

## **DOE EMSP Progress Report, Project 87023**

### **1. Research Objective:**

DOE and other Federal agencies are making a significant investment in the development of field analytical techniques, nonintrusive technologies, and sensor technologies that will have a profound impact on the way environmental monitoring is conducted. Monitoring and performance evaluation networks will likely be based on suites of in situ sensors, with physical sampling playing a much more limited role. Designing and using these types of networks effectively will require development of a new paradigm for sampling and analysis of remedial actions, which is the overall goal of this project. Specifically, the objectives of this project are to create an adaptive framework that will: (1) enable effective interpretation of non-intrusive monitoring data, (2) improve predictions and assessment of remediation performance, (3) develop decision rules for on-site adaptive sampling and analysis, and (4) enable more informed decision making and risk analysis of long-term monitoring systems.

### **2. Research Progress and Implications**

As of 9 months of a 3 year project, we have made progress on several tasks. The Argonne team has gathered available data from the Argonne 317/319 site and sent it to UIUC last week (their funding was delayed until recently). The data are now under review and analysis. Two research assistants have received training and performed literature reviews on spatial geostatistics, interactive genetic algorithms, and analytical software needed for this project. An interactive genetic algorithm code has been obtained and successfully implemented on test functions. A user interface for the interactive genetic algorithm has been designed and partially implemented. Two models of user preferences have also been created and successfully implemented on test functions.

### **3. Planned Activities**

Within the next year, we plan to:

- Review the field data
- Create a three-dimensional transport model from the data that will be used to generate artificial “ground truth” data
- Create artificial “measured” data using Monte Carlo simulation from distributions around the ground truth data. The distributions will be created based on the Argonne team’s assessment of the precision of different types of measurements and detection limits.
- Begin creating space-time statistical models with Markov Chain Monte Carlo updating from the field and artificial datasets. Begin exploring combinations of these models with simple analytical and numerical models.
- Collect and analyze data from the phytoremediation systems at the 317/319 site. Investigate how this data correlates with existing contaminant concentration and water level data.

### **4. Information Access**

No publications or results are available yet.