A standardized data framework for capturing, storing, retrieving, and analyzing data from sedimentological experiments.

Data in the geosciences are often limited by their spatial or temporal scales. Physical experiments provide an exceptional tool to investigate Earth’s systems at extremely high spatial and temporal resolutions. The integration of the total library of past and future experiments would open a broad window into the interactions between climate, water, vegetation, sediment, tectonics, and sea level in constructing the Earth’s surface and stratigraphic record. Large-scale science questions that can be asked with physical experiments range from the response of delta regions to sea-level rise and sediment flux changes, the dynamics of rivers and stratigraphic systems to sediment, water, ecology, tectonics, and management questions. Moreover, integration of the large database of past and future experiments, all of which are labor-intensive, will allow to build generalizable and repeatable conclusions that can be applied throughout Earth system sciences.

Currently, such efforts are hampered by a large range of available data structures, laboratory procedures, and methods by which data is collected, formatted, and stored. Here, we present a new initiative to build a standardized framework for efficiently collecting, storing, retrieving, and analyzing experimental data. Most experimental data are temporally varying and either 1) single parameters (e.g. sediment and water flux) or 2) spatially varying (e.g. high resolution topographic and photographic data).

Therefore, we are proposing to build a generalizable NetCDF-based and geospatially-registered data structure that (1) allows to overlay orthorectified imagery onto topographic scans (DEMs), (2) organizes all data (topography, photos, and additional variables) into a unified temporal framework, (3) facilitates links with a standard set of tools to analyze experiments that will work automatically when data have been prepared in the proper NetCDF format, (4) promotes the construction of a community index of experimental data, (5) incorporates suggestions and feedback from the community and current ways of analyzing experiments, (6) is also compatible with time-series data of landscape changes measured outside of physical experiments (e.g. numerical models or field studies).