

Final Technical Report for Northeastern Regional Center of the DOE's National Institute for Climatic Change Research – DE-FC02-06ER64157

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OVERVIEW:

Administration of the NERC of NICCR began at Penn State in December of 2005 and ended in December of 2011. During that time, five requests for proposals were released and five rounds of proposals were reviewed, awarded and administered. Throughout this award, 203 pre-proposals have been received by the NERC in five RFPS and 110 full proposals invited. Of the 110 full proposals reviewed, 53 were funded (most in full, some partially) resulting in 51 subcontracts. These awards were distributed among 17 universities and 3 non-governmental research institutes. Full proposals have been received from 29 universities and 5 non-governmental research institutes. Research activities have now been completed.

PROCESS:

The process of requesting and reviewing proposals was coordinated with the other NICCR regional centers so that they coincided in time and the proposals were treated similarly in the review process. Each request for proposals was released and broadly disseminated a few months prior to the due date for required, one-page pre-proposals. The pre-proposals were reviewed by 8 to 12 reviewers, including each regional center director, the DOE NICCR program manager, 2 reviewers selected by the DOE program manager, and 2-3 reviewers selected by the NERC Director. These review ratings, based upon both the relevance of the pre-proposals to the RFP and their scientific merit, were combined numerically and anonymously by one member of the DOE NICCR management team (Amthor, first three years; NERC, fourth year; MWRC, final year), and distributed in aggregate (mean, median, range) to all regional center directors. Each center then proposed a selection of pre-proposals to be invited for full proposals. *The number of pre-proposals invited for full proposals was chosen to ensure a success rate in the full proposal review process no lower than approximately 30%.* Typical project budgets were small, roughly \$125K/yr. This limited the program to relatively simple projects, but enabled broad participation by the research community in the DoE research agenda.

The review of Penn State proposals was handled by the DOE NICCR program manager to avoid conflicts of interest. In all other cases, the NERC has chosen a combination of ad-hoc reviews and a panel to evaluate full proposals. Both the reviewers and the panelists were selected by the NERC Director (Kenneth Davis) and Associate Director (David Eissenstat), whose expertise is complementary (Davis is a Meteorology professor expert in micrometeorology and the carbon cycle; Eissenstat is a plant physiologist expert in roots and soil processes who heads the Penn State Ecology graduate program). Three ad hoc reviewers and two panelists reviewed each full proposal. Panelists met at Penn State for a day and synthesized the reviews in group discussion, ranking the proposals

into ‘highly recommended’, ‘recommended’, ‘fund if funds available’ and ‘do not fund’ categories. The Director and Associate Director participated in this discussion process, but the panelists were asked to propose the rankings. In all cases, these recommendations were followed in order to determine those proposals selected by the NERC for support. The NERC recommendations for support were then presented to the entire NICCR management team (regional center directors and DOE program manager), and pending discussion in that forum and approval by the DOE program manager, a request for supplemental funding for support of these projects was prepared and sent to the DOE.

Penn State then issued subcontracts to those institutions whose proposals were selected for funding. Annual progress reports were required prior to the end of each annual budget period, and final reports were required shortly after the project end dates. We are in possession of an archive of progress reports and final reports.

All full proposals, funded or not, received a full set of reviews and a panel summary with an overall rating of their proposal. Several investigators who were not funded chose to submit revised proposals to successive RFPs. For such repeat submissions, we sought some continuity among reviewers for revised proposal submissions, and provided panelists with past reviews in order to avoid the problem of “oscillating criticism” (cases where proposals are critiqued from opposing points of view, making it difficult to satisfy reviewers in any case), and to encourage the proposing scientists to clearly and convincingly address prior critiques. Pre-proposals did not receive any reviewer comments. The Director attempted to answer questions from scientists who raised questions about the rejection of a pre-proposal.

In addition to formal reports to the DOE, our center activities were reported to the research community through a regional center web site that included abstracts for all funded research projects, an archive of the past requests for proposals, and a summary of the products of our Center’s funded research activities. Products that were reported included publications, data sets and model codes developed, and research highlights. The regional center conducted synthetic research aimed at supporting and building upon the research activities of a large number of the research projects supported by the NERC. NERC PIs have been encouraged to participate in appropriate professional meetings and interagency research programs (e.g. the North American Carbon Program; Ecological Society of America).

Our broad solicitation for pre-proposals drew in a large number of responses from non-governmental investigators conducting NICCR-relevant research in the northeastern United States. Center management was able to solicit high-quality reviews from across the nation, and the complementary expertise of the director and associate director aided both in this process, and in the process of crafting the request for proposals that were issued each year. The participation of the Director and Associate Director in a wide range of professional and program meeting aided in raising the visibility of NICCR, and provided close contact with the research community. *Penn State requested no indirect*

costs on subcontracts administered via this program since an administrative budget was already provided by the DOE to run the center, increasing the DOE funds available for research activities.

The research foci of the requests for proposals from the NERC were crafted to complement, build upon and cut across the research interests of the DOE climatic change research program. The research complemented DOE's Terrestrial Ecology Program and the Terrestrial Carbon Processes program by soliciting experiments and measurements that complement ongoing research in these areas. In addition, the RFPs solicited research into feedbacks between the terrestrial energy and water cycles and climatic change, prognostic biogeography and climatic change, and research that synthesizes core measurements or experiments in any of these areas into predictive models of how terrestrial ecosystems and climatic change are likely to interact. By supporting research at academic and non-governmental institutions, the DOE research agenda was enriched by interaction with investigators involved with related agencies and research agendas. The regional focus of the NERC further ensured that the ecosystem-climate interactions in the northeastern United States received at least a modest amount of dedicated attention from the DOE climatic change research program. Since smaller research awards were encouraged, a large number of different investigators contribute to NICCR. It is important to note that this overall research program, while adding value to the DOE climatic change research program, was also quite dependent upon a framework of DOE research including manipulative experiment and flux towers, and also core programs of other agencies (e.g. forest inventories from the USDA-FS; terrestrial remote sensing from NASA). It is important that NICCR periodically review the base upon which its synthetic, value-added research focus rests, and contribute to this base when and where appropriate.

IMPLEMENTATION DETAILS:

The NERC developed, in coordination with the other regional centers, a broad distribution list for request for proposals. In addition to a list of individuals who contacted the NERC directly and requested to receive notice of funding opportunities, and posting the RFPs on the NERC web site (<http://www.niccr.psu.edu>) and the national NICCR web site (<http://www.niccr.nau.edu>), the RFP was distributed to the following email lists and web sites:

Email lists:

AmeriFlux	Ameri.Flux@lists.unh.edu
Ecological Soc of America	ECOLOG-L@LISTSERV.UMD.EDU
Soil Sc Soc of America (S-7 group)	forsoils@u.washington.edu
Agronomy Community:	strslist-On@ashs.org
	Rhizlist-on@ashs.org
Isogeochemistry Listserv	ISOGEOCHEM@LIST.UVM.EDU
Agronomy Society of America (ASA):	headquarters@agronoy.org
Crop Soc of America (CSA):	headquarters@crops.org
Soil Science Society of America (SSSA):	headquarters@soils.org
Community of Science	funding@cos.com

Grants Resource Center (GRC)
NIGEC NERC email list
Geography Community
American Meteorological Soc
AGU-Atmospheric Chem (Secrtry)
AGU-Biogeosciences (Secretary)
Tx Research Admnstrs Group
Penn State funding notices listserv
SPIN
Penn State Easterling Group

Thompsonsone@aascu.org
(stored at Penn State by the NERC staff)
L-GEOGCOMM@lists.psu.edu
through bfarley@ametsoc.org
wennberg@gps.caltech.edu
mavoytek@usgs.gov
tram@asu.edu
jxp5@psu.edu
cbrownell@infoed.org
plc103@psu.edu

Websites:

AGU Biogeosciences
ESA ecophys

www.agu.org/sections/biogeo/
www.biology.duke.edu/jackson/ecophys

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The review process was handled in a very timely fashion. Decisions concerning pre-proposal were issued within a month of receipt of the pre-proposals. Decisions concerning full proposals were delivered within 3 month of receipt of full proposals. Subcontract funding was put in place approximately 6-8 months after the receipt of full proposals.

Panelists for the NERC have been: RFP1) Gaby Katul, Duke; Paul Moorcroft, Harvard; Peter Curtis, Ohio State; Yiqi Luo, U. Oklahoma; Mac Post, ORNL; Yude Pan, USDA-FS; RFP2) Julie Jastrow, Argonne; Mac Post, ORNL; Xuhui Lee, Yale; Christine Goodale, Cornell; Dev Niyogi, Purdue; RFP3) Rich Norby, ORNL; Charles Canham, Institute for Ecosystem Studies; Peter Curtis, Ohio State; Martha Anderson, USDA-ARD; Robert Sinsabaugh, U. New Mexico; and RFP4) Rich Norby, ORNL; Charles Canham, Institute for Ecosystem Studies, Marc Fischer, LBNL and Hanqin Tian, Auburn Univ. RFP 5 was reviewed by a panel of approximately 12 scientists who were consulted via teleconference for the final single-year projects to be selected.

In addition to Director Kenneth Davis and Associate Director David Eissenstat, current NERC personnel included Linda Altamura, Administrator, Brett Raczka, Graduate Research Assistant, and Nathan Urban, Postdoctoral Fellow. Altamura handled administrative issue for the center, and Raczka and Urban assisted with scientific syntheses, ranging from editing scientific content for the center web site to performing original research in support of and synthesizing NICCR investigations.

Presentations (individual project reports available on request).

Research products (more complete lists available from individual project reports, available upon request):

(Davidson & Trumbore, The Woods Hole Research Center, University of California, Irvine)

Soil respiration data will be updated annually on the Harvard Forest web site:

<http://harvardforest.fas.harvard.edu/data/p00/hf006/HF006-data.html>

Data for radiocarbon measurements (downloadable Excel files) are available at:

https://webfiles.uci.edu/setrumbo/public/NICCR/2006_incubations.xls

https://webfiles.uci.edu/setrumbo/public/NICCR/2006_2008serita_plotsall.xls

<https://webfiles.uci.edu/setrumbo/public/NICCR/summarynwnplot.xls>

Spatial Datasets (Goodale/Ollinger project)

Climate drivers for the northeastern U.S. (140 years on a 10 km grid) based on model output from the GFDL climate model have been provided to the research team at UNH by Dr. Hayhoe of Atmos Research. Ancillary data layers such as soil and vegetation type are being compiled at UNH in preparation for running the PnET model. Atmos Research is prepared to provide climate predictions for other GCM models once these components are in place.

In support of this project, the suite of PnET models has been rewritten in a 4th generation programming language (MATLAB) in order to facilitate the structural additions proposed in this work and reduce the effort required to produce large spatial simulations and output visualization. PnET has always been a public model and the newly developed code base is available on the website (<http://www.pnet.sr.unh.edu>).

(Dail/Davidson Project, University of Maine, Woods Hole Research Center)

Available Data: <http://howlandforest.org/>

<http://cdiac.esd.ornl.gov/>

(Foster/Hadley Project, Harvard University)

Available Data: ftp://ftp.as.harvard.edu/pub/nigec/HU_Wofsy/hf_data/Final

(Munger/Wofsy Project, Harvard University)

All data for carbon pools, carbon fluxes, and atmospheric gas concentrations located at:

<http://www.as.harvard.edu/data/nigec-data.html>

Flux and plot-based biometry data are current at:

ftp://ftp.as.harvard.edu/pub/nigec/HU_Wofsy/hf_data/

ftp://ftp.as.harvard.edu/pub/nigec/HU_Wofsy/hf_data/ecological_data/

(Varner/Crill Project, University of New Hampshire, Stockholm University)

Data Available: <http://harvardforest.fas.harvard.edu/data/p06/hf068/hf068.html>

(Richardson/Davidson/Dail Project, Harvard University)

Datasets are archived at:

ftp://epg-ftp.umaine.edu/NICCR/Soil_R/

ftp://cdiac.ornl.gov/pub/ameriflux/data/Level1/Sites_ByName/Howland_Forest_Main/biological_data/

<http://harvardforest.fas.harvard.edu:8080/exist/xquery/data.xq?id=hf006>

(Xiao/Ollinger/Richardson, Univ. New Hampshire)

The research data and model products of this project include:

- (1) Compiled site-level data for Bartlett Experimental Forest and Hubbard Brook Experimental Forest (e.g., climate, carbon fluxes and stocks, water fluxes, N fluxes and stocks);
- (2) A modified PnET-CN model that runs at the daily time step and is implemented in C that is more capable for data assimilation, large-scale modeling, and supercomputing than the original versions (Visual Basic and Matlab);
- (3) A data assimilation framework based on Markov chain Monte Carlo (MCMC) implemented in R for both single and multiple data constraints;
- (4) Integrated PnET-CN and MCMC (PnET-MCMC) that is implemented using both C and R;
- (5) Probability density functions (PDFs) and uncertainty estimates of key model parameters; and
- (6) Probabilistic model simulations and uncertainty estimates for Bartlett Experimental Forest for the 21st century under different emission scenarios (A1B, A2, and B1) for both default and optimized model parameters.

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