

Alison Rockwell
EOL Outreach & Communications
HIPPO Science Meeting

March 12, 2012

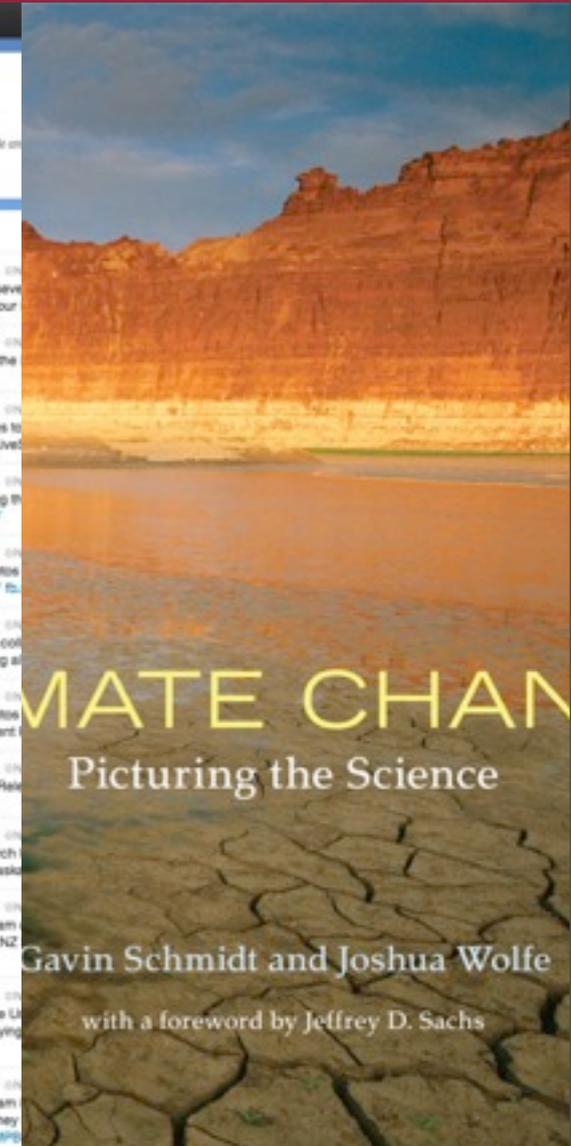
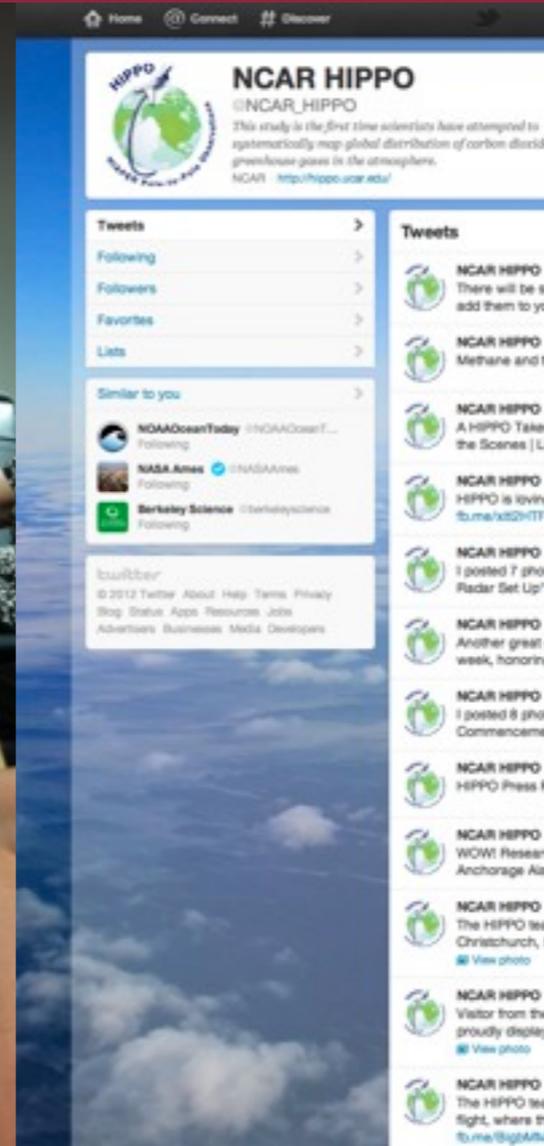


HIPPO
Education & Outreach Summary

HIPPO

Education & Outreach Summary

HIPPO Education & Outreach Summary



AGU

Events

Print

2.0

Extra!



 **AGU**
American Geophysical Union

AGU Geophysical Information for Teachers (GIFT) Workshop



Using Scientific Field Campaigns to Learn About Climate Science



Tools for Teaching Climate Science



AGU 2011 :: December 5, 2011

Using Scientific Field Campaigns to Learn About Climate Science

NCAR's Earth Observing Laboratory (EOL) provides a unique look into current atmospheric science related to climate research. Educators and students can explore what it's like to use cutting-edge research instruments during field campaigns to address current questions regarding Earth's changing climate.

How Do We Know?

There is a wealth of information out there about climate change and global warming, and students may be asking:

- How do we know that the climate is changing?
- What will the climate be like in 20 years?

The answers are complex, but with the help of current research of the atmosphere, scientists have a better understanding of how the different Earth systems work together.

In order to study the climate, researchers (1) look at climate data from such places as tree-rings, ice cores and corals; (2) add that to modern day weather and climate research; (3) compare multiple models to actual findings; (4) integrate this information into climate models that project future weather and climate.

The Earth Observing Laboratory's outreach program provides an in-depth look into current atmospheric science field campaigns that study various aspects of weather and climate.

- Severe Weather
- Climate Processes
- Atmospheric Patterns
- Ocean-Air Interactions
- Air Chemistry

EOL develops and deploys NSF lower atmospheric observing facilities including two research aircraft and several radars, that are used for research projects around the world.

Engaging students into how and why atmospheric science research is conducted through modern and relatable teaching tools is an effective way to teach weather and climate science.

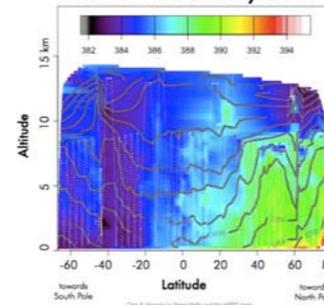


Making the Connection

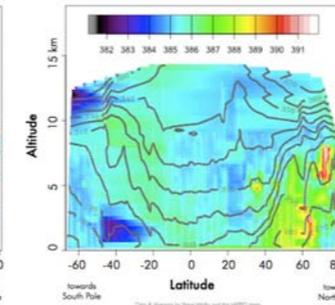
Following along in real-time with scientists can be exciting and engaging for students. By interacting with scientists in the field, students can make a clear connection to the data that is used in the classroom, creating a much more impactful learning experience.



Carbon Dioxide (CO₂) ppm
HIPPO I :: January 2009



Carbon Dioxide (CO₂) ppm
HIPPO II :: November 2009



Using Field Campaigns

Field campaigns run by EOL provide an accessible and scalable way to be involved with atmospheric science research, and can be integrated into a variety of classes:

- Earth Science
- Chemistry
- Physics
- Engineering
- Environmental Studies
- Geography
- Political Science
- Science Ethics
- Literature & Writing

Tools for Teaching Climate Science



AGU 2011 :: December 5, 2011

Using Scientific Field Campaigns to Learn About Climate Science

Several online resources are available to educators that can be freely utilized to develop climate science curricula. Students can learn about and follow field campaigns all over the world; interact with researchers on Facebook; gain a better understanding of climate science and how research is conducted; and use collected data for classroom activities.

Types of Online Resources

- Field Projects Website
- Multi-Media & Video Galleries
- Google Earth Interactive Tools
- Social Media & Web 2.0 Platforms

Why Would Students Be Interested?

Weather and climate affects everyone around the world. From the food that we produce and eat to the air we breathe, the atmosphere impacts us daily. There is still so much to be discovered about Earth's atmosphere, students can be at the frontiers of discovery!

What Can I Do?

Encourage students (everyone, actually!) to follow and explore NCAREOL on our social media platforms. As students are looking for careers that *make a lasting difference to society*, this is a great way to encourage a career in science. After all, science needs more than just scientists.

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Web 2.0 Resources



www.eol.ucar.edu/field_projects



www.facebook.com/ncareol



www.youtube.com/ncareol



www.twitter.com/ncareol





Educational Resources

RETI 2011

Several climate science teachers involved with the Research Experience In

The HIPPO project. Teachers involved

Explore the Research

AGU Geophysical

Presented by Alison Rockwell, Vidal Salazar, Becca Hatheway, and Sarah Bruemmer

This workshop provided information about how scientists use large scale field campaigns to collect data about the Earth's atmosphere in order to learn more about climate science. The hands-on activities allow teachers and students to analyze climate data sets and gain a better understanding of how climate models work.

Presentation:

- ▶ [Using Scientific Field Campaigns to Learn About Climate Science](#)
- ▶ [Presentation Video](#)

Classroom Activities:

- ▶ [HIPPO Curtain Plots Short Lesson](#)
- ▶ [Classroom Activity Video](#)

Supplementary Resources:

- ▶ [Tools for Teaching Climate Science PDF](#)
- ▶ [Telling a Compelling Tale, Scientifically Speaking](#)
- ▶ [CO2 HIPPO I Plot](#)
- ▶ [CO2 HIPPO II Plot](#)
- ▶ [HIPPO Curtain Plots Short Lesson \(Answers\)](#)
- ▶ [Carbon Flow Student Worksheet](#)
- ▶ [CO2 Concentrations in the Atmosphere Student Worksheet](#)
- ▶ [PPT presentation - What is a Model?](#)

teachers involved with the Research Northern Colorado and NCAR.

climate science being conducted.

Workshop



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▶ ABOUT HIPPO

HIPPO is a landmark study for many reasons, not the least of which is it is the first time scientists have systematically mapped global distribution of carbon dioxide and other greenhouse gases in the atmosphere, covering the full troposphere in all seasons and multiple years.

▶ FOLLOW HIPPO

- Become a fan on Facebook
- Follow Us on Twitter
- Watch Us on YouTube
- Receive NSF/NCAR GV flight notifications

▶ FEATURED PUBLICATION

Philosophical Transactions of the Royal Society :: HIAPER Pole-to-Pole Observations (HIPPO): fine-grained, global-scale measurements of climatically important atmospheric gases and aerosols

▶ HIPPO DATES

- ▶ HIPPO I :: 8 January-30 January, 2009
- ▶ HIPPO II :: 31 October-22 November, 2009
- ▶ HIPPO III :: 24 March-16 April, 2010
- ▶ HIPPO IV :: 14 June-11 July, 2011
- ▶ HIPPO V :: 9 August-9 September, 2011



Educational Resources

RETI 2011

Several climate science teachers involved with the Research Experience in Teachers' Education (RETE) 2011 workshop.

The HIPPO project provides a unique opportunity for teachers involved in the RETE 2011 workshop.

Explore the Research Experience in Teachers' Education (RETE) 2011 workshop.

AGU Geophysical Research Society

Presented by Alison Rockwell, Vidal Salazar, Becca Hatheway, and Sarah Bruemmer

This workshop provided information about how scientists use large scale field campaigns to collect data about the Earth's atmosphere in order to learn more about climate science. The hands-on activities allow teachers and students to analyze climate data sets and gain a better understanding of how climate models work.

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Scientists and staff at the National Center for Atmospheric Research (NCAR) work with a wide variety of audiences. Each audience benefits from a slightly different approach to communication, which is tailored to their different interests, levels of expertise, value systems, and biases. As a result, we have designed a variety of programs to address a breadth of climate change communication needs.

PROGRAM APPROACHES TO MEET THE NEEDS OF A VARIETY OF AUDIENCES

Tours

NCAR hosts more than 15,000 people on public tours annually. These tours reach visitors from around the world with disparate knowledge and beliefs about climate change. Interpretation staff is well versed in communication methods and topics on the issue of climate change that resonate and meaningfully engage the audience.

Exhibits

- Research is conveyed in NCAR's Climate Discovery Exhibit with strong input from our scientists. Among the climate-focused exhibition features are video displays that share NCAR research; these multimedia resources are also posted on YouTube, iTunes University, and the NCAR website for broad dissemination.
- Audio tours convey exhibit content in greater detail. The new NCAR-Wyoming Supercomputing Center (NWSC) will continue this model. Additionally, NWSC exhibits will be mobile, bringing science research to residents across the state of Wyoming.
- NCAR's exhibit booth and staff travel to a variety of conferences, providing presentations, literature, and other information on NCAR research and support efforts.

Scientists Communicating Science

NCAR has a new program to help scientists more effectively communicate science, with an emphasis on targeting specific societal and commercial groups in a manner consistent with their values and beliefs. Included in this effort is nurturing a cadre of young scientists who see communicating science as part of their future career aspirations.

NCAR benefits from having science writers, outreach and education specialists, and a media team that help craft and disseminate the variety of messages aimed at NCAR's broad range of audiences.

Largely funded by the National Science Foundation (NSF), the National Center for Atmospheric Research (NCAR) strives to meet NSF objectives of educating the public, the media and the wider scientific community. Under this aegis, NCAR staff address a variety of populations, from K-12, to the public interested in science, to Congressional staffers responsible for providing policymakers with the latest research findings on a variety of topics – including current science.

SHORT-TERM NCAR PROGRAMS

NCAR runs a variety of short programs that invite specialists to the center to learn about climate and related Earth and atmospheric science. Among these are the Advanced Study Program's annual science colloquium for post-docs and recent graduates in the geosciences, the NCAR Journalism Fellowship for seasoned journalists interested in or covering science, the Research Experience for Teachers, who have an opportunity to talk to researchers and develop classroom curriculum, as well as various internship programs for high school, undergraduate and graduate students interested in atmospheric and Earth sciences.

The NSF/NCAR Gulfstream V arrives in Anchorage, Alaska in August 2011 to begin the last series of flights in the HIAPER Pole-to-Pole field campaign.



SOCIAL MEDIA

NCAR laboratories have a growing number of social media outlets. These include highlights on the Earth Observing Laboratory's field programs, updates on the NCAR-Wyoming Supercomputing Center build, information on the High Altitude Observatory's researchers, the latest NCAR research on AtmosNews, and Spark, UCAR Science Education, which can be found on Facebook, Twitter and YouTube. In addition, a Google Earth interactive visualization displays all of EOL's global field projects since 1984. Communities of practice that overlap with NCAR research areas in the computational and Earth sciences are fostered through these social media outlets.

NCAR has an active presence on a variety of Web 2.0 media, including its NCAR-Wyoming FaceBook page, www.facebook.com/pages/NCAR-Wyoming-Supercomputing-Center-Project-NWSC/12192248161446

PARTICIPATION IN NATIONAL INITIATIVES

Educators within UCAR Science Education contribute at a national level through participation in national initiatives such as the Climate Literacy and Energy Awareness Network (CLEAN), listservs, workshops and committees within numerous organizations (AGU, NSTA, ASTC, AMS). Through these interactions, NCAR research reaches educators who in turn bring science to the lives of many. Lesson plans and effective educational multimedia tools are also created that translate the research through engaging, data-rich inquiry lessons.

NCAR's Visualization Laboratory provides visitors with a real-world view on scientific data in a graphically dynamic way.



CONCLUSION: Providing information via a variety of message delivery systems and to diverse audiences is critical to delivering climate change messages effectively. Making the information useful and relevant, providing it in a context that reaches the intended recipients, and engaging the audience's curiosity are keys to successfully bringing science beyond the laboratory and into people's lives.

Events





2011 Undergraduate Leadership Workshop Students

2011 Journalism Fellows



search

NSF National
Science
Foundation



2011 RETI Teachers

Outreach Events & Visits

HIPPO II

Open Houses:

- RAF
- Anchorage
- Rarotonga
- Christchurch

Super
Science
Saturday

3 | 00+

HIPPO III

Booths at
Las Vegas
Science &
Tech Expo

RAF Open
House

30 | 5+

HIPPO IV

ULW
Students

RETI
Teachers

HIRO
Students

40+

HIPPO V

Journalism
Fellows

15+



HIPPO 2.0





HIPPO V :: 9 August - 9 September, 2011



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ABOUT HIPPO

HIPPO is a landmark study for many reasons, not the least of which is it is the first time scientists have systematically mapped global distribution of carbon dioxide and other greenhouse gases in the atmosphere, covering the full troposphere in all seasons and multiple years.

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Phase V Flight Plan

- Boulder, CO USA
- Anchorage, AK USA
- Towards North Pole
- Kona, HI USA
- Rarotonga, Cook islands
- Christchurch, New Zealand
- Towards South Pole



What is HIPPO?

The "HIAPER Pole-to-Pole Observations (HIPPO) of Carbon Cycle and Greenhouse Gases Study" will measure cross sections of atmospheric concentrations approximately pole-to-pole, from the surface to the tropopause, five times during different seasons over a three year period. A comprehensive suite of atmospheric trace gases pertinent to understanding the Carbon Cycle will be measured. The program will provide the first comprehensive, global survey of atmospheric trace gases, covering the full troposphere in all seasons and multiple years.



Featured HIPPO Videos



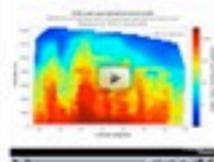
Sampling Black Carbon Over Sea-Ice and Open Leads

The HIPPO campaign presents an unparalleled opportunity to sample the atmosphere, as the name suggests literally from pole-to-pole, from 500 feet about the surface of the ocean to 45,000 feet in altitude. [\(Learn more...\)](#)



Carbon Dioxide Instrument

The CO₂ instrument draws air in through a rear facing inlet, in one of the the HIMIL which we'll go over and take a look at, there's one hanging on the bottom of the plane, it's easy to see. [\(Learn more...\)](#)



Atmospheric Water Vapor

This image also is showing a color representation of one of the species that we measure in the HIPPO experiment, this one is water vapor...[\(Learn more...\)](#)



Intertropical Convergence Zone

This photograph was taken from the aircraft as it was approaching the equator. What you see there is the Intertropical Convergence Zone...[\(Learn more...\)](#)



Google Analytics

12,989 people visited this site

October 15, 2009 - Feb 28, 2012

 19,446 Visits

 12,989 Unique Visitors

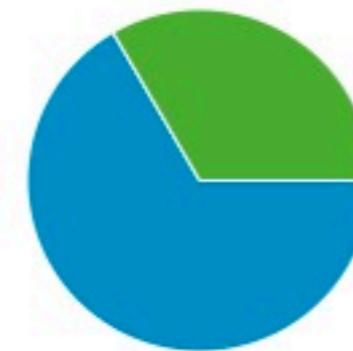
 50,690 Pageviews

 2.61 Pages/Visit

 00:02:30 Avg. Time on Site

 65.92% Bounce Rate

 66.59% % New Visits



 **66.61% New Visitor**
12,953 Visits

 **33.39% Returning Visitor**
6,493 Visits



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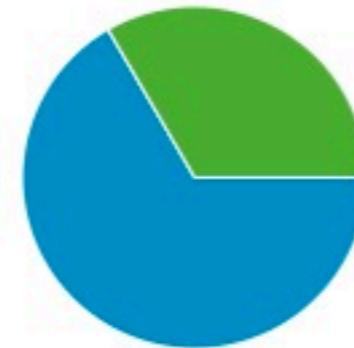
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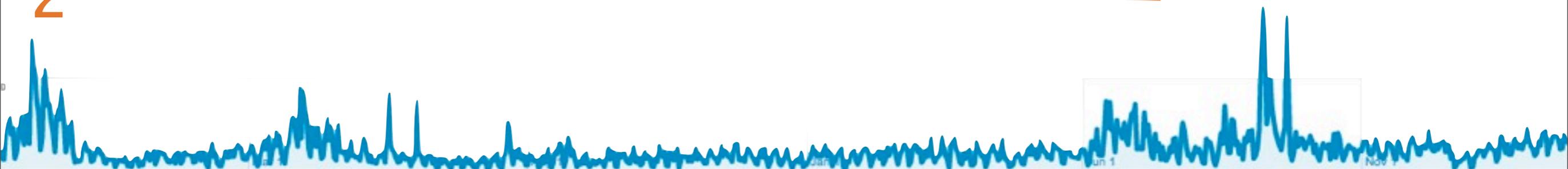
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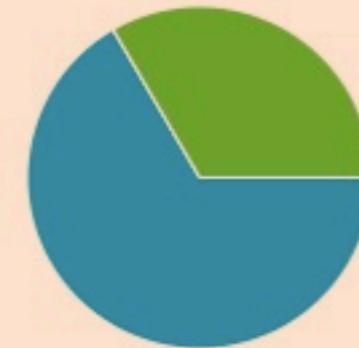
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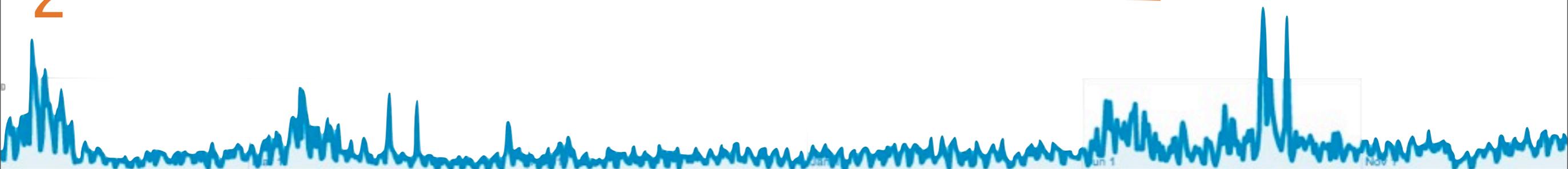
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Average Website Performance Metrics

(Source: All websites listed on AnalyticsSEO using Google Analytics)

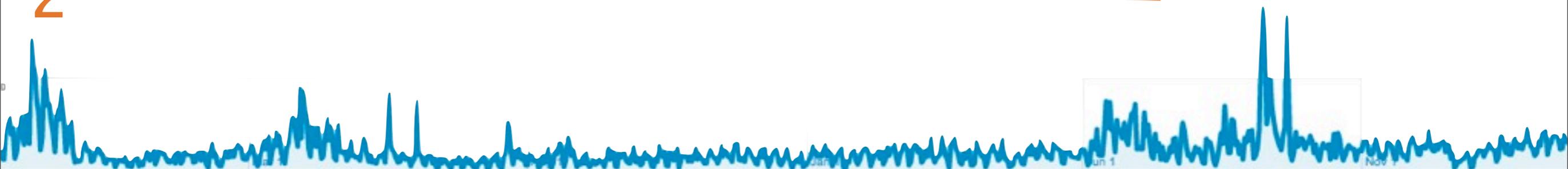
GA Metrics	Average
Average Pageviews per Visit	4
Average Time on Site (s)	161.5
Bounce Rate (%)	41
Brand Engagement (%)	43.5
E-commerce Transactions	81.9
New Visits (%)	65.4

<http://www.analyticsseo.com/blog/average-website-metrics-google-analytics-bounce-rate-time-on-site>

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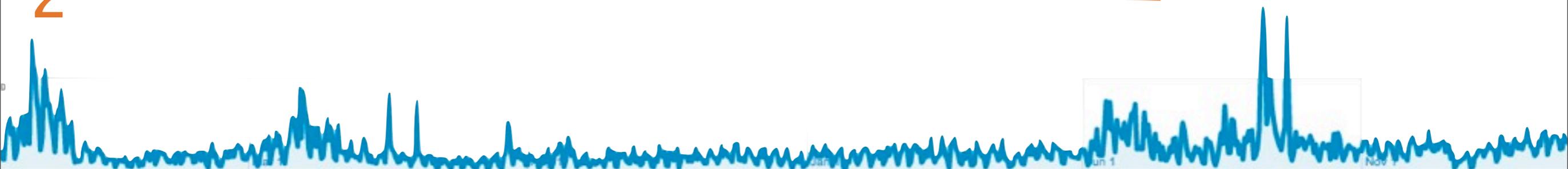
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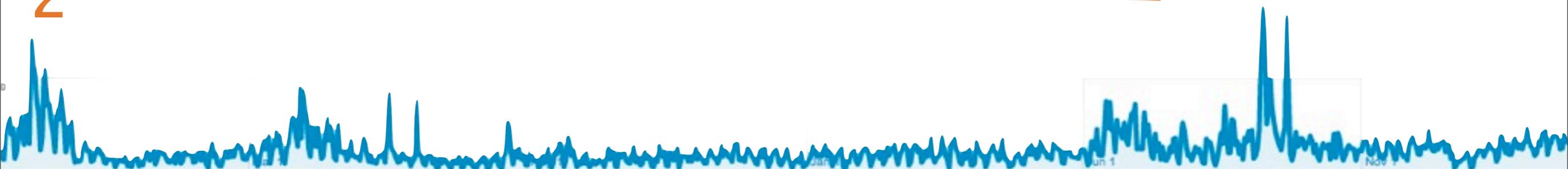
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News Releases

[Home](#) > [AtmosNews](#) > [News Releases](#) > Global portrait of greenhouse gases emerges

DETAILED GLOBAL PORTRAIT OF GREENHOUSE GASES EMERGES FROM POLE-TO-POLE FLIGHTS

September 07, 2011

[News Release - 2011](#)
[Multimedia Gallery - 2011](#)
[Fact Sheet](#)
[HIPPO Home Page](#)

BOULDER—A three-year series of research flights from the Arctic to the Antarctic has successfully produced an unprecedented portrait of greenhouse gases and particles in the atmosphere, scientists announced today. The far-reaching field project, known as HIPPO, is enabling researchers to generate the first detailed three-dimensional mapping of the global distribution of gases and particles that affect Earth's climate.



The GV in Anchorage, Alaska during HIPPO. (©UCAR, Photo by Carlye Calvin. This image is freely available for media use. For more information, see [Media & nonprofit use](#).)

The series of flights, which come to an end this week, mark an important milestone as scientists work toward targeting both the sources of greenhouse gases and the natural processes that draw the gases back out of the atmosphere.

"Tracking carbon dioxide and other gases with only surface measurements has been like snorkeling with a really foggy mask," says Britton Stephens, a scientist with the National Center for Atmospheric Research (NCAR) and one of the project's principal investigators. "Finally, HIPPO is giving us a clear view of what's really out there."

"With HIPPO, we now have views of whole slices of the atmosphere," says Steven Wofsy, HIPPO principal investigator and atmospheric and environmental professor at Harvard University's School of Engineering and Applied Sciences. "We've been quite surprised by the abundance of certain atmospheric components and the locations where they are most common."

The three-year campaign has relied on the powerful capabilities of a specially equipped Gulfstream V aircraft, owned by the National Science Foundation (NSF) and operated by NCAR. The research jet, known as the High-performance Instrumented Airborne Platform for Environmental Research (HIAPER), has a range of about 7,000 miles (11,000 kilometers). It is outfitted with a suite of specially designed instruments to sample a broad range of atmospheric constituents.

The flights have helped scientists compile extraordinary detail about the atmosphere. The research team has studied air samples at different latitudes during various seasons from altitudes of 500 feet (150 meters) above Earth's surface up to as high as 45,000 feet (13,750 meters), into the lower stratosphere.

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Cheryl Dybas, NSF Public Affairs
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Katy Human, NOAA Public Affairs
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[more info for journalists >](#)

UCAR COMMUNICATIONS

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Yvonne Mondragon, 303-497-8601

Photo Inquiries

Carlye Calvin, 303-497-8609

Digital Image Library

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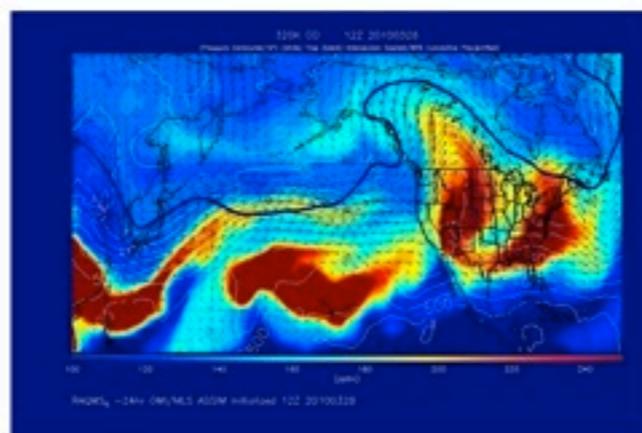


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Comcast

Article:
A HIPPO Takes to the Skies to Taste Earth's Atmosphere
Rachel Hauser, National Center for Atmospheric Research
Date: 14 October 2011 Time: 03:22 PM ET

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This is from a model simulation of carbon monoxide, a pollutant usually present with black carbon in the atmosphere, from March through April 2010. The pollution travels eastward because of a springtime clockwise circulation in the central Pacific. It travels longer distances during this period, leading to higher black carbon loadings in the Northern Hemisphere. CREDIT: Animations courtesy of R. Bradley Pierce, NOAA/NESDIS/STAR [View full size image](#)

This Behind the Scenes article was provided to LiveScience in partnership with the National Science Foundation.

Once international agreements demand it, effective, enforceable greenhouse gas reduction will require in-depth information on the fluxes and transports of these and other atmospheric constituents.

Researchers know that concentrations of aerosols like black carbon and gases like carbon dioxide, water vapor, ozone, and nitrous oxide vary across the globe and by season. Until recently, a fine-grained picture of the concentrations and understanding of the dynamics

of these atmospheric components did not exist.

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HIAPER Pole to Pole Obser...

Timeline

Now

Posts by Page

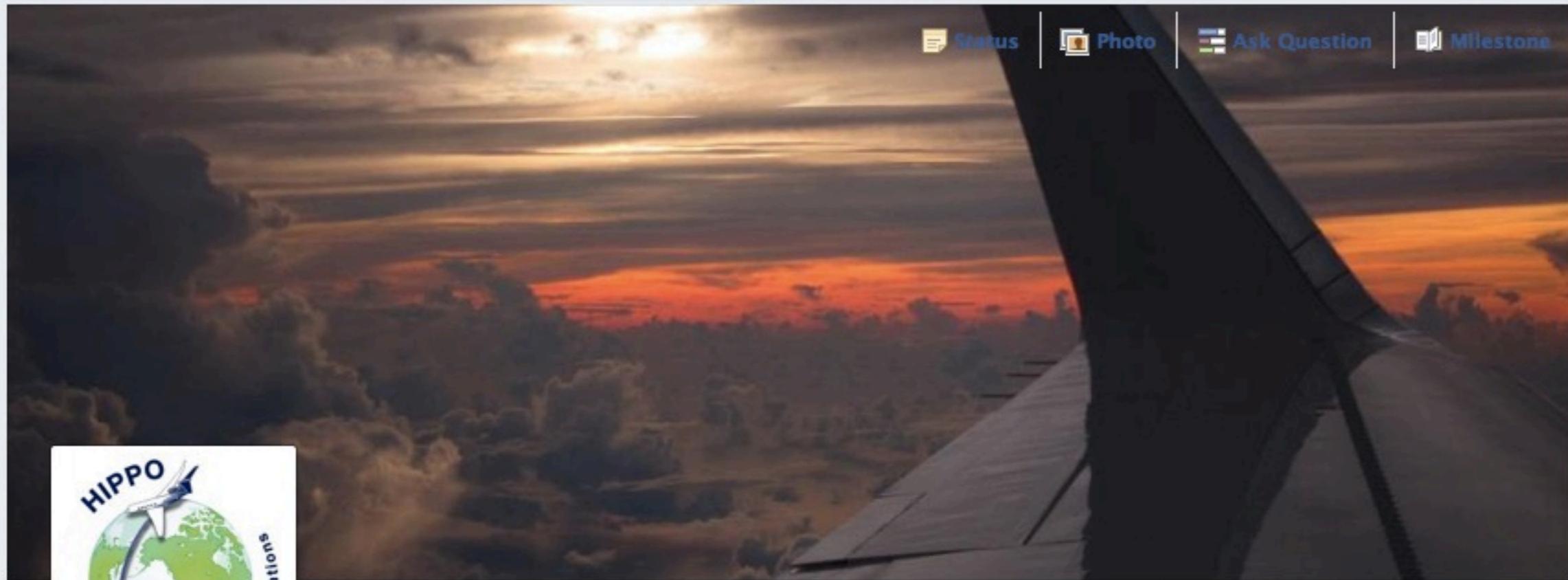
Admin Panel

Status

Photo

Ask Question

Milestone



HIAPER Pole to Pole Observations (HIPPO)

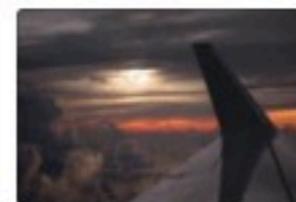
586 likes · 4 talking about this



Non-Profit Organization

The project will provide the first comprehensive, global survey of atmospheric trace gases, covering the full troposphere in all seasons and multiple years.

About



Photos



Likes



Videos

Posts by Page

Status

Photo

Ask Question

Milestone

What's on your mind?



HIAPER Pole to Pole Observations (HIPPO) updated their cover photo.

3 minutes ago





HIAPER Pole to Pole Obser...

Timeline

Now

Posts by Page

Admin Panel

Now

February

2012

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The Earth Observing Laboratory (EOL) is a world renowned leader in Atmospheric Science. For 50 years we have developed and deployed observing facilities



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HIAPER Pole to Pole Observations (HIPPO)

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Non-Profit Organization

The project will provide the first comprehensive, global survey of atmospheric trace gases, covering the full troposphere in all seasons and multiple years.



586



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HIAPER Pole to Pole Observations (HIPPO) updated their cover photo. 3 minutes ago





NCAR HIPPO

@NCAR_HIPPO

This study is the first time scientists have attempted to systematically map global distribution of carbon dioxide and other greenhouse gases in the atmosphere.

NCAR · <http://hippo.ucar.edu/>

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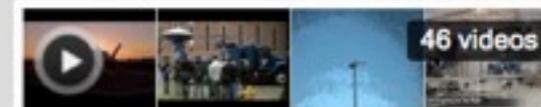
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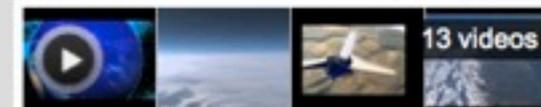
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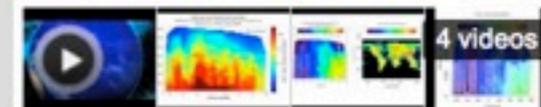
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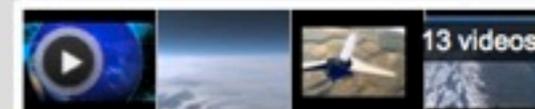
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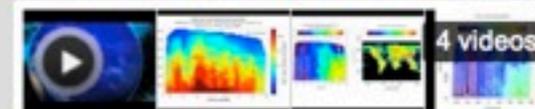
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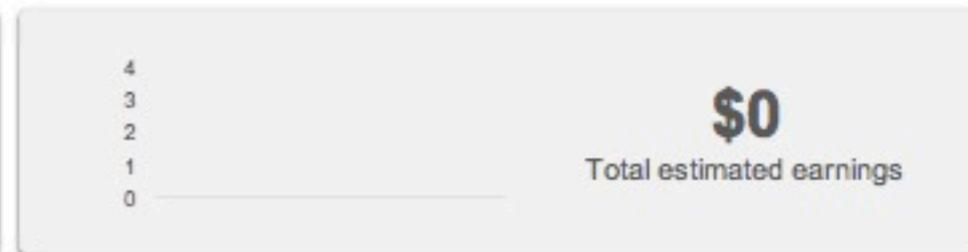
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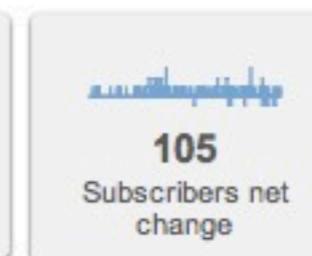
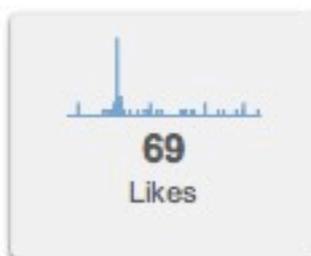
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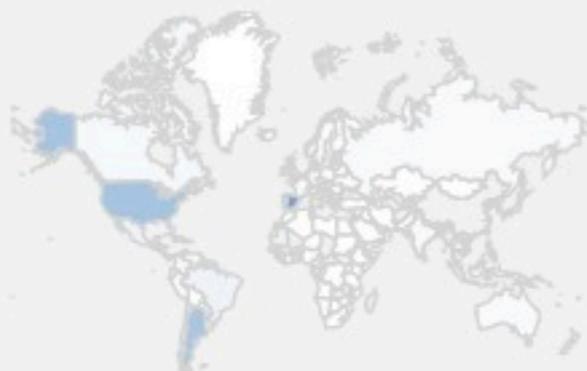
Video	Views ↓	Subscribers net change	Total estimated earnings
1. HIPPO II - Research Flight 03	23,439	0	\$0
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4. HIPPO V Flight Plan :: 9 August - 9 September, 2011	842	0	\$0
5. Carbon Dioxide (CO2) Instrument on the HIPPO Cam...	562	0	\$0
6. Atmospheric Water Vapor	510	1	\$0
7. HIPPO Phase II RF02 Polar Flight	468	0	\$0
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9. HIPPO IV Flight Plan :: 14 July - 10 June, 2011	399	0	\$0
10. HIPPO II - Research Flight 01	380	0	\$0



Demographics

Top geographies

- Spain
- United States
- Argentina
- Mexico
- Brazil



Gender

- Male 80.1%
- Female 19.9%



Discovery

Top playback locations

- Embedded player on other websites 60.9%
- YouTube watch page 32.1%
- Mobile devices 3.8%
- Other 3.2%



Top traffic sources

- Mobile apps and direct traffic 70.5%
- View referrals from YouTube 21.8%
- View referrals from outside YouTube 7.7%
- Other 0.0%





HIPPO in Print



HIPPO Pens!

Our Paper-Thin Atmosphere

The part of the atmosphere where weather occurs (the red layer in this photo) is called the troposphere. It is only 7 to 10 miles (11 to 16 kilometers) deep. If Earth were the size of a soccer ball, the troposphere would be thinner than a sheet of paper.

The top of this thin layer is another one, called the stratosphere. It contains the ozone protective layer. Some of the ultraviolet light that otherwise would destroy life on Earth.

In the 1950s, scientists found that part of the ozone layer was disappearing above Antarctica each spring. Human-made chemicals released into the air and absorbed in the polar stratosphere are destroying ozone. One of these chemicals is now restricted, but those already in the atmosphere will remain there for decades to come.

Reflections on Climate



Plants, water, cities, clouds, and ice absorb and reflect sunlight. The amount that gets absorbed on the Earth may vary from day to night, or it may change from one year to the next.

When a fully sunlit cloud passes overhead on a summer day, you feel cooler immediately. That is because the top of the cloud reflects longer heat rays away before they reach the Earth. Clouds also warm Earth by trapping heat from Earth's surface.

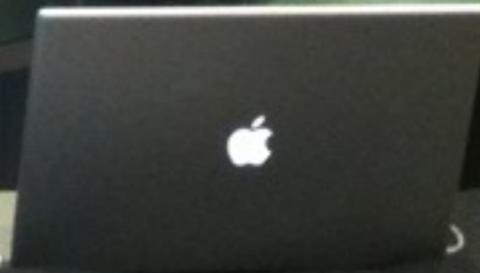
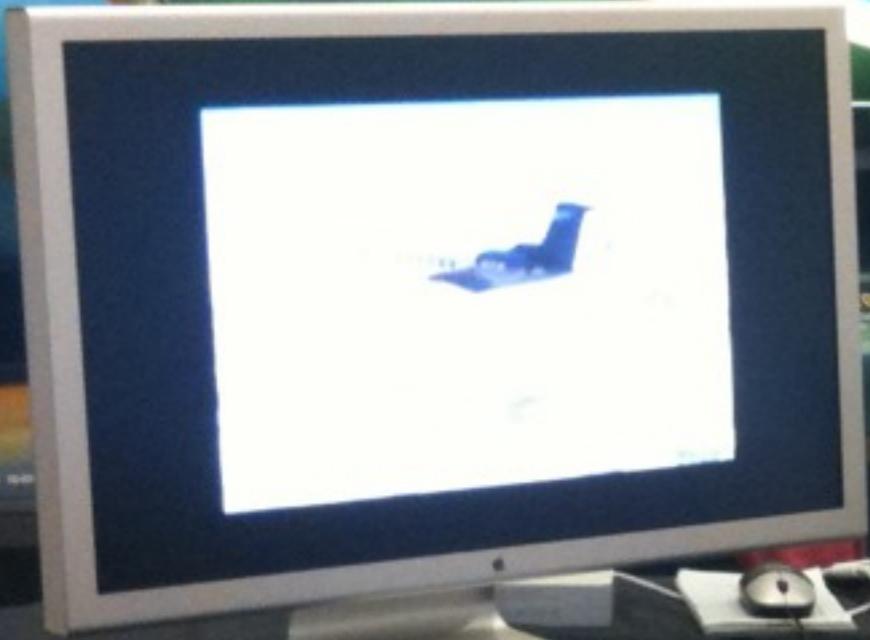
Some invisible molecules absorb and reflect sunlight. Greenhouse gases do this. The carbon dioxide above most of the planet has warmed the planet through heat that it traps that bounces back from the Earth.

Earth's temperature and the level of carbon dioxide in the atmosphere have risen and fallen many times over the past 400,000 years. This is because our melting glaciers, by the absorption of incoming solar heat, cooling other things. There is a correlation about every 100,000 years in human history, and global temperatures are at their warmest in at least 1,000 years. (See graph to right.)

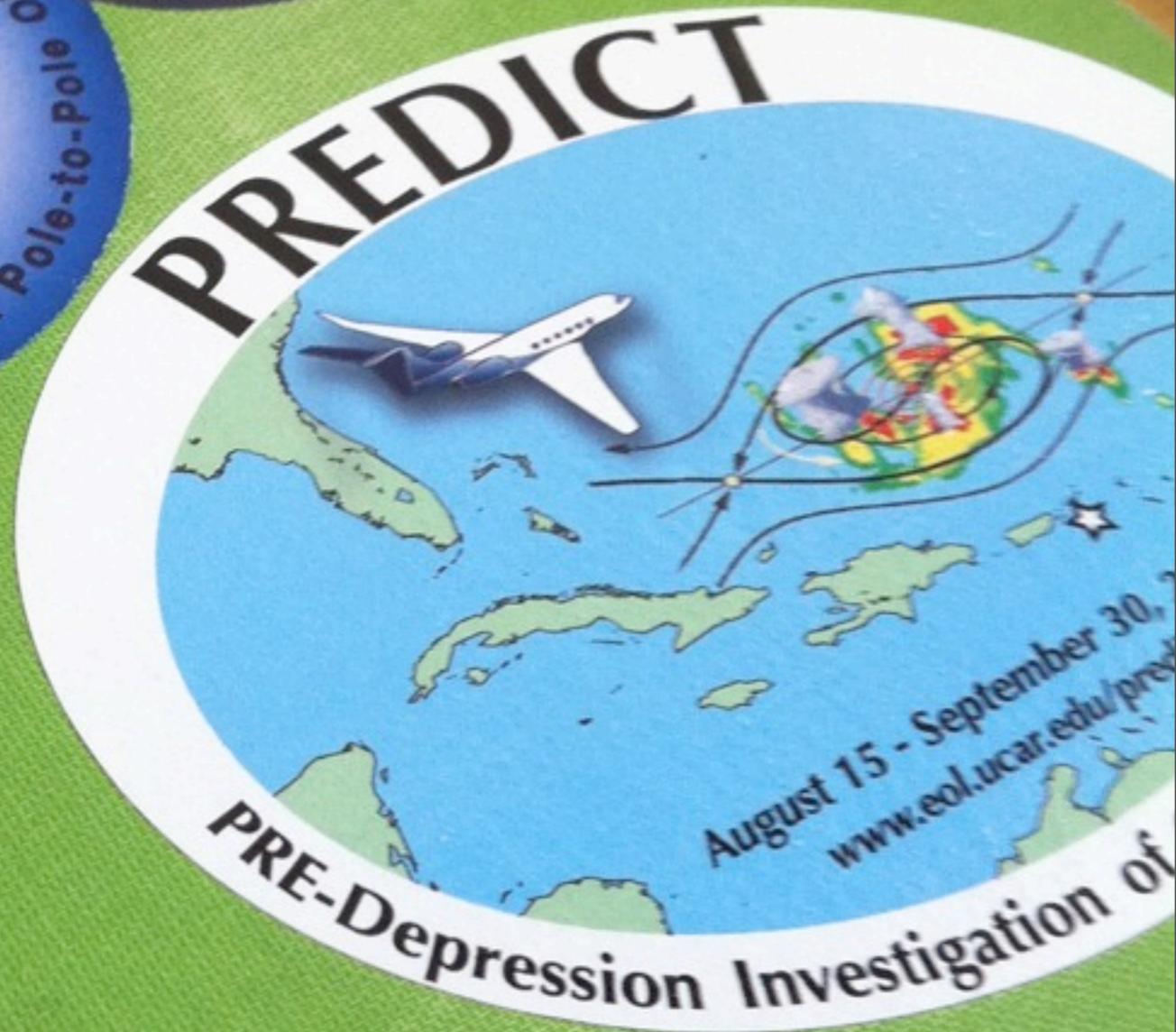
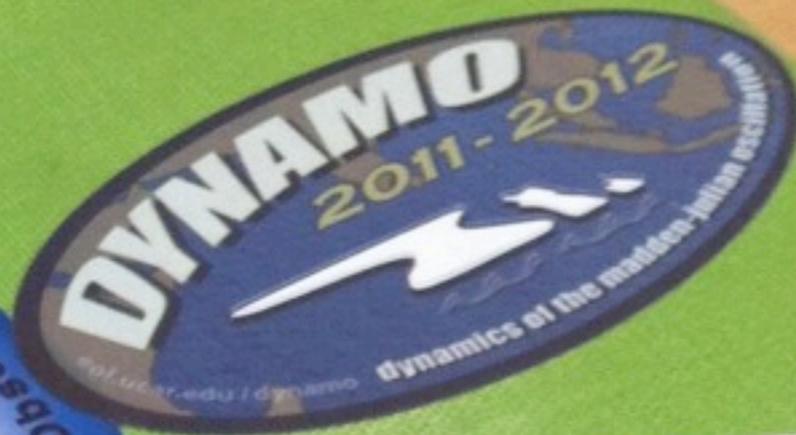
Why Do We Have Seasons? (Answer)



The Earth's axis is tilted at an angle of about 23.5 degrees. This tilt causes the Earth to receive different amounts of sunlight throughout the year, creating the four seasons: spring, summer, fall, and winter.



HIPPO Brochures



HIPPO Stickers



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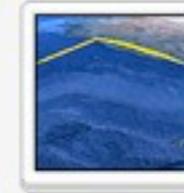
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HIPPO III

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22 photos

1 view

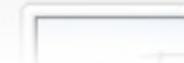
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HIPPO IV

27 photos

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HIPPO III



HIPPO II

22 photos

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<http://hippo.ucar.edu/hippo-pics-information>

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HIAPER **Pole-to-Pole** **Observations**

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HIPPO Pics Information

There is now a place for everyone to upload and share their HIPPO pictures!

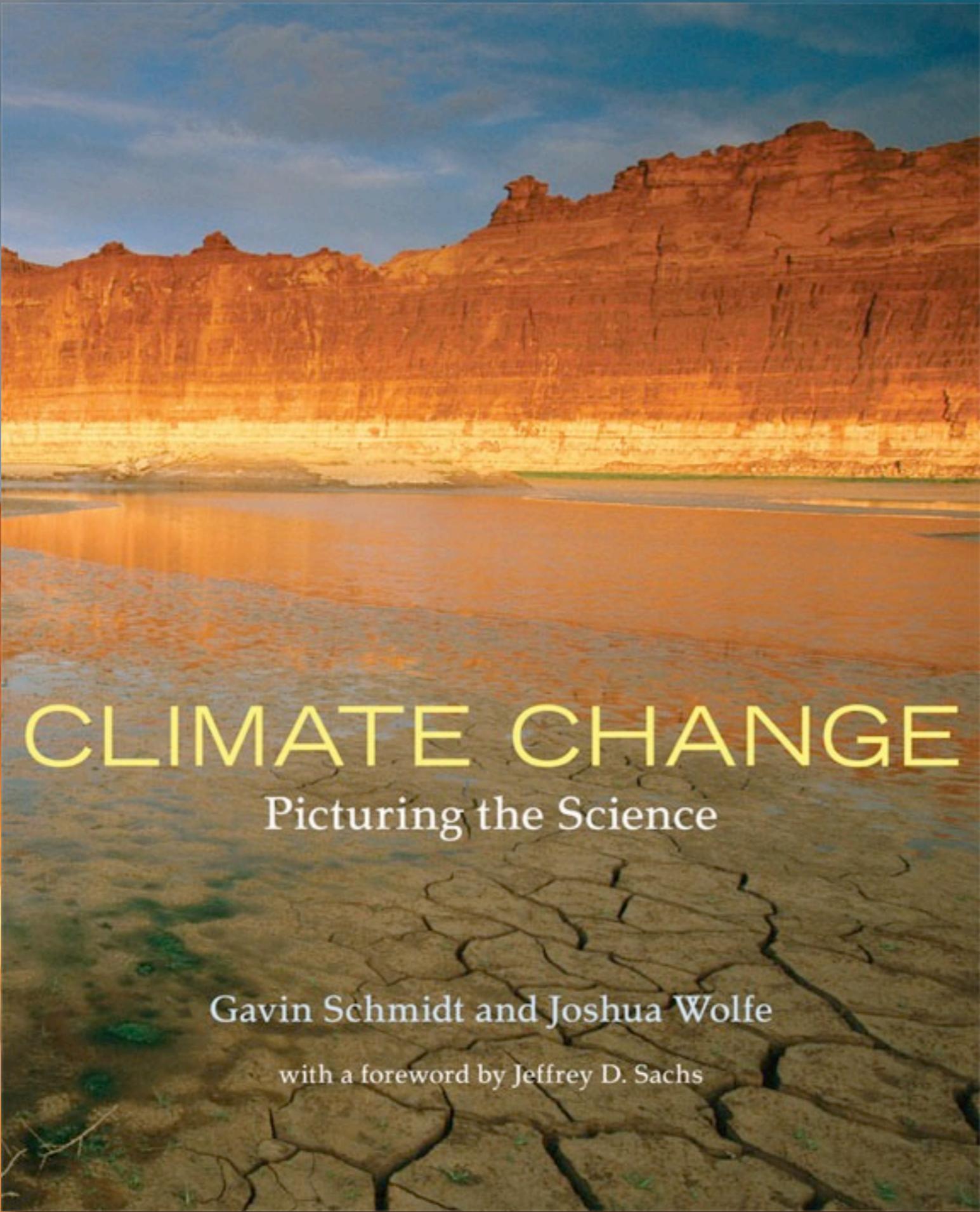
A Flickr (online photo organization and sharing software) account has been set up, you can access it with the following information:

URL: <http://www.flickr.com/photos/hippopics/>

Yahoo! ID: hippopics

Password: greenhouse





CLIMATE CHANGE

Picturing the Science

Gavin Schmidt and Joshua Wolfe

with a foreword by Jeffrey D. Sachs