

Report of the 1st Biogeosciences Strategic Initiative Advisory Committee Meeting, June 21-22, 2004

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Preamble

The Advisory Committee of the NCAR Biogeosciences Initiative was convened at the request of NCAR Director Tim Killeen and Associate Director Larry Winter, who asked the committee to review the progress and potential of the Initiative.

The Advisory Committee met at NCAR on June 21-22 2004. Prior to the meeting, the committee was provided with no material other than a website address pointing to the Strategic Plan. At the introduction, Dr. Larry Winter, NCAR Associate Director, discussed the charge to the committee, provided a brief history of the BGS Initiative, and brought the committee up to date on the NCAR reorganization. Dr. Elisabeth Holland, Lead of the BGS Initiative, gave an overview of BGS highlights, which was followed by four formal 15-minute presentations on different directions of BGS research. The Advisory Committee met with the BGS scientists and personnel in two groups – pre-tenure and post-tenure scientists. This report is written based on information gleaned from the interviews and with discussions with Dr. Elisabeth Holland, and with Drs. Tim Killeen and Larry Winter.

Summary

The new Biogeosciences Strategic Initiative was established to coordinate Biogeosciences (henceforth BGS) research within NCAR and build on existing strengths across several of the existing Divisions. It has succeeded in this effort admirably, in the process creating a formalized BGS community within NCAR – something that did not exist before.

We see the Biogeosciences Initiative as an important development at NCAR and encourage continued support and growth. The Biogeosciences Initiative has clearly enhanced coordination and communication among the many NCAR scientists who do work related to the broad area of Biogeosciences, has provided a place for the development of integrative topics that span NCAR Divisional boundaries, and is recognized by the community at large as an important effort. Building on this success requires establishing a more formal organizational structure within which BGS can function successfully within NCAR. Divisional management deserves recognition of their flexibility in cooperating and facilitating development of BGS.

1. Scientific Quality and Merit

Biogeosciences spans an incredibly wide range, touching virtually all areas of environmental research. The topics chosen for focus by the NCAR Biogeosciences Initiative are appropriate to the NCAR mission and central to overall biogeosciences. Scientific quality appears strong, and appropriately leverages ongoing programs within Divisions.

A major strength of BGS is the quality of the early career scientists who are working within it (and who constitute the major use of funds). BGS has clearly enhanced coordination and communication among the many NCAR scientists who do work related to the broad area of biogeosciences, and has provided a place for the development of integrative topics that span NCAR Divisional boundaries.

The BGS initiative is new, and it is premature to judge its scientific impact (in addition to the fact that we did not receive materials that would allow for a thorough science review). Nonetheless, there are specific areas where NCAR is providing leadership within the BGS community:

- Addition of biogeochemical cycles of C, N, dust/VOC/aerosols within the CCSM, as well as exploration of the feedbacks between land cover and climate;
- Observational facilities development, in particular the development of community-requestable, ground-based and airborne instruments focused on BGS research, such as the inexpensive CO₂ network instrument and the ¹³C/¹²C laser;
- Data assimilation approaches to improving parameterizations in carbon and N cycle models;
- Regionally focused field/modeling campaigns designed to combine modeling with measurements to extrapolate fluxes from local to regional scales in heterogeneous terrain;
- N-cycle science planning.

There is increasing recognition of the BGS program externally, as evidenced by the visibility of BGS personnel within the new IPCC assessment, and the acquisition of external funding (e.g. through NSF Biocomplexity funded proposals) to support the Carbon in the Mountains Experiment (CME) and the ¹³C laser. Community visibility is also growing as NCAR BGS sponsors workshops to set the scientific agenda for the N cycle and transfer methods for data assimilation. Future, planned workshops will focus on guiding future development of and increasing community awareness of the availability of NCAR models, instrumentation and facilities.

The committee was not given enough information to make a more thorough assessment of the science, but we were concerned that there does not appear to be an internal mechanism to evaluate scientific progress for the BGS initiative, or a clear set of short- to mid-term goals.

2. Goals of the Program

The three stated long-term science questions of the Biogeosciences Initiative are broad and all-encompassing, making it difficult to measure progress. We recommend formulation of a set of near-term goals that are more focused on the contributions NCAR BGS can make (or lead) in a 5-10 year framework.

The four initial tasks identified by BGS grow out of existing programs: (1) coupled biogeochemistry/climate models emphasizing C and N cycles that cross spatial scales, (2) coupled chemistry/climate models that include biogenic trace gas emissions for predictions of regional air quality, including changes due to wildland fires; (3) integration of models and measurements, and testing of data assimilation methods to scale CO₂ fluxes over mountainous (heterogeneous) terrain; (4) impacts of human land cover change (particularly agriculture and urbanization) on biogeochemical cycles and climate. Each of these four areas has identified participants and a strategy with articulated short-term goals; each also receives most of its support from either NCAR Divisions or external funding. BGS has facilitated and augmented Division-sponsored efforts by adding funds to provide support for and foster collaboration among junior scientists working within these efforts, or to pay for development of new instrumentation.

Within the four identified tasks there are clear short-term goals and prioritization of how resources will be allocated. However, it is unclear how priorities are set across projects, or whether a mechanism (beyond consensus among the steering committee) for setting these priorities exists.

3. Internal and external collaborations

BGS is clearly well linked to a number of NCAR cross-cutting initiatives, particularly the Wildland Fire R&D Collaboratory and the Weather and Climate Impact Assessment Science initiatives, but in the future also to the Water Cycle Across Scales initiative. It is also clearly linked to the core areas of research in many of the Divisions. A major role of BGS is fostering interactions between Divisions and in particular bringing together modeling and measurement components at NCAR to the benefit of both groups.

BGS at NCAR has engaged in four types of activities that benefit the larger science community:

- (1) Developing and integrating biogeosciences components (e.g. N and VOC) into the CCSM which will be downloadable by the scientific community within a year or two;
- (2) Developing new tools and community-requestable instrumentation.
- (3) Developing model/measurement integration as part of regional flux studies.
- (4) Engaging the broader community through science planning activities (e.g. N workshop) and workshops (e.g. Carbon Data Assimilation System).

The carbon in the mountains (CME) project provides an excellent example of how NCAR can augment/add value to a university-led field campaign. We encourage efforts to inform the broader biogeosciences community of the availability of these resources.

4. Relevance to national and international societal needs

BGS scientists are involved in developing the first US community-based coupled earth system model, which is of strategic national importance. Policy informative predictions of dust, VOC, air quality, CO₂ and land surface properties for the next century will come from the efforts of the CCSM community. Further, BGS scientists are actively leading and participating in international science programs (e.g. global VOC emission algorithms) and future assessment activities.

NCAR is unique in providing codes, instrumentation, expertise, and platforms (tower/aircraft) that facilitate field operations by the broader biogeoscience community. Student training opportunities are also available (e.g. through laboratory facilities, ASP postdoctoral fellowships, SOARS), and should be expanded if possible (e.g. NCAR graduate research fellowships).

5. Management structure

The Initiative management structure at present is appropriate to a limited effort that mostly provides a means for fostering collaboration among existing Divisional programs and seeding small projects. However, if BGS is to evolve and perhaps begin major new initiatives, more management support and institutionalized structure is required.

Within the context of an evolving institutional reorganization, we identified the following areas of concern for the future of the BGS initiative:

- (1) The initiative leader seems to have no power beyond persuasion to influence BGS-supported scientists— she has no voice in promotion procedures, and must negotiate personnel actions with the various Division leads.
- (2) While the junior scientists associated with the BGS initiative appeared happy overall with their status, there is the potential for future conflicts if it is unclear to them how their participation in BGS affects their job evaluation/promotion procedures. The junior scientists do not know how they are being evaluated and the fact that BGS is not formally participating in their evaluation, even though BGS is paying part of their salaries, may ultimately lead to a lack of commitment to the initiative (i.e. BGS-related tasks will be assigned lower priority if they are perceived to conflict with Division-related tasks). The junior scientists also contribute to internal NCAR progress reports and planning documents for their Divisions and the numerous Initiatives they participate in. The number of such documents (6-8 in a year for some) appears excessive, particularly for their career levels, and should be streamlined.
- (3) The potential tension between maintaining or increasing support for crosscutting programs like BGS, while at the same time keeping them from appearing to compete with the Divisions for resources, is a concern. BGS should remain a crosscutting, interdisciplinary effort rather than becoming a Division itself.

(4) The BGS initiative presently seems to lack a clear mechanism for strategic planning or setting of priorities. However, with no participation in the annual NCAR budgeting and personnel processes, it is difficult for BGS to independently define its priorities.

6. Should the initiative become permanent?

Yes, BGS is integral to the mission of NCAR. With that said, however, we saw little in the way of a vision for how the BGS initiative should evolve in the future. Our recommendations under management structure address this to a limited degree.

7. Specific comments on this advisory/review process

The advisory committee received very little advance information about the Biogeosciences initiative, the role of BGS within the NCAR structure, or the specific charge of this committee, prior to our arrival at NCAR. We felt that the information we were supplied was inadequate to conduct a formal review either of the science being conducted or of the scientists; hence our comments here are general rather than providing specific scientific recommendations. While we understand that both the NCAR Initiatives and attempts at their review are only recently established, we encourage NCAR management to give better direction and information to future review/advisory groups.

8. Specific Recommendations

1. Because it has evolved from existing Divisional programs, the BGS initiative appears to lack a coherent theme. The highest priority is for this group to develop a detailed 'road map' – a coherent science plan with specific, achievable (in the 5-10 year time frame) objectives that includes an estimate of what resources (people and money) would be required to achieve those goals, a process for evaluating achievements, and identifies the relationship of work at NCAR BGS research to the rest of the community. The road map should be developed in collaboration and in consultation with the Divisions and the other new Initiatives.
2. Formulate overarching goals of BGS to be more specific to the special role of biogeosciences within NCAR and to be in concert with the mission of NCAR (e.g. "predicting atmospheric composition and its link to climate" as opposed to "improved understanding of biogeochemical cycles", "development of atmospheric simulation and observing tools and infrastructure specific to BGS issues.")
3. Build a formal process for prioritizing allocation of resources within the BGS initiative that is clear to all the scientists within BGS.

4. If the BGS initiative is to grow, the initiative leader should have the formal authority to participate in NCAR budget planning and annual personnel decisions, and should be given compensation and appointment level appropriate to this increased management role.

5. Human dimensions should inform scientific planning. Many of the scientific issues NCAR BGS is addressing are rooted in concerns about atmospheric impacts on humans, or human influence on the atmosphere. Close collaboration with social scientists can result in this research being put to good use, and can help to sharpen and focus the BGS initiative's research agenda.. We encourage involvement of BGS in parallel initiatives on assessment and societal problems.