

# Challenges and lessons learned in implementing climate and geospatial understanding in the K-16 curriculum and among diverse students

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Vermont State Climatologist



# Who am I?

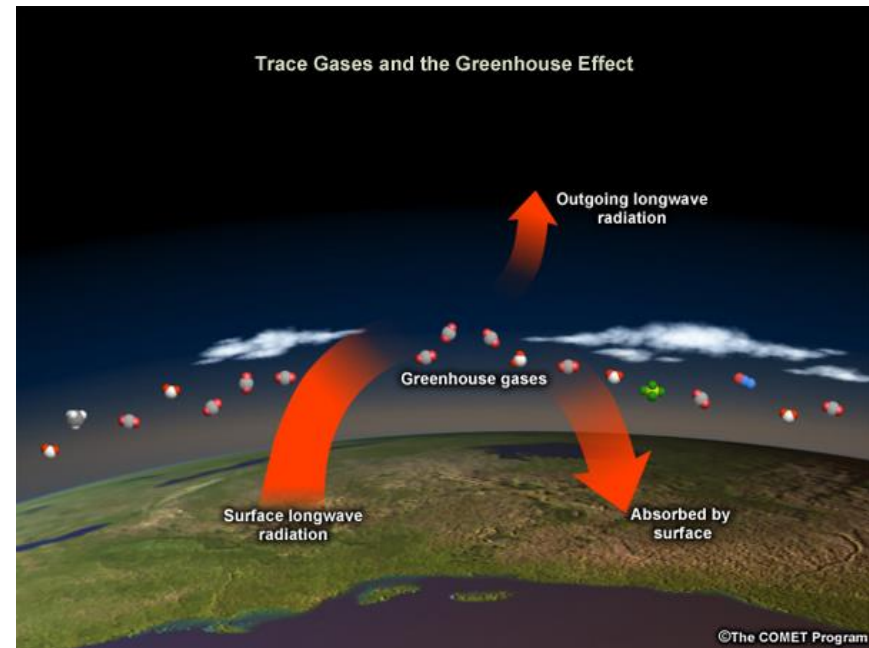
- Faculty in Geography Department
- American Association of State Climatologists
  - Secretary
- American Association of Geographers
  - National Councillor
- American Meteorological Society
- NOAA Science Advisory Board
  - Climate Working Group
  - Portfolio Review Task Force
- NSF
  - panelist (10 programs)
  - Atmospheric Science Collaborations and Enriching NeTworks (ASCENT)
- National Climate Assessment – lead author Northeast
- NCAR & WMO
  - invited speaker

# Who's in the audience?

- media
- general public presentations
- K-16+ students (VT, NY)
- K-12 teachers
- my neighbors
- retired communities (UVM faculty, Wake Robin)
- life-long learners (Osher)
- VT State Agencies (ANR, DOH, DEMHS, VTTrans) & municipalities
- atmospheric science colleagues / students
- other academe

# “Speaking in code”

- vocabulary of the atmospheric sciences
- poor use of metaphors
  - “trapping heat” “bouncing back energy”
- “radiation”
- abstract concepts
- interconnectedness of land-ocean-air



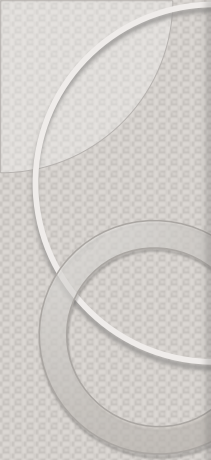
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# Lessons learned from diverse audiences

- language of the climate sciences
- role of misconceptions
- where in the curriculum?
- importance of learning styles
- educators can make a difference
- role of life experience



- 
- “Through your presence here today, you come from a long line of giants whose shoulders you stand on, giants who graduated from this school and giants who never made it to school.”
  - “You cannot continue to succeed in the world or have a fulfilling life in the world unless you choose to use your life in service somehow to others and give back what you have been given.”



# D-ClimNet



# Diversity Climate Network (D-ClimNet)



The  
UNIVERSITY  
of VERMONT



0914377

# D-ClimNet's programmatic elements

- goal = to stimulate interest and train the next generation of racially and gender diverse climate scientists
- Climatology as a viable career option
- mentoring by scientists of color
- high schools (grades 9-12)
- Community colleges
- universities, including Ph.D. granting institutions
- New York city, Los Angeles, Georgia, Burlington



# The University of Vermont

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## Diversity Climate Network (D-ClimNet) Shaping the face of tomorrow's climate scientists

Stimulating interest and training the next generation of racially and gender diverse climate scientists...

D-ClimNet represents a new national partnership among the University of Vermont (UVM), the University of California - Los Angeles (UCLA) and the University of Georgia (UGA) to create a pipeline of under-represented students from the high school to graduate degree levels. The network is unique in its focus on the climate sciences as well as its commitment to training



- UVM Home
- Diversity Climate Network
- Program Overview



You are posting, commenting, and liking as Diversity Climate Network (D-ClimNet) — Change to La Dg



Diversity Climate Network (... Timeline Recent

Admin Panel

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Diversity Climate Network (D-ClimNet)

April 8, 2013

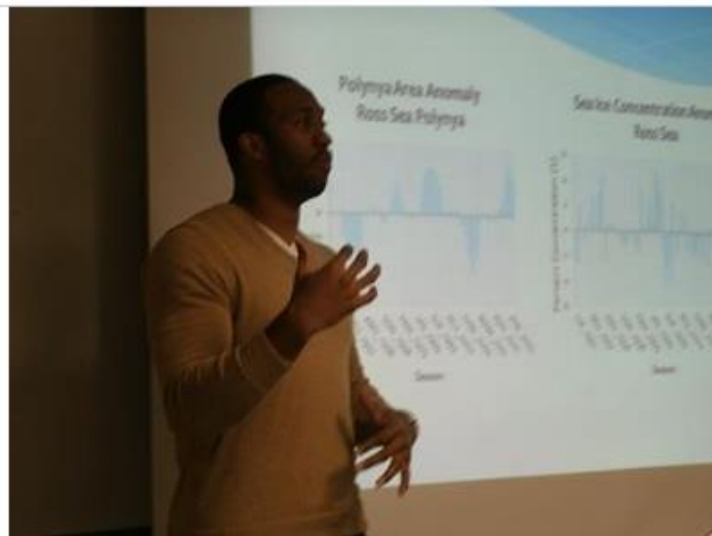
UCLA D-Climnet Student Jason Ward visited University of Georgia and University of Vermont recently as a part of a student share and exchange effort. Pictures from his visit to Vermont...



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This post was served to 14 people

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Diversity Climate Network (D-ClimNet)

April 8, 2013

UGA D-Climnet PhD student and USFS Scientist Marcus Williams in Liberia sharing knowledge on climate



Diversity Climate Network (D-ClimNet) shared a link.

February 14, 2013

d-climnet PI briefs Senate on climate. Testimony and webcasted here ...http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing\_id=cf67a715-fca1-8682-f7dd-13242e8035d1

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Usually when we hear people say someone has a "good job," traditional



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Marshall Shepherd

Timeline

Now

Friends · 1,594 (1 Mutual)



Matt Daniel



Headley White



Tish Yager



Al Sandrik



Fred Bortz



Phil Harp



Heidi Cullen



Anthony Byers



Brian Ether ton

About

🏢 **Professor, Scientist, Director of UGA Atmospheric Sciences Program at University of Georgia**

Past: NASA Goddard Space Flight Center

🎓 **Studied Physical Meteorology at Florida State University**

Past: University of Georgia and Cherokee High School

🏠 **Lives in Dacula, Georgia**

📍 **From Canton, Georgia**

💍 **Married to Ayana Shepherd**

👤 **Followed by 69 people**



**Marshall Shepherd** changed his profile picture.

May 29



Like · Comment · Share

29 people like this.



**Sylvia Forsh Baker** Love this photo!

May 30 at 3:37pm · Like · 1

Now

2013

2012

2011

2010

2009

2005

1999

1993

1987

Born

You are posting, commenting, and liking as Diversity Climate Network (D-ClimNet) — Change to La Dg



Diversity Climate Network (...) Timeline Now

Admin Panel

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Post



Diversity Climate Network (D-ClimNet) shared a link.

April 15

Our PI Dr. Shepherd has pinned this piece at Ebony.com
http://www.ebony.com/career-finance/why-african-americans-
may-be-left-out-of-the-21st-century-job-market-
498#axzz2QXE3XCxN



Why African Americans May be Left Out of the 21st Century Job Market

www.ebony.com

Usually when we hear people say someone has a "good job," traditional

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Diversity Climate Network (D-ClimNet)

April 8

More pics from Jason at Vermont. Presenting his work...



Diversity Climate Network (D-ClimNet)

April 8

D-Climnet Vermont and UCLA PIs with Dr. Warren Washington, Presidential Medal of Science winner and pioneering climate scientist.



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14 people saw this post



Diversity Climate Network (D-ClimNet)

April 8

Now

2011

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Diversity Climate Network (D-ClimNet)



Funded by NSF Geoscience Education Award (GEO-0914377)

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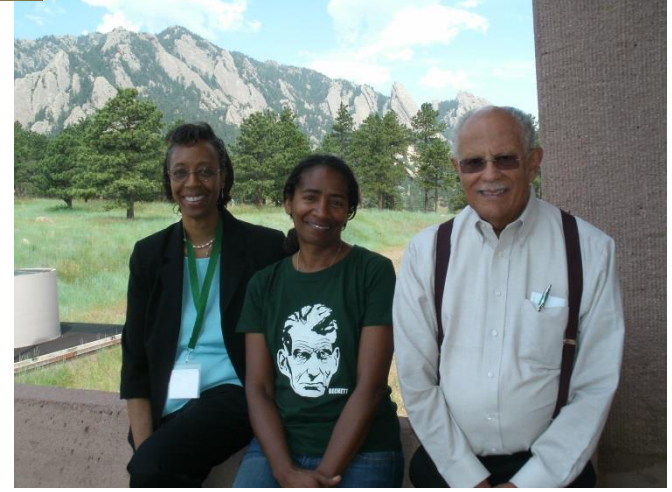
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Chat

# D-ClimNet scientists look up to Dr. Warren M. Washington



# 2014 AAG Honorary Geographer



Photos: AAG & L.-A. Dupigny-Giroux



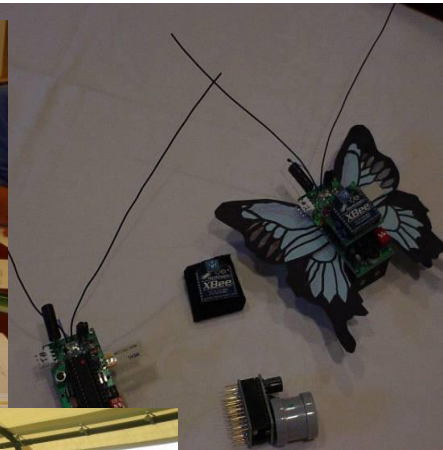
# Lessons learned from D-ClimNet

- climate and geosciences do not resonate
- “yes, we can”
- importance of mentoring
- importance of peer mentoring & networking
- choice of thesis and dissertation topic



**SWAC**

# Satellites, Weather & Climate (SWAC)



Photos: L-A.  
Dupigny-Giroux  
& M. Fortney



# SWAC is...

- teacher professional development
- in-service science, math & social science teachers
- elementary, middle and high schools
- inquiry & project based learning
- STEM content knowledge & skills
  - climate, weather
  - engineering
  - geospatial technologies

# Tapping into a child's curiosity



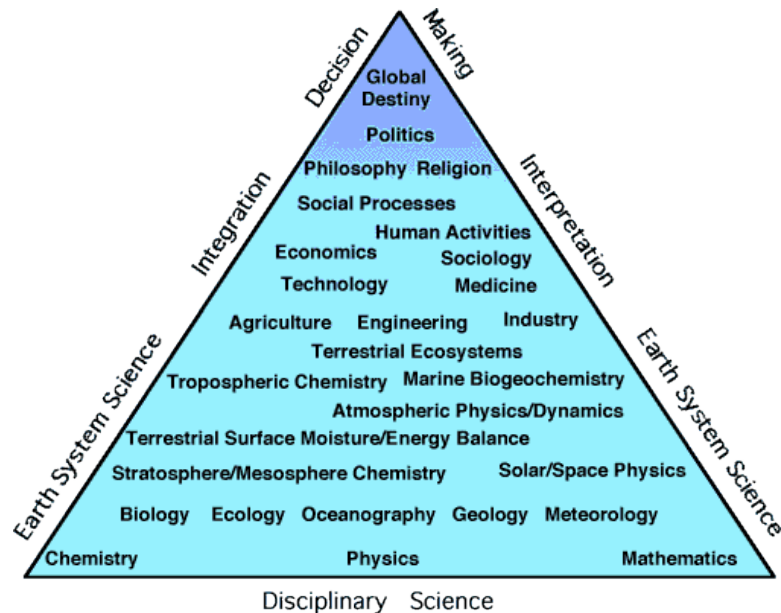
# Why do we need to start young?

- prevent misconceptions
- reduce angst
- Nature of Science discourse
- unevenness of elementary & secondary curriculum
- university/college course on weather & climate

# Lessons learned from SWAC

- problem- and project-based learning
  - importance of a safe, learning environment
  - partnerships are key
  - we are all teachers-learners
  - varying challenges across grade levels
- 
- encourage whole-school approach
  - embed core principles in other subject areas
  - crisis in the climate sciences & geosciences is global

# Inter/intra/multi/trans-disciplinary



- Geoscientists use certain skill set
  - feedbacks, fieldwork, interdisciplinary problem-solving
  - “spatially challenged”
- Kolb’s learning style
- dominance of a given style
- implications for teaching style
  - linear course structure
  - 3-D concepts



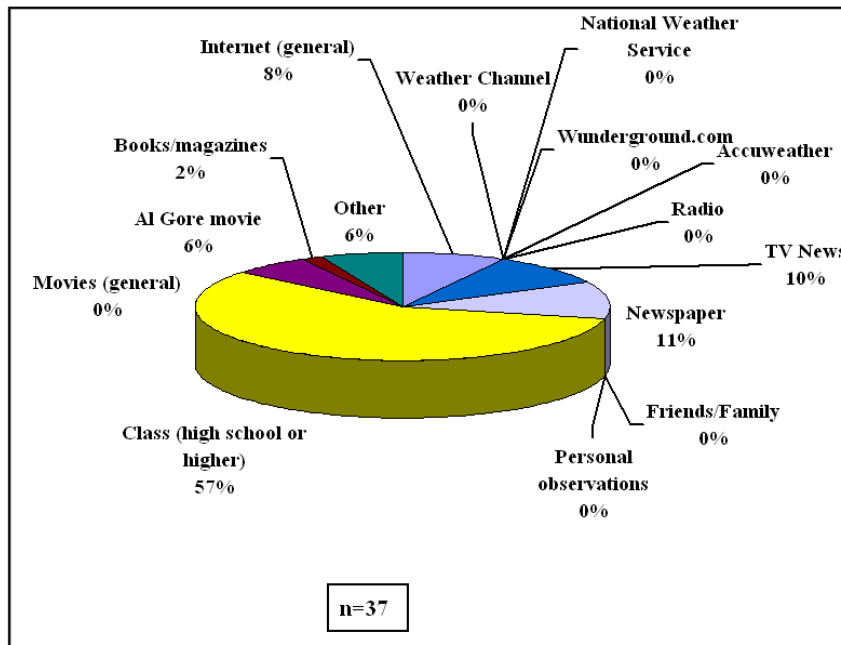


# The journey forward

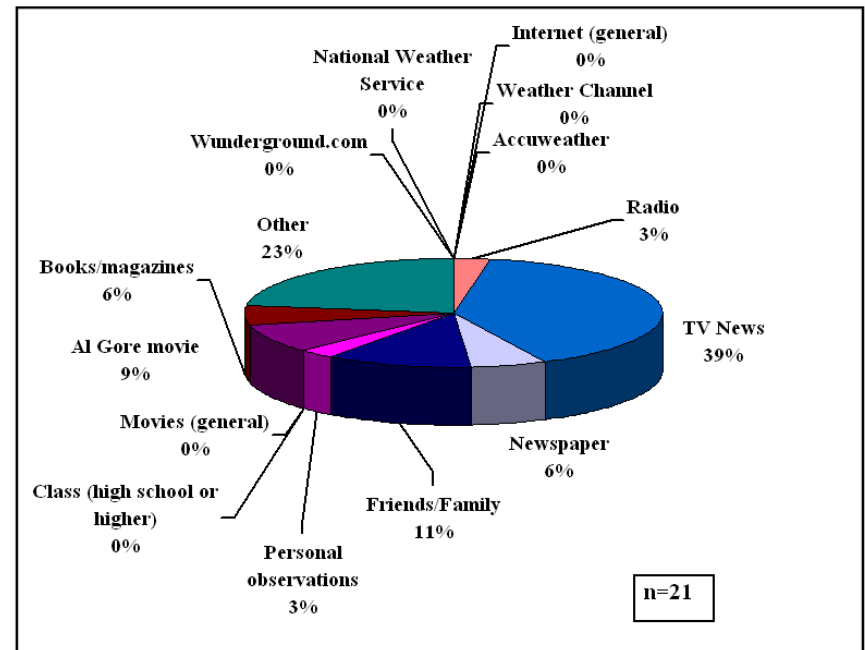
# Moving the conversation forward - students

- role models
- mentoring (at all levels)
- cultural sensitivity
  - family
  - new Americans
  - school dynamics
  - gender differences
- awareness & content knowledge
- misconceptions resistant to instructional remediation
- importance of textbook diagrams, verbal explanations, personal observations and the stories recounted to young children
- K-grey continuum

# What is the source of your global warming/climate change knowledge?



**Grade 11 students,  
2008**



**University of Vermont  
Staff, 2008**

# Moving the conversation forward - educators

- teacher professional development and support for curricular reform

# Geoscience Education Working Group II (2005)

- “The need for sufficient numbers of highly qualified Earth Science teachers in the K-12 workforce is a problem that has contributed to a lack of awareness of, and interest in, the geosciences among students.”

# Moving the conversation forward - educators

- teacher professional development and support for curricular reform
- cutting-edge content, skills and inquiry-based experiences for students
- visualization in 3-D
  
- flexibility – “teachable moments”
- integrated science approach
- geosciences at all levels

# Moving the conversation forward – other considerations

- meeting people where they are
- cognitive sciences
- cultural references
- accessibility – content & as scientists
  
- long-term process
- self-knowledge
- calling a spade a spade

For further information, please contact:

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