Data System for Structural Geology and Tectonics

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We are prototyping a Data System for Structural Geology and Tectonics (SG&T) data that is platform independent (from mobile device to desktop) to enable collection and sharing of data from field to laboratory settings. The goals of this effort, funded by US National Science Foundation, are to enable recording and sharing data within the geoscience community, to encourage interdisciplinary research, and to facilitate the investigation of scientific questions that cannot currently be addressed. The development of the Data System emphasizes community input in order to build a system that encompasses the needs of researchers, in terms of data and usability. SG&T data is complex for a variety of reasons, including the wide range of temporal and spatial scales (many orders of magnitude each), the complex three-dimensional geometry of some geological structures, inherent spatial nature of the data, and the difficulty of making temporal inferences from spatial observations. To successfully implement the development of a SG&T data system, we must simultaneously solve three problems: 1) How to digitize SG&T data; 2) How to design a software system that is applicable; and 3) How to construct a very flexible user interface.

To address the first problem, we introduce the "Spot" concept, which allows tracking of hierarchical and spatial relations between structures at all scales, and will link map scale, mesoscale, and laboratory scale data. A Spot is an observation or relationship with an area of significance. A Spot can be a single measurement, an aggregate of individual measurements, or even relationships between numerous other Spots. We address the second problem of software design through the use of a graph database to better preserve the myriad of potentially complex relationships.

In order to construct a flexible user interface that follows a natural workflow and that serves the needs of the community, we are engaging the SG&T community in order to utilize the expertise of a large group of scientists to ensure the quality and usability of this data system. These activities have included Town Halls at GSA and AGU, subdiscipline-specific workshops to develop community standards, and pilot projects to test the data system in the field during the study of a variety of geologic structures.