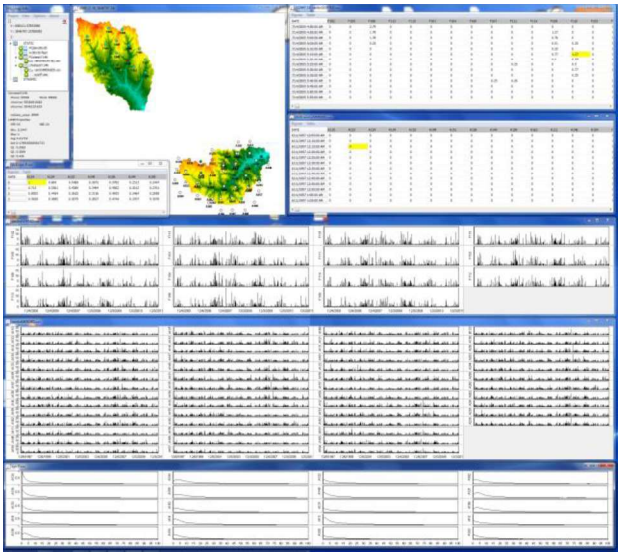
United States Department of Agriculture
Agricultural Research Service

The SPELL project

Grazinglands Research Laboratory, El Reno, Oklahoma May 2017

Rationale: High spatial and temporal resolution observations help us to better understand the rapid changes in biophysical responses at the watershed or edge-of-the-field scale. In most cases, the lack of computational tools with the capacity to integrate large datasets in a comprehensive manner becomes a limitation to fully utilize this information for analysis of cause-and-effects scenarios. A common practice to overcome the burden of massive data is to aggregate observations to a given spatial or temporal scale, for example, farm size at daily and annual basis. This practice helps to speed up computations while facilitating communication with shareholders. However, it may also smooth important information of the phenomena under investigation and can bypass important watershed interactions.



Data collection is expensive and challenging, and not all data collected add knowledge about the phenomenon being investigated. However, in natural systems, the measurment of the expected mean and its varibility for a given variable (e.g., rainfall, nitrogen concentration) is important, especially in those rare occasions where unexpected events can lead to the identification of long-term changing conditions. These two properties of data provide valuable knowledge about the phenomenon of interest when properly measured, analyzed, and modeled. For example, during a rainfall event we are interested in knowing the amount of water that falls in a certain period of time (e.g., day, hour, or minutes). Also, we find important to know how different the rainfall events were at other locations and how rapidly it changes in time. To do this, we need to deploy the necessary density of sensors to observe the phenomenon, be prepared to measure unexpected responses, and have the capacity to efficiently process this data. Measuring and being able to visualize, quantify, and idealize these differences (variability) in space and time may help to undertand significant differences in sediment, nitrogen, and phosporous responses occurring in contiguous areas sharing similar land uses and soils that may ocurr in very short period of time.

Objective: To develop computational tools with the capacity to incorporate high spatio-temporal resolution datasets facilitating data processing, analysis, and classification of agro-ecosystems responses under present and future scenarios.

The ultimate goal of the SPELL project is to provide the computational environment to assist with the challenging task of processing, segregating, and assist the analysis of large watershed datasets.

What we are doing: We identify, idealize, and develop computational tools to better link data, data properties, and data segregation to speed-up analysis of water and bio-chemical fluxes that take advantage of big data.

We aim to improve the prediction of the responses of our agro-production systems, reduce uncertainties, and provide better decision making tools.

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