearinghouse (where file downloading and metadata storage were reasonably uniform) would also help improve access and usability of disparate datasets. This might mean, for example, that a researcher would only need to learn one data upload/download system, which would empower users to access geological, geophysical, biological, and climatology data, for example, via the same interface, rather than having to learn a new protocol to access data from each discipline.
- A centralized data clearinghouse would also provide a place for PIs collecting new data to upload their results, thereby blending both existing databases and accommodating the needs of researchers who currently rely on ad-hoc arrangements to store and share their data. Although NSF's new data-sharing requirements are separate from EarthCube, participants expressed concern that if new data acquisition/sharing isn't incorporated into the EarthCube model, some of the problems and challenges listed in section 2 will persist.
- There was also strong interest in the suggestion that resources be allocated to digitizing and updating legacy data that is not currently available in digital form. Participants were very enthusiastic about this idea and felt that it would be a high-yielding investment.
- The "universal Earth-science database" concept generated the most excitement among participants. Participants were less concerned with visualization and modeling resources, in part because it seems that existing software and collaborative websites (e.g., CSDMS) are

suitable for accomplishing important research goals (or at least are not viewed as significant barriers to progress), although improvements in visualization software and access to expensive software licenses (particularly for evaluating LIDAR and seismic data) would be helpful. Ultimately, challenges locating, accessing, formatting, and compiling data are currently frustrating and stifling to participants in this workshop.