Multiscale Education & Diversity

K to Gray!

Researchers

Graduate

Undergraduate

Public Outreach

K-12

School Visits

Each year:

- 50+ schools
- 20,000 students
- 250 volunteers
- 12 interns
- Schools with diverse populations.
- Diverse group of interns.

Open House

- 8000 visitors
- Science partners

- Journey of a raindrop
- Junior weathercaster
- Clouds and art
- Many more!

Teacher Workshops

- 500+ teachers
- Local
- Regional
- National

Colorado Science Convention

Oglala Lakota College

American Association of Physics Teachers

Summer Teacher Course

- 240 teachers so far.
- 40 CMMAP graduate students involved.

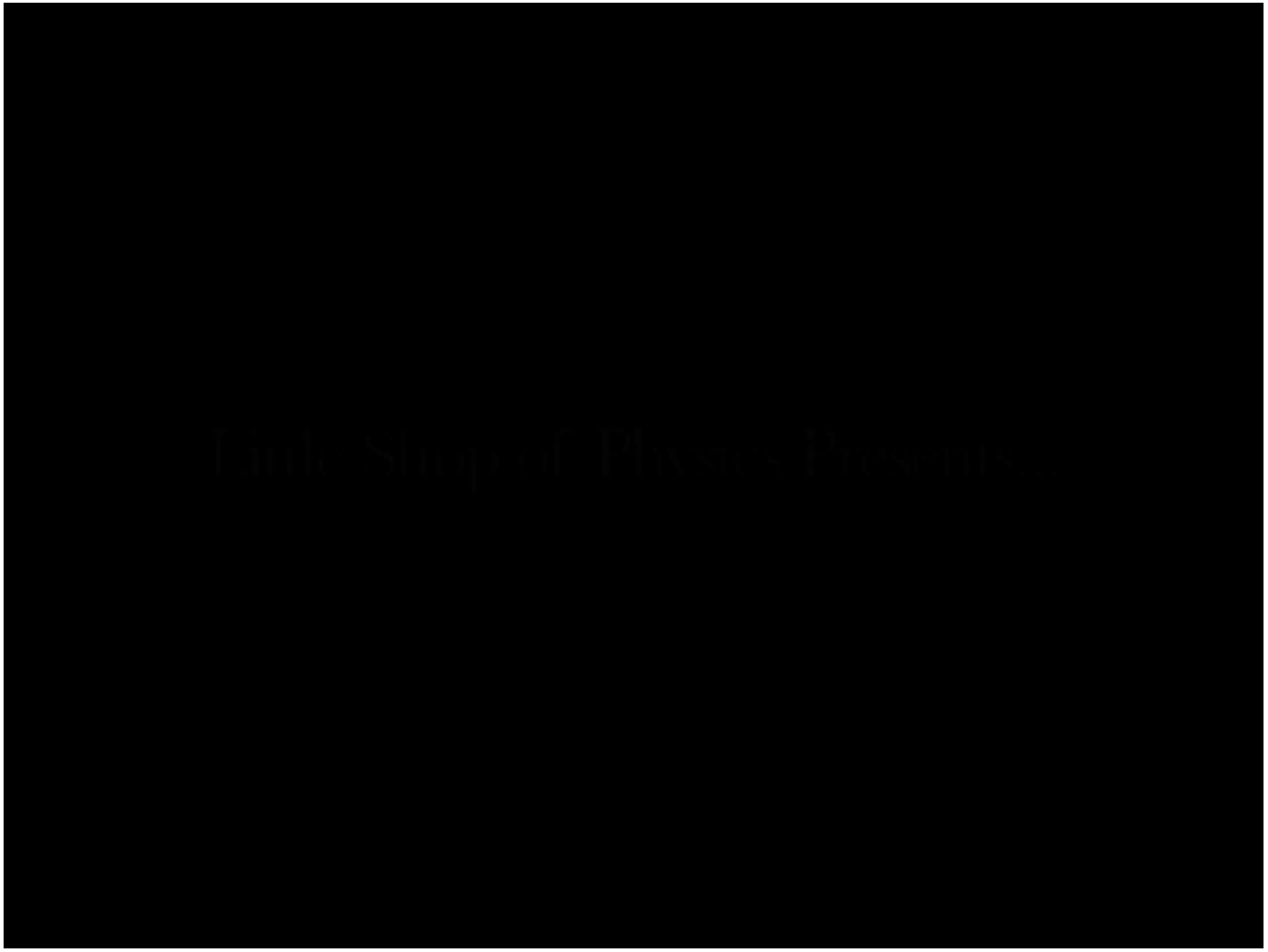
- Now 2 courses, more in future years. "Summer Teacher Institute"
- Evolving in response to feedback from teachers.
- Developing materials to share.

A mix of instructional styles is key.

On the Air

Atmospheric science themed episodes

Everyday Science TV Series



Wind: Blowing Your Way!

Colorado Global Climate Conference

- 500 high-school students & teachers
- Keynotes by
  - Susan Solomon
  - Sally Ride
  - Piers Sellers
  - Warren Washington
- Daylong seminar & workshop series
- Hands-on exhibits
- Career & scholarship information

Supported by

Governor's Energy Office

Hispanic Engineering, Science, and Technology Week

Bringing the LSOP Road Show to Texas!

- Teacher workshops
- Middle School Challenge
- Career Fair
- Community Day

4000 students, 1000 teachers, hundreds of undergrads

Colorado Energy Office

Governor's Energy Office

- Former Governor Bill Ritter issued Executive Orders in 2008 *requiring* reductions in energy use, fuel, water, waste by government operations
- "Greening Government Council"
- Need for employee motivation, education, training

Greening of State Government

Lead by Example

- 5,600 state buildings
- 63 million square feet owned plus 517 leased spaces
- $154 million annual utility budget
- 140 agencies
- 16 Executive Departments
- 30,000 employees
- Fleet ~6000 Vehicles

Greening State Government

Lead by Example Program

From baseline year 2005-06, the State will by 2012 reduce consumption by:

20% - energy

20% - paper

10% - water

25% - petroleum

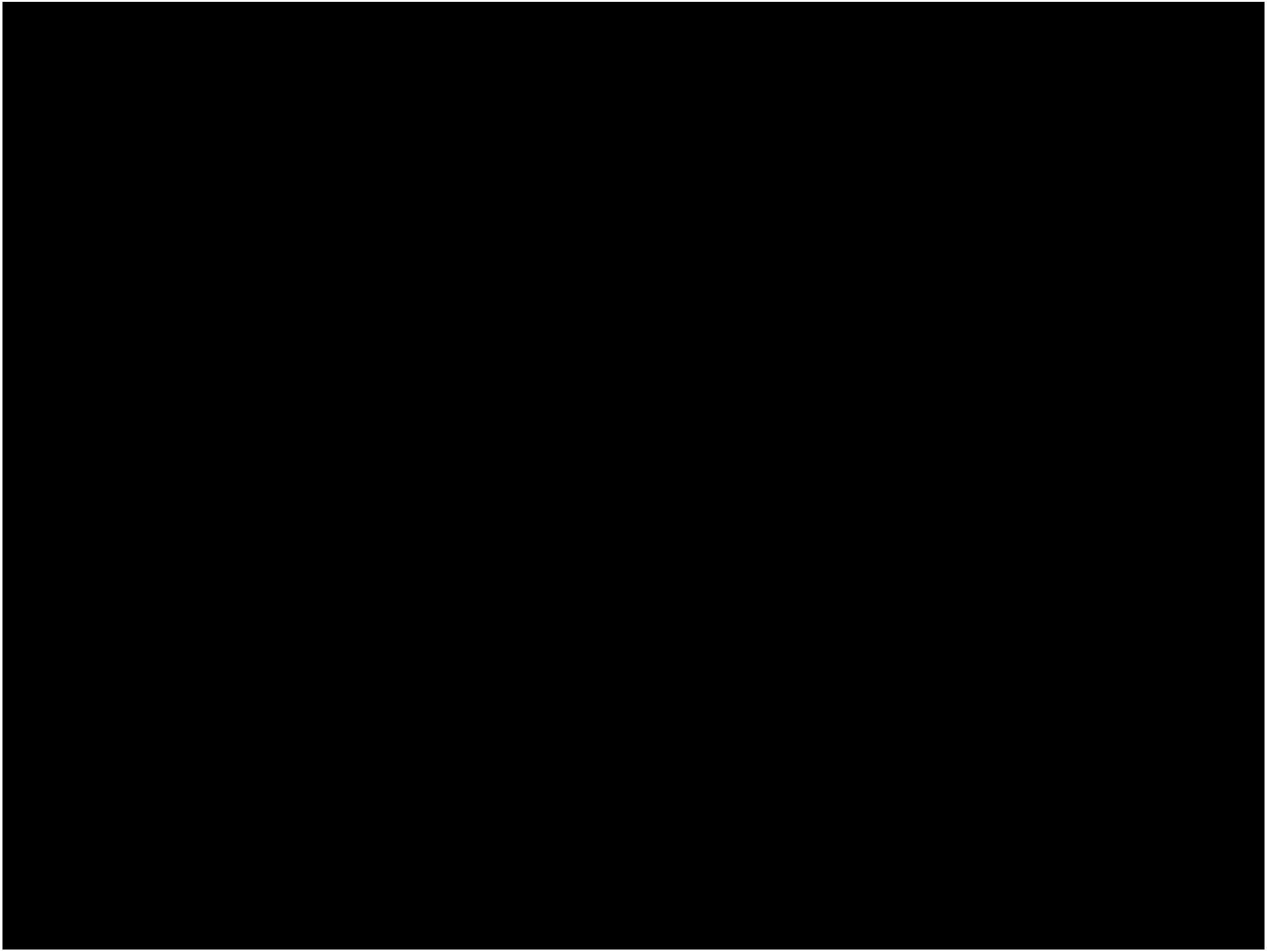
COLORADO ★ GREENING STATE GOVERNMENT ★

CMMAP as "Science Advisor"

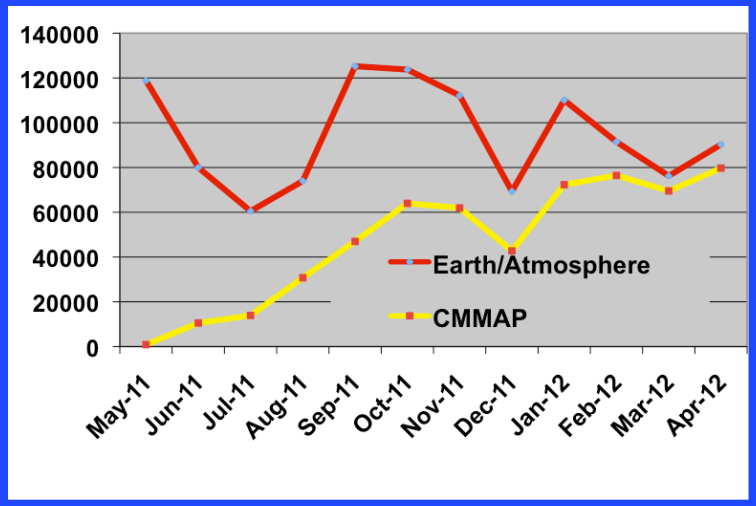
1. Training and Workshops for Agency leads
2. Governor's Office support for student conference on climate change
3. Research support for Governor's objectives
   - Prof. Michele Betsill (Political Science) Environmental Governance Working Group
   - Soliciting "mini-proposals" from Sustainability School faculty
   - Up to $5000, review by CMMAP and GGC

Public Outreach

- *Windows to the Universe* website
  16 million readers at 3 levels in 2 languages
- "Effective Engagement of Hostile Audiences on Climate Change"
- Dozens of public presentations
  - Churches, museums, civic groups
  - Cattleman's Association
  - Heartland Institute!
- Short web videos



Web-Based Outreach via UCAR



- 569,678 unique users
- 971,960 page views
- 20% Spanish language readers

SIXTH INTERNATIONAL

CONFERENCE ON CLIMATE CHANGE

JUNE 30 - JULY 1, 2011
WASHINGTON, DC

The Heartland INSTITUTE

SIXTH INTERNATIONAL CONFERENCE ON CLIMATE CHANGE

LUNCH KEYNOTE DEBATE:

Scott Denning
Colorado State University

vs.

Roy Spencer
University of Alabama

RESTORING THE SCIENTIFIC METHOD
HEARTLAND.ORG

New Climate Courses

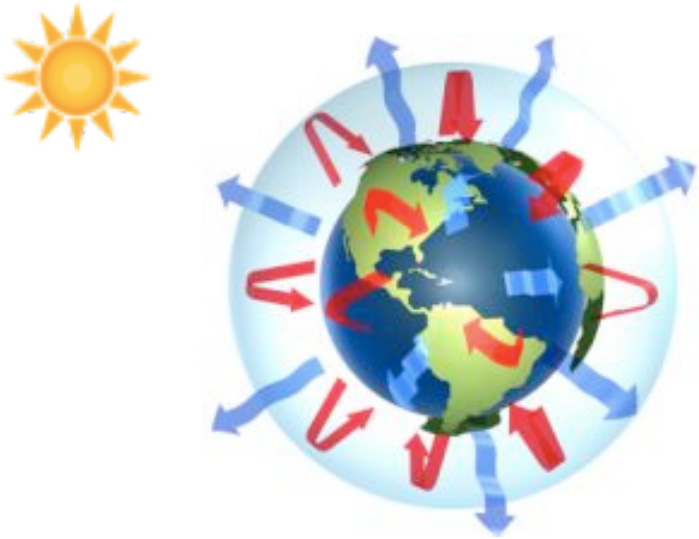
- CSU ATS 150 "Climate Science for Poets"
- NS 696a: Physics of Weather & Climate
- NS 696b: Climate & Global Change
- Colorado College: Global Climate Change
- OSHER Lifelong Learning Institute
- CSU Online Plus (two courses)

CMMAP

Reach for the sky.

Climate Science for Poets

- **NO PREVIOUS EXPERIENCE REQUIRED!**
- **3 credits, 45 hours of classroom time**
- **No prerequisites**
- **Multi-mode learning: lecture, reading, video, hands-on**
- **class size ~ 45**
- **web distribution**



Learn how the climate system works,
how and why it's changing,
likely climate futures,
and what can be done about it!

Non-Science Majors
Especially Welcome

Climate Science for Poets

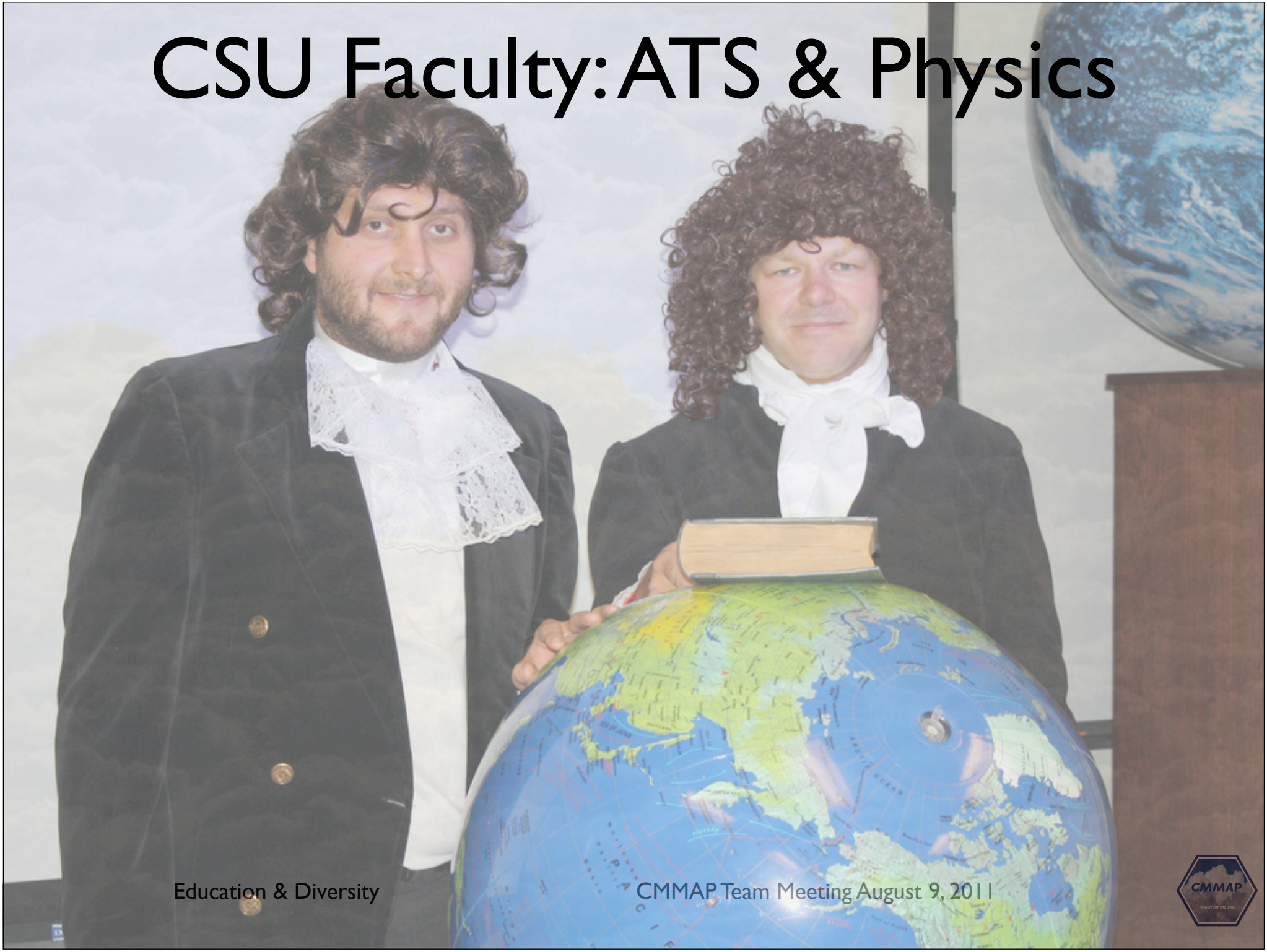
COURSE OUTLINE

1. **Introduction (1 lectures)**
2. **Overview of the Earth System (2 lectures)**
3. **Energy and Electromagnetic Radiation (4 lectures)**
4. **The Atmospheric Greenhouse Effect (2 lectures)**
5. **The Energy Balance of the Earth (3 lectures)**

6. **Circulation of the Atmosphere and Oceans (4 lectures)**
7. **Weather and Climate (3 lectures)**
8. **Climates of the Past (4 lectures)**
9. **The Global Carbon Cycle (3 lectures)**

10. **Fossil Fuels and Energy (3 lectures)**
11. **Climate Modeling and Projections (2 lectures)**
12. **Climate Impacts and Economics (3 lectures)**
13. **Mitigation, Adaptation, and Policy (4 lectures)**
14. **Climate Change Communication and Culture (2 lectures)**

CSU Faculty: ATS & Physics



Education & Diversity

CMMAP Team Meeting August 9, 2011

Summer Internship

- Research experience
- Multidimensional mentoring

- A supportive, inclusive community
- Professional development
  - leadership and communication
- Extensive financial support

5 summers - 50 interns

Summer 2012 - 13 interns
38% from underrepresented groups

Summer Internship Program

CMMAP

Reach for the sky.

Where do we come from?

2007

CMMAP welcomed three interns in our first year.

One of our first summer interns, Beth Beckel explored cloud and precipitation chemistry. She learned the basics of gas-phase atmospheric chemical sampling techniques and spent most of the summer learning about the mist chamber.

Claudette Ojo worked on the Tropical Ozonesonde Dataset for Satellite Validation Processing and Modeling looking at spatial and temporal relationships between ozone and termperature as a function of height.

Parker Kraus investigated land-atmosphere interactions in the West African country of Mali, looking at evaporation and photosynthesis rates.

2008

CMMAP enjoyed six interns in 2008.

Claudette Ojo, a business major, interviewed companies for the organization Climate Wise to learn the progress they were making in reducing greenhouse gas emissions.

Alice Duvivier and Jette Petersen worked together on a numerical approximation for mathematical operators used in climate modeling.

Tyler Ruggles, interested in environmental science and policy, helped a city become part of the Mayors for Climate Change organization.

David Sullivan studied carbon pricing and taxation for the National Conference of State Legislators finding advantages and disadvantages of different methods and creating a booklet.

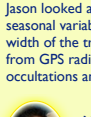
Zoe Keve has a strong interest in helping people and improving our world. She worked at the National Conference of State Legislators constructing a booklet on biofuels.

Watch us grow!

Find out more about us here:
www.cmmap.org/scienceEd/internships.html

2011

2011 brought us eleven summer interns.



The moisture cycle of the Madden-Julian Oscillation (MJO) was the focus of Jennifer's research this summer

Brittany compared and analyzed total precipitable water from ground-based GPS and SSM/I Satellite Remote Sensing.

Julie investigated approaches to local Climate Action Programs and model practices in Colorado.

Molly studied the sources and trends of free tropospheric aerosols measured at Mauna Loa.

Jason looked at the seasonal variability of the width of the tropical belt from GPS radio occultations and reanalyses

Dustin performed an error analysis of SSM/I F08 antenna temperatures to produce an extended record of observations for climate applications.

Evaluating the response of the terrestrial biosphere to significant drought was the focus of Ian's summer research.

Moises performed studies of variability in fire count in Indonesia: Effects of ENSO and MJO phase.

David looked at the diurnal cycles characteristics of disturbed and undisturbed periods during TiMREX.

Keri's research modeled the West African Monsoon and looked at the formation of African easterly waves.

Jessica did a comparison model precipitation forecasts for hurricane Ida which ocurred in 2009.

2009

Ten interns spent a summer at CMMAP in 2009.

Laura Witte worked with the Ft Collins Sustainability Group estimating how much CO2 would be conserved by implementation of policies.

Lance Vanden Boogart worked with the land-surface modeling group comparing a chemistry transport model with observed CO2 concentrations in the midwest.

Katie Riley researched and summarized trends in the carbon offset market. She also created a hypothetical model of offset design.

Liz Huddle spent the summer determining parameters for a mist chamber to try to increase its efficiency.

Having a strong passion for disaster research, Heather Morgan tried to find a connection between the MJO and Atlantic hurricanes.

Katherine Heal learned to use an aerosol mass spectrometer to analyze aerosol emissions from types of biodiesel and later, perform sampling in Rocky Mountain Nat'l Park.

Samantha McGraw conducted interviews and researched New Jersey city climate action plans.

JoBeth Minniear came to CMMAP to research how water vapor, temperature, and vertical velocity relate to one another in a very high resolution simulation of a tropical convection system.

Terreka Hart focused her research on how concentric eyewalls and mesovortices influence the intensity of hurricanes in the Atlantic basin.

Cara Tabor performed research with a spin tank to compare mathematical models of a balanced vortex and what she observed in ice-generated vorticies in the spin tank.

2010

Watch us grow, indeed! We hosted 12 interns this year!

Idamis Del Valle came from Puerto Rico to study the effects of enhanced moisture triggers on precipitation and winds.

Jackie Gushue looked at electrical rate structures and their impact on demand response decision making with a company in Fort Collins.

Stormy Stevens looked at the impact of tropical cyclone rainfall on drought in Alabama.

Kyle Hemes researched the spatiotemporal influence of vegetation on global surface-atmosphere exchange.

Ariana Marrero, from Puerto Rico, studied the variability of the seasonal cycle in the Tropical Eastern Pacific and Caribbean.

Chris Alston researched hurricane activity along the US northeast coast.

Nick Geyer used the Vector Vorticity Model to simulate the Tropical Western Pacific-ICE case.

Daniel Rothenberg got into the nuts and bolts of a climate model dynamical core.

Tina Laboy spent her summer researching the propogation of the Madden-Julian Oscillation

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Erin Kashawlic compared data assimilation schemes used by operational forecast centers.

Marie-Christine Razaire examined the responses of the ocean carbon cycle to climate change.

After the internship ...

where did our interns go?

B.S. programs: 17
M.S. programs: 17
Ph.D. programs: 6
Scientific workforce: 10

7 interns in Atmospheric Science at CMMAP/CSU
1 intern in Political Science with CMMAP Faculty

100% placement, 20% in CMMAP grad programs!

Changing Climates @ Colorado State

- 100+ talks
- 100+ speakers
  - –27 departments
  - –8 colleges
  - –other campus entities
  - –town, state, region, nation

~ 5500 listeners

Graduate Students

Supported 35 graduate students at 7 institutions!

- 48% women, 20% ethnic minorities
- Atmospheric Science, Political Science, Psychology, Human Dvlpt., Sociology

Participate in Center's research --

- inventing innovative methods for climate modeling
- studying climate impacts and policy
- uncovering reasons for the historical underrepresentation of diverse populations in climate science

Summer PD Workshop

Training the next generation of climate scientists

- Students learning from each other and building partnerships
- 2009: Climate Policy and Politics
  - Global Climate Negotiations, Communicating Climate Change Workshop, Discussion on local and national climate policy
- 2010: 100 Views of Climate Change
  - Multidisciplinary view of climate, communication skills
- 2011: Climate, Careers and Teaching
  - Climate Change and other disciplines, How to Become a Professional Scientist, The Science and the Art of Teaching
- 2012: Forests and Climate Change
  - Collaboration between CMMAP and NSF I-WATER

After Graduate School...

Anna Harper

Gabriel Williams

15 students received PhDs

Anna Harper - *Postdoc*
University of Exeter (Exeter, England)

Mike Pritchard - Postdoc
University of Washington (Seattle, WA)

Luke Van Roekel - *Assistant Professor*
Northland College (Ashland, WI)

Levi Silvers - *Postdoc*
Max Plank Institute for Meteorology
(Hamburg, Germany)

Gabriel Williams - *Assistant Professor*
University of Louisiana at Monroe (Monroe, LA)