Office of Biological and Environmental Research Global Change Education Program (GCEP)

Double Tree Hotel
Washington, D.C.

Rickey Petty
August 12, 2007
- Atomic Energy Act of 1954 (PL 83-703)
- Federal Non-nuclear Energy Research and Development Act of 1974 (PL 93-557)
- Department of Energy Organization Act of 1977 (PL 95-91)
The DOE Mission

…advance the national, economic, and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex.
5 strategic themes

- **Energy Security:** Promoting America’s energy security through reliable, clean, and affordable energy

- **Nuclear Security:** Ensuring America’s nuclear security.

- **Scientific Discovery and Innovation:** Strengthening U.S. scientific discovery, economic competitiveness, and improving quality of life through innovations in science and technology

- **Environmental Responsibility:** Protecting the environment by providing a responsible resolution to the environmental legacy of nuclear weapons production

- **Management Excellence:** Enabling the mission through sound management
Major DOE Labs & Field Facilities

Update September, 2005
NOTE: Location within each state is not to scale

LEGEND:
- Operations Offices
- Production/Cleanup
- Laboratories
- Field Offices
- Site or Project Offices
- Special Purpose Sites/Offices
- Power Administrations
- NNSA Service Center
- Washington D.C. Headquarters
Top Five Government Research Organizations for*:

<table>
<thead>
<tr>
<th>Physical Sciences</th>
<th>Environmental Sciences</th>
<th>Mathematics &amp; Computing</th>
<th>Engineering</th>
<th>R&amp;D Facilities**</th>
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<tbody>
<tr>
<td>1. Energy (2,012)</td>
<td>1. NASA (1,051)</td>
<td>1. DOD (657)</td>
<td>1. NASA (1,948)</td>
<td>1. Energy (939)</td>
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<td>2. NASA (1,019)</td>
<td>2. NSF (481)</td>
<td>2. Energy (623)</td>
<td>2. DOD (1,837)</td>
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<td>3. DOD (383)</td>
<td>3. NSF (399)</td>
<td>3. Energy (851)</td>
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<td>4. DOD (412)</td>
<td>4. INTERIOR (364)</td>
<td>4. HHS (127)</td>
<td>4. NSF (484)</td>
<td>4. NSF (271)</td>
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<td>5. HHS (205)</td>
<td>5. Energy (335)</td>
<td>5. COMMERCE (89)</td>
<td>5. TRANS (323)</td>
<td>5. HHS (227)</td>
</tr>
</tbody>
</table>

* Numbers are FY 1999 Dollars in Millions - Source: NSF

** Numbers are FY 1999 Dollars in Millions - Source: OMB
The mission of the Department of Energy's Office of Science is to deliver the remarkable discoveries and scientific tools that transform our understanding of energy and master and advance the national, economic, and energy security of the United States.
Office of Science Programs

- Advance Scientific Computing Research
- Basic Energy Sciences
- Biological and Environmental Research
- Fusion Energy Sciences
- High Energy Physics
- Nuclear Physics
- National Labs and User Facilities
- Office of Work Force Development
Office of Biological and Environmental Research (BER) Mission

BER program has been advancing environmental and biomedical knowledge that promotes national security through improved energy production, development, and use; international scientific leadership that underpins our Nation’s technological advances; and research that improves the quality of life for all Americans.
- Life Sciences & Medical Applications Division
- Climate Change Research Division
- Environmental Remediation Research Division
### BER Funding Profile

**(dollars in millions)**

<table>
<thead>
<tr>
<th></th>
<th>FY 2006 Appropriation</th>
<th>FY 2007 Appropriation</th>
<th>FY 2008 President’s Request</th>
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<td><strong>Biological &amp; Environmental Research</strong></td>
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<tr>
<td>Life Sciences</td>
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<td>282.3</td>
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<td>Climate Change Research</td>
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<td><strong>Medical Applications &amp; Measurement</strong></td>
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<tr>
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<td><strong>Subtotal, BER</strong></td>
<td>439.0</td>
<td>483.5</td>
<td>531.9</td>
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<td><strong>Congressional Direction</strong></td>
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<tr>
<td><strong>Total, BER</strong></td>
<td>564.1</td>
<td>483.5</td>
<td>531.9</td>
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</table>
The Climate Change Research includes process research and modeling efforts to:

(1) improve understanding of factors affecting the Earth's radiant-energy balance;

(2) predict accurately any global and regional climate change induced by increasing atmospheric concentrations of aerosols and greenhouse gases;

(3) quantify sources and sinks of energy-related greenhouse gases, especially carbon dioxide; and

(4) improve the scientific basis for assessing both the potential consequences of climatic changes, including the potential ecological, social, and economic implications of human-induced climatic changes caused by increases in greenhouse gases in the atmosphere and the benefits and costs of alternative response options.
1. Climate Change Research continues to support the Administration’s Climate Change Science and Technology Programs

2. Provide data to develop, test, and improve climate models to simulate and predict responses of climate to increased atmospheric carbon dioxide and aerosols and deliver predictions at regional scales.

3. SciDAC research continues to develop mathematical and computational tools needed for climate modeling.

4. Climate modeling research continues to advance climate models by building cloud system resolving models, including the effect of sulfate aerosols on climate, giving scientists better decadal and centennial scale climate simulations for predicting regional climate.
Atmospheric Radiation Measurement (ARM)
Atmospheric Science Program (ASP)
Climate Change Prediction Program (CCPP)
Ecosystem Research
Global Change Education Program (GCEP)
Integrated Assessment
NICCR (National Institutes for Climate Change Research)
Terrestrial Carbon
ARM World-Wide

ARM Climate Research Facility (ACRF) Sites

Legend
- ACRF Site
- ARM Mobile Facility
- World Countries

Date: April 2007
Source: ACRF ©
ARM Provides Marked Improvements in Global Weather Forecast Models
The Department of Energy's Atmospheric Science Program has as its long-term goal developing comprehensive understanding of the atmospheric processes that control the transport, transformation, and fate of energy related trace chemicals and particulate matter. The current focus of the program is aerosol radiative forcing of climate: aerosol formation and evolution and aerosol properties that affect direct and indirect influences on climate and climate change.
Daytime Thermally-Driven Circulations

- based on DOE’s IMADA field campaign during February - March 1997
- 4 boundary layer sites: 915 MHz radar wind profilers, up to 5 soundings / day

1: slope flows
2: up-valley flow
3: clouds
4: marine density current
5: gap wind
NESTED DOMAINS OF INVESTIGATION IN MILAGRO 2006 FIELD PROJECT

Geographic Overlap of Projects

MIRAGE-Mex
NASA DC-8

MIRAGE-Mex
NSF C-130, KingAir
Ground supersites

MAX-Mex
DOE G-1, KingAir
Ground Supersites

MCMA-2006
CENICA
Supersite

S. Madronich, NCAR
Strategic Planning: The premise for climate change research has changed

Need to answer questions that decision makers/society are asking or will likely ask:

- What will happen? How is climate likely to progress over the coming decades to centuries under different greenhouse gas forcing scenarios? Could human-induced forcing cause abrupt changes in climate, and if so, how abrupt and how much?

- What would climate change mean for us? What are potential impacts on human systems and on ecosystems and resources of value to humans?

- What can we do about it? What are viable options and their efficacy in mitigating or adapting to climate change? When must specific alternatives for mitigation or adaptation be deployed?
Strategic Plan Challenges: Next Generation of Climate Change Research

- Strategic Plan needs to map out DOE’s future investment portfolio in climate change research.

- Where to invest program dollars?
  - balancing process research with computational modeling and model development?
  - Is there an optimal balance, and if so, what is it?

- With constrained budgets, what research should be given the highest priority for funding to improve and provide a sound scientific underpinning of climate and Earth system models, including improving confidence in their application for answering policy relevant questions?
Strategic Plan Challenges … (cont’d)

- How do we ensure information from process research is better represented in models to improve their performance?

- Where does DOE need to play a leading role? Where do we or should we depend on collaboration/partnering with other agencies?

- What is needed to develop state-of-the-art models to effectively and efficiently utilize DOE’s leadership-class computing capabilities?
CCRD Strategic Plan: 5 overall goals

1. Advance climate & Earth systems modeling

2. Improve understanding and model representations of climate processes and Earth system processes that can affect climate

3. Improve understanding of human impacts on and consequences of climate change

4. Improve capabilities and infrastructure for conducting climate change research

5. Manage for results through strategic, problem-driven management approaches
Member Departments/Agencies

- DOE -- Department of Energy
- DOT -- Department of Transportation
- EPA -- Environmental Protection Agency
- NASA -- National Aeronautics and Space Administration
- NSF -- National Science Foundation
- NOAA -- National Oceanic and Atmospheric Administration
- USAID -- U.S. Agency for International Development
- USDA -- U.S. Department of Agriculture
- USGS -- U.S. Geological Survey (Department of Interior)
CCSP Science Elements

- Atmospheric Composition
- Climate Variability and Change
- Water Cycle
- Land-Use/Land Cover Change
- Carbon Cycle
- Ecosystems
- Human Contributions and Responses
The U.S. Department of Energy's Office of Biological and Environmental Research has established the Global Change Education Program (GCEP) to promote undergraduate and graduate training in support of the Department's global change research activities. Global change research encompasses a wide variety of study areas, including atmospheric sciences, ecology, global carbon cycles, climatology, and terrestrial processes. There are two components to the GCEP:

- **Summer Undergraduate Research Experience (SURE).** SURE involves students at the end of their sophomore or junior years and includes an orientation course and mentored research experience at national laboratories.

- **Graduate Research Environmental Fellowships (GREF).** GREF supports graduate students in global change research through collaborations between universities and national laboratories.

- [http://www.atmos.anl.gov/GCEP/](http://www.atmos.anl.gov/GCEP/)
# GCEP DISTRIBUTION *

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*Data From 1999 Through 2007*
## GCEP DISTRIBUTION*

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*Data From 1999 Through 2007*
Many Thanks

- Ms. Donna Holdride - ANL
- Ms. Alicia Wells - ORAU
- Dr. Milton Constantin – ORISE
- Ms. M. Estelle Gilbreth - UALR
- Dr. Nancy Marley – UARL
- Dr. Jeff Gaffney – UALR
Backup Slides