Breakout Session Report
ARM/ASR User and PI Meeting
March 16-20, 2015

Session Title: ARM/ASR/NGEE: Building collaboration in Alaska
Session Date: 18 March 2015
Session Time: 1:30pm
Summary Authors: Matthew Shupe, Stan Wullschleger, and Mark Ivey

Main Discussion

The primary objective of this session was to explore priority areas for coordination and leveraging among the ARM, ASR, and NGEE programs. It was noted that all of the programs have interests in developing coupled-system, process-level understanding and improving predictive capability in the system. Initially this coordination will focus on the Arctic region because of the intensive focus of all three programs there, but also because of the significant and influential changes occurring there. To set the stage for the session we had three overview presentations, one from NGEE-related themes (Margaret Torn), one an overview of the ARM ACME flights on the North Slope (Sebastien Biraud), and one with perspectives on atmosphere-surface interactions in a coupled system (Matthew Shupe). These presentations nicely illustrated the surface, sub-surface, and atmosphere systems and their interactions. Moreover, the potential intersection of programs became clear to many (most?) in the room. Following these presentations we engaged in open discussion on a few general science questions/topics/areas.

- How are the atmospheric, surface, and sub-surface energy budgets related? Given our best information, can we achieve energy budget closure?
- How do atmospheric processes shape/modulate the annual evolution of sub-surface processes?
- What is the influence of spatial heterogeneity in the atmosphere and land (inundation, soil moisture, energy balances, etc.) for understanding surface exchange processes? How is spatial variability quantified, characterized, and upscaled for appropriate representation in models?
- Can trends in the sub-surface system be traced to trends in the atmospheric system? Do we have sufficient measurements to observe these?

Potential areas for coordination among the programs were discussed. Specifically on the ASR side, the LACI group is working on a white paper to outline ASR priority areas for land surface research. We should inject ideas into that process in order to get Alaska activities into the plan. Additionally, NGEE-Arctic is currently in the process of re-proposing for the next 4 year period (later in 2015). This project is likely to be supported, and there is currently the opportunity to incorporate new ideas into the NGEE activities that are proposed.

Specific science areas relevant to the coupled atmosphere-surface system were discussed, including:

- The coastal area around Barrow and Oliktok Point is a good place to focus in part because of the resources available (and airspace), but also because of the import climate changes in the area, perhaps related to sea-ice and ocean changes.
- BioGeoChemistry aspects should also be included because these are “coupled” with other aspects of the terrestrial domain.

- Spatial heterogeneity was a major theme of the discussions. On 3-10m scales there is significant variability in albedo, temperature, moisture, surface fluxes, soil/surface type, etc. How does this variability influence the aggregate scale energy, moisture, and gas exchange? What level of complexity is needed to represent this system and the different scales of variability in the land versus that atmosphere?
- Closure study: There was some discussion both during and after the session on the idea of closing some budgets, specifically the energy budget. Can we measure the atmospheric fluxes that represent some spatial domain and then estimate the soil fluxes also in that same domain?
- Spatial variability of soil moisture relative to spatial variability in precipitation distribution is important for considering surface wetting or drying processes.
- Unmanned aircraft as a key tool: There was interest in using unmanned systems to observed spatial variability in surface type and other parameters (NDVI, radiation, turbulent heat fluxes, gas concentrations, etc). For example, there would be 1-2 flights per week for the full summer season to track the evolution. It was noted that there is a DOE workshop on UAS needs/priorities (cross program) in May 2015. This would be an opportunity for identifying ways to coordinate measurements for terrestrial and atmospheric research.
- Overall the session was very successful in that the different communities were able to educate each other on the important considerations and explore ideas for interfacing to study the coupled system. It was widely recognize that there are a number of key areas for coordination that would be a great benefit for developing coupled models and of apparent high value to DOE.

Needs

Need to explore ways to formalize interactions among the communities/programs, at the programmatic and science support level. Some of the science topics that were discussed are on the margins of, or outside of, what the different programs typically support; there has not traditionally been support for them. Is there a way to find cross-program collaboration/funding for some of these topic areas? One thought was that the TES program may be interested in slightly broadening their call to include coupled-system impacts on the terrestrial system. There may also be the potential for reaching out to the DOE modeling programs to address the coupled-system modeling aspect of the problem. There was some agreement that such modeling efforts reside somewhere between the different programs but should be of interest.

Future Plans

Generally the ideas discussed in this session should be folded into the ASR LACI group and pursued via that channel. Additionally, it was noted that there are opportunities for future NGEE-ARM-ASR collaborations in the tropics. NGEE-tropics is starting soon and ARM has made measurements in the tropics. These programs could have a similar session focused more on tropical topics in the future.

Action Items

Matthew Shupe will interact with Torn, Berg, Turner and others in LACI to represent Arctic interests in the LACI design and discussions. Mark Ivey will interact with Sebastien Biraud, Margaret Torn, and Beat Schmid on possible NGEE/ASR/ARM interactions related to overflights of G1 this summer in Alaska.