Predictive Assimilation Framework for Subsurface Process Prediction.

Roelof Versteeg (roelof.versteeg@subsurfaceinsights.com) - Subsurface Insights (PI).

Subsurface system behavior is driven and controlled by the interplay of physical, chemical, and biological processes. These processes occur and are coupled at multiple temporal and spatial scales. The resulting multi-scale, multi process environmental complexity is both an essential attribute of subsurface environments and a major complication in developing an understanding of such environments. The last ten years has seen a rapidly growing appreciation and understanding of the occurrence and importance of these coupled processes and - in parallel with this growing understanding - an increase in the ability to integrate numerical forward and inverse models from different disciplines with heterogeneous datasets (hydrological, geochemical, geophysical, meteorological and microbiological) to provide a holistic understanding of past, current and predicted subsurface system behavior.

Tools for this integration have been developed (and are continuing to be enhanced) by both DOE and university researchers, and are currently applied primarily in the context of research efforts. This application typically involves numerous manual steps in data integration and processing, which are associated with substantial turn-around times between data acquisition and result availability.

There is a substantial value and increasing interest to having this kind of information available for operational efforts, for instance for site remediation and monitoring. This motivated a STTR proposal by Subsurface Insights and Lawrence Berkeley National Laboratory to develop a Predictive Assimilation Framework for subsurface process prediction.

This framework should allow for the automated integration of heterogeneous data with advanced models and the delivery of the resulting information on subsurface processes in near real time in an actionable manner to different stakeholders. This framework is being implemented as a cloud based application. The feasibility of this framework was demonstrated in Phase I of the STTR, and Subsurface Insights was recently selected for the Phase II effort.

In our poster we will discuss the current status and capabilities of this framework as well as the roadmap for framework enhancement in Phase II. The framework is being developed and demonstrated using data from the LBNL Rifle site, and is synergistic with data management and research efforts occurring under the LBNL SFA. Planned enhancements are focused along two thrusts: enhancements of technical capabilities (which have to do with increasing what the framework can do) and enhancements of the underlying software implementation (which has to do with ensuring that the framework can be easily deployed at multiple sites, is robust, and provides for data and result security).