Current and Emerging K-16 and Public Outreach Resources from UCAR

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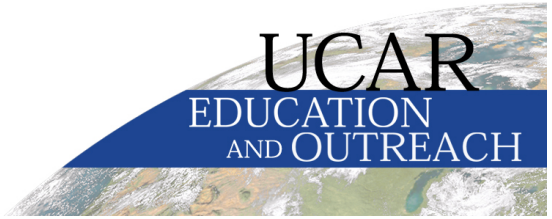
CMMAP Team Meeting, Berkeley, CA
Wednesday, January 12, 2011



Overview

- Focus of UCAR EO's activities
  - SOARS – undergrad/graduate education and workforce development
  - Windows to the Universe - web-based outreach
  - Illustrations, microworlds, toy models, visualizations
  - K-12 - teacher professional development
- Broadening/deepening collaborations
- Demo/discussion of a visualization
- Kinesthetic activity – the dynamic nature of systems

UCAR EDUCATION AND OUTREACH

SOARS – an undergraduate to grad bridge program

Broadening participation in the atmospheric and related sciences

Main program strategies

- Authentic research experiences
- Mentoring
- Supportive community

research | mentoring | community SOARS

NSF

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Past CMMAP protégés

- 4 CMMAP-supported protégés have entered graduate school and one in CMMAP-related research at CSU
- 1 CMMAP-supported protégé is applying to graduate programs currently
- CMMAP supported protégés include
  - 5 Females and 2 Male
  - 2 African-Americans, 4 Latino, 1 Asian

research | mentoring | community SOARS

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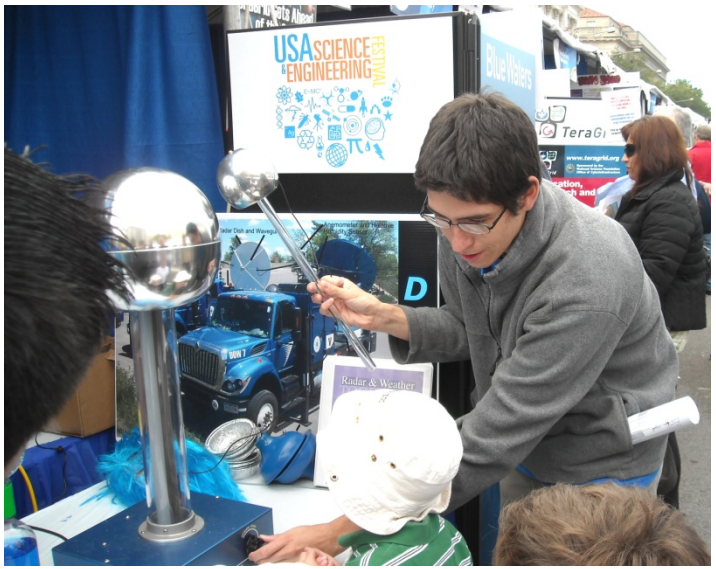
SOARS & CMMAP 2011-2016



- Opportunities for students in science education
- 2 students per summer
- SOARS partnership with NEON and WHOI
- Internship opportunities for high school students
- Participatory research

SOARS application deadline Feb 1
Please encourage your students to apply!
www.soars.ucar.edu

Extensive Outreach through W2U

Share this page

ATMOSPHERE

Layers

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Polar Atmosphere

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Modeling

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Games/Activities

Images

Teaching Resources

Science Literacy Framework

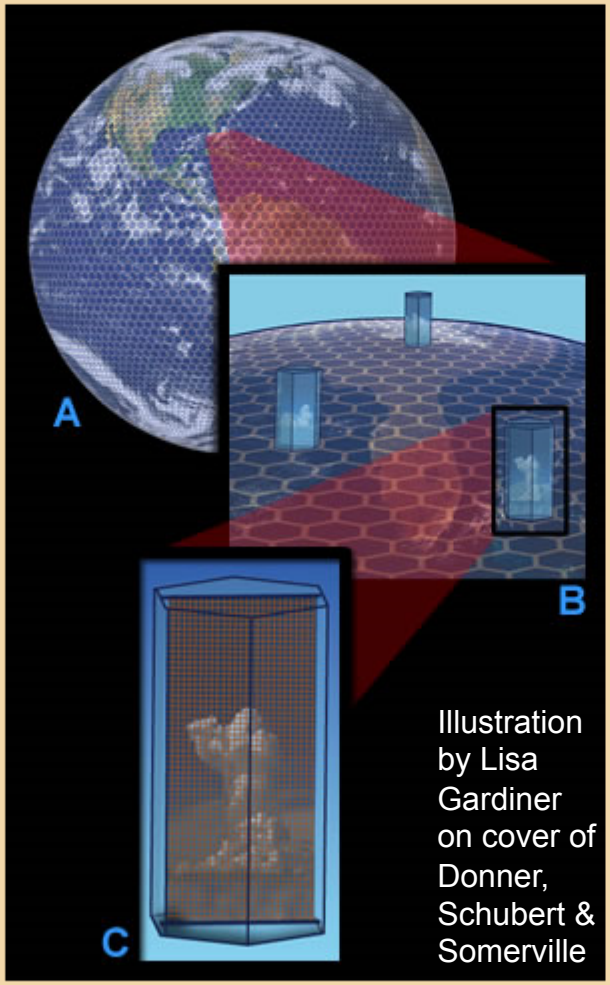

Illustration by Lisa Gardiner on cover of Donner, Schubert & Somerville

At a large scale, the CMMAP model divides Earth into hexagons of equal size (A). The model calculations focus on the atmospheric events within each hexagon

CMMAP - Studying Clouds and Climate

Clouds are an important part of Earth's weather and climate. Scientists use computer models to study our planet's climate. These computer models include models of clouds. It's hard to model clouds because these models need to include both large and small things. Some parts of cloud models need to explain very big things like hurricanes that can be more than a hundred miles across. Other parts of cloud models need to explain very small things like raindrops and snowflakes.

CMMAP (pronounced "see-map") stands for the Center for Multi-Scale Modeling of Atmospheric Processes. CMMAP scientists are working on a new way to model the climate that will help us to better understand the roles clouds play today and in the future as our climate changes. Climate model grid cells are usually about the size of the state of Delaware. The problem with modeling clouds is that they are much smaller than this, and there could be thousands of clouds in an area the size of Delaware at any given time.

One solution that CMMAP scientists are working on is to make the grid cells small enough to simulate clouds. This has been done using cells the size of city blocks. Although these models do a good job simulating clouds that are realistic, they are very slow. Even the fastest computers in the world are too slow to simulate global climate with city-block-sized cells. Someday this will be possible, but that is many years away.

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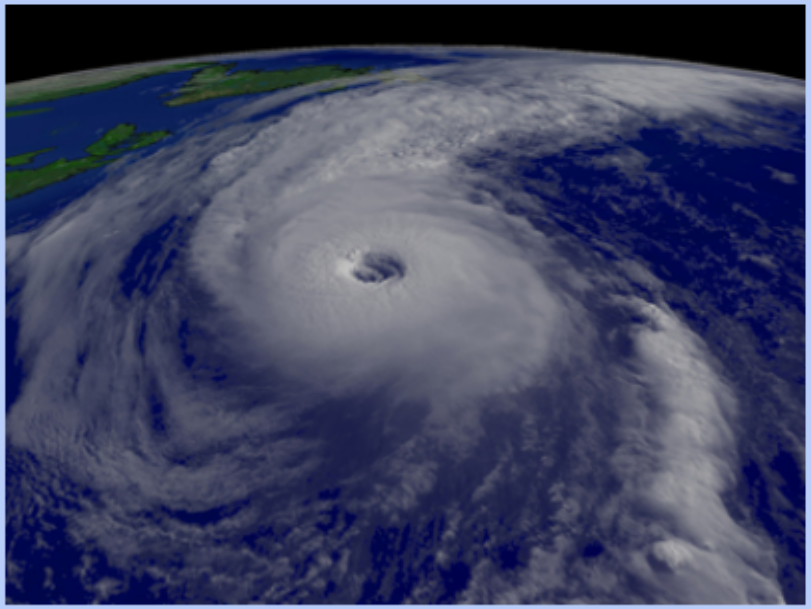
Games/Activities
Images
Literacy Framework

Weather

Weather is the state of the atmosphere at a given time and place. Most weather takes place in the troposphere, the lowest layer of the atmosphere.

Weather is measured and described in a variety of ways by meteorologists, scientists who study and predict weather. Air temperature and pressure, the amount and type of precipitation, the strength and direction of wind, and the types of clouds are all described in a weather report.

Weather changes each day because the air in our atmosphere is always moving, distributing energy from the Sun. In most places in the world, the types of weather events also vary throughout the year as seasons change.



Hurricane Alex, a category 3 storm at its strongest, traveled north along the east coast of North America in August 2004 causing flooding, strong waves, and rip tides along the coast. Hurricanes form in the tropics over warm ocean water and die down when they move over land or out of the tropics. These storms are called hurricanes in the Atlantic and typhoons or tropical cyclones in other areas of the world.

Courtesy of NOAA

1 2 3 4

Compartir

ESTADOS DEL TIEMPO

Frentes

Nubes

Tempestades

Tornados

Huracanes

Olas de Calor

Ventiscas

Zonas Urbanas

Óptica atmosférica

Instrumentos

Arte y Cultura

Juegos/Actividades

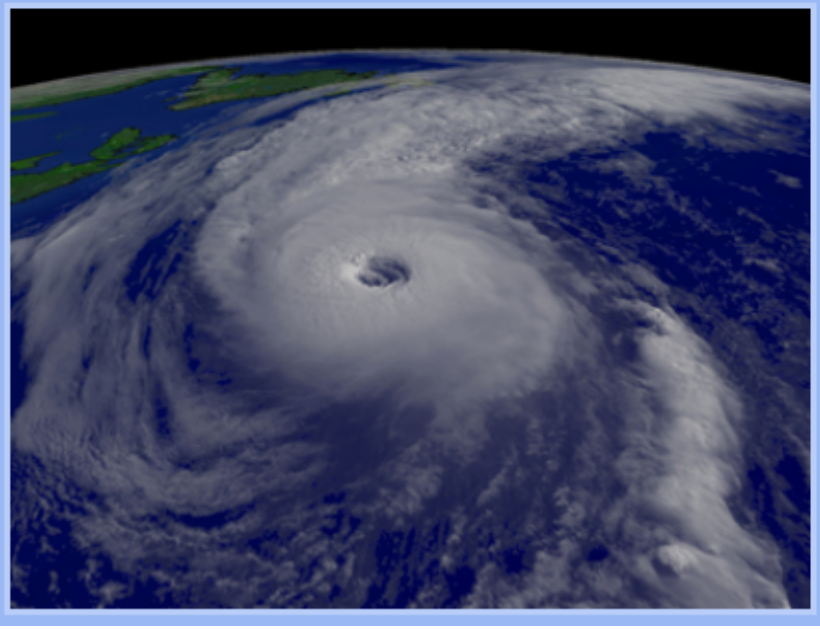
Imágenes

Marco de Instrucción

Estado del tiempo es la condición en que se encuentra la atmósfera en un determinado momento y lugar. La mayoría de los estados del tiempoocurren en la troposfera, la capa más baja de la atmósfera.

Los meteorólogos, científicos que estudian y predicen los estados del tiempo, miden y describen los estados del tiempo de muchas maneras. La temperatura y la presión del aire, la cantidad y el tipo de precipitation , la fuerza y la dirección del viento, y los tipos de nubes, son todos factores descritos en un informe del estado del tiempo.

Los estados del tiempo cambian todos los días porque el aire en nuestra atmósfera está siempre en movimiento y distribuye la energía del Sol. En casi todo el mundo, los tipos de eventos de los estados del tiempo varían a lo largo del año a medida que van cambiando las estaciones.



El huracán Alex, una tormenta categoría 3, viajó a lo largo de la costa este de Norte América en agosto 2004, causando inundaciones, fuertes olas, y Corrientes marinas intensas. Los huracanes se forman sobre los océanos cálidos de los trópicos, y se debilitan y mueren cuando se mueven sobre tierra o fuera de los trópicos. Estas tormentas son llamadas huracanes en el Atlántico, y tifones o tormentas tropicales en otros lugares.

Cortesía de NOAA

1 2 3 4

Windows to the Universe Image Galleries

Select a gallery

- Earth
  - Images from Space
  - Atmosphere
    - + Clouds
    - + Weather
    - **Atmospheric Optics**
  - + Climate
  - + Landforms
  - + Water
  - + Rocks and Minerals
  - + Living Things
  - + Biomes
  - + Cryosphere and Polar Regions
  - Moon
- + Solar System
- + The Universe
- + Space Weather
- + Space Missions
- + Mythology and Art
- + People
- + Field Campaigns

Earth - Atmosphere - Atmospheric Optics


This image of a double rainbow was taken in

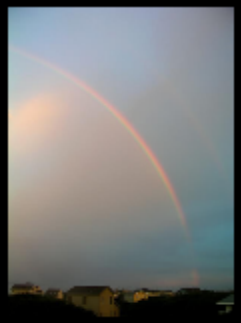

A green flash can be seen at sunrise and


A sun pillar is a glittering vertical shaft of ...


A silver lining, which sometimes can be seen


At sunrise or sunset, the sky may appear r


When direct sunlight strikes falling rain, a ...


For a rainbow to form, water droplets must be


This photograph shows polar stratospheric


These mystifying clouds are called Polar ...


A perhelia (sun dog) bright patch or ...


Halos form when light from the sun or moon is

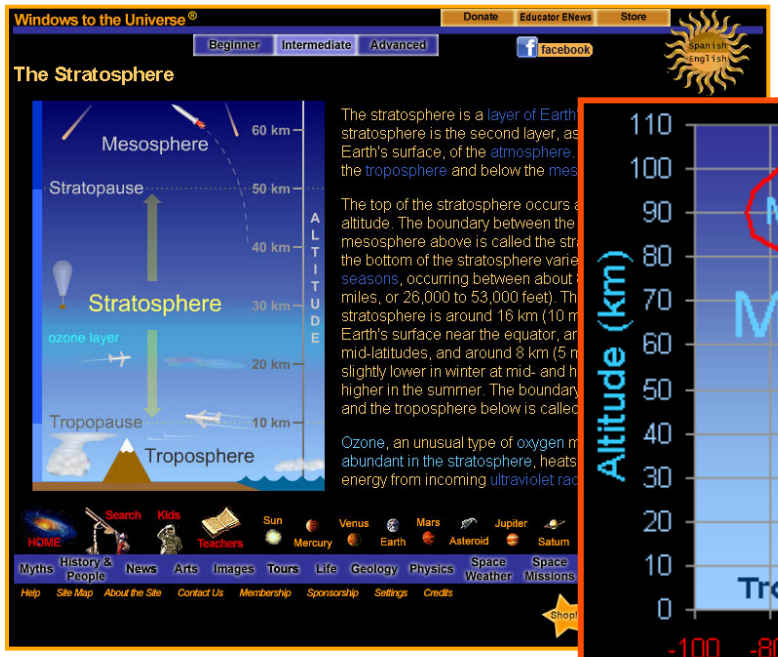

This photograph was taken from the window


Crepuscular rays poking through clouds create a

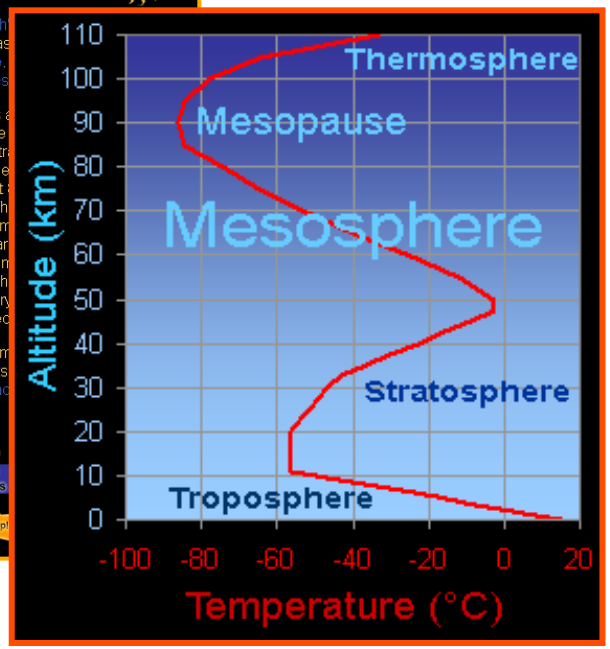

Solar winds and other forms of solar activity ...

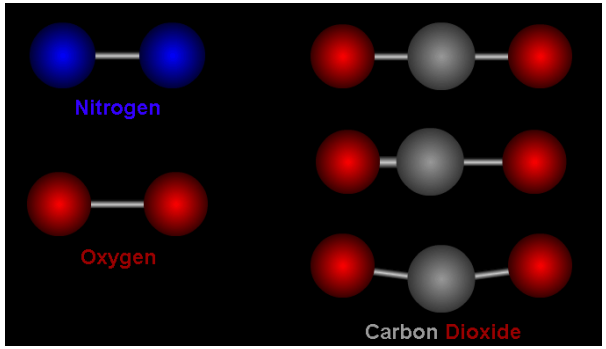

Anti-crepuscular ray: are beams of sunligh

Atmospheric graphics and virtual labs

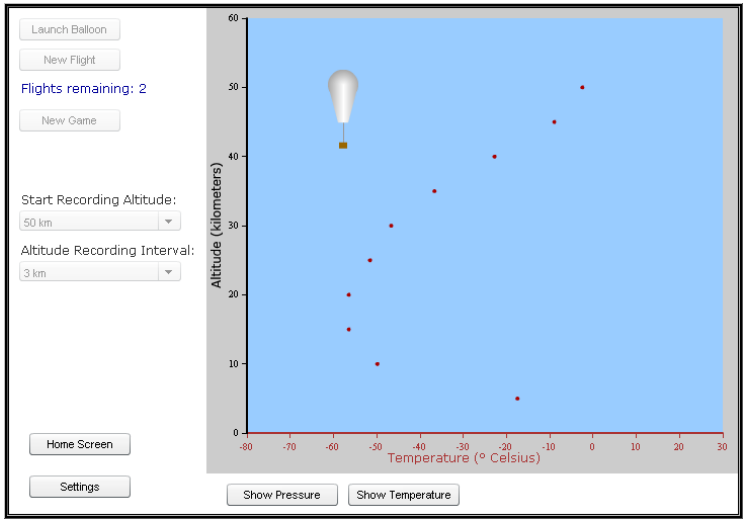


atmospheric layers and composition





virtual ballooning activity



WINDOWS TO THE UNIVERSE

Teacher Resources
Lesson Plans and Activities for the Classroom
www.windows.ucar.edu

Title:	**Virtual Ballooning to Explore Earth's Atmosphere**
Summary:	Students will use software to launch virtual weather balloons and collect data about Earth's atmosphere.
Source:	*Windows to the Universe activity by Randy Russell. Available online at: www.windows.ucar.edu/tour/link=/teacher_resources/graphs /teach_balloon_atmostrata.html*
Grade level:	6-12
Time:	1 hour
Student Learning Outcomes:	• Students will be able to describe how temperature and air pressure vary with altitude in Earth's atmosphere. • Students will design a research plan and make decisions in the process of conducting a simple experiment or "research project". • Students will learn about layers of Earth's atmosphere, electromagnetic radiation, the ozone layer, and the Greenhouse Effect.
Lesson format:	Computer and paper-and-pencil based activity.

Clouds in Art

Which type of cloud do you see in this painting?
Compare with the photographs in the Cloud Finder.

This painting, by nineteenth-century French Impressionist painter Camille Pissarro, is called Route de Louveciennes. Louveciennes is a village near Paris, France. There are puffy little cumulus clouds in the sky above the town. Check the Cloud Finder to learn more.

More Cloud Paintings

WINDOWS TO THE UNIVERSE

Cloud Finder

Cloud Photos:

Cumulus clouds are puffy like cotton balls. They tend to have defined edges against the sky. The clouds in Pissarro's painting have distinct edges and cumulus shapes.

Credits | For Teachers

Connecting Science & Humanities

The Sky is Low, The Clouds Are Mean, a poem by Emily Dickinson

This painting by British
called Seascape Study
he has painted a rain cl
dark like this one and c
Click on image for full si
Public domain/Wikipedi

The Sky Is Low, The Clouds Are Mean

The sky is low, the clouds are mean,
A travelling flake of snow
Across a barn or through a rut
Debates if it will go.

Tawhiri, Maori God of Wind and Storms

Maori wood carving at the Arataki Visitor Centre, Auckland, New Zealand
Click on image for full size (110 Kb)
Public domain image/Wikipedia Commons

Tawhiri was very angry with his brothers. They disagreed about whether their parents, Rangi (the sky) and Papa (the Earth), should be separated. His brothers won, sky and Earth were separated, and Tawhiri was furious.

As the god of wind and storms, Tawhiri had a way to retaliate against his brothers. He hid in the sky and plotted his revenge.

From his place in the sky he sent thunderstorms and hurricanes to his brother Tane-mahuta, the god of forests. The tall trees of the forests cracked and fell.

He sent storms over the oceans to punish his brother Tangaroa, the god of the sea. Waves and whirlpools of water upset the oceans.

He sent storms to his brothers Haumia-tikitiki and Rongo-ma-tane, the gods of food. These brothers were protected by their mother the Earth. She held them close and they were not harmed by the storms Tawhiri sent.

The last brother, Tu-matauenga, withstood the wind and storms that Tawhiri sent. This brother was the god of fierce humans.

Tawhiri had thirteen cloud children who lived in the sky. Some of the cloud children were dark and stormy and others were light and puffy. He was also the father of rain, mist, and fog.

The story of Tawhiri and his family is a part of the mythology of the Maori people from New Zealand and eastern Polynesia.

Disseminating LSOP Videos

Videos about Clouds, Weather, and Climate

These videos cover various topics related to clouds, weather, and climate. They were created by the Little Shop of Physics (LSOP) and the CMMAP Project.

Cotton Candy and Windmills

A machine for making cotton candy illustrates how air pressure, wind, and a bit of spin control the flow of air around our planet... and make for a tasty treat!

Length: 3 minutes 13 seconds

Convection Cells Move Air Around

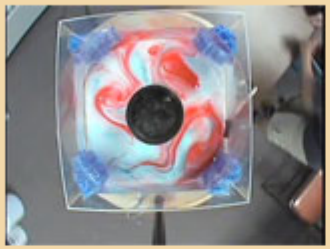
Warm air rises; cool air sinks. This process of convection moves air around in our atmosphere, causing winds to blow.

Length: 3 minutes 5 seconds

Global Winds

Convection moves warm and cold air around. Global winds on our planet are also influenced by Earth's spin. Brian demonstrates this with a spinning bowl and dry ice.

Length: 5 minutes 39 seconds



Global Atmospheric Circulation Model

Taka Ito, an oceanographer at Colorado State University, uses a spinning water tank with warm and cold water to demonstrate global circulation of wind and how Earth's spin affects the wind .

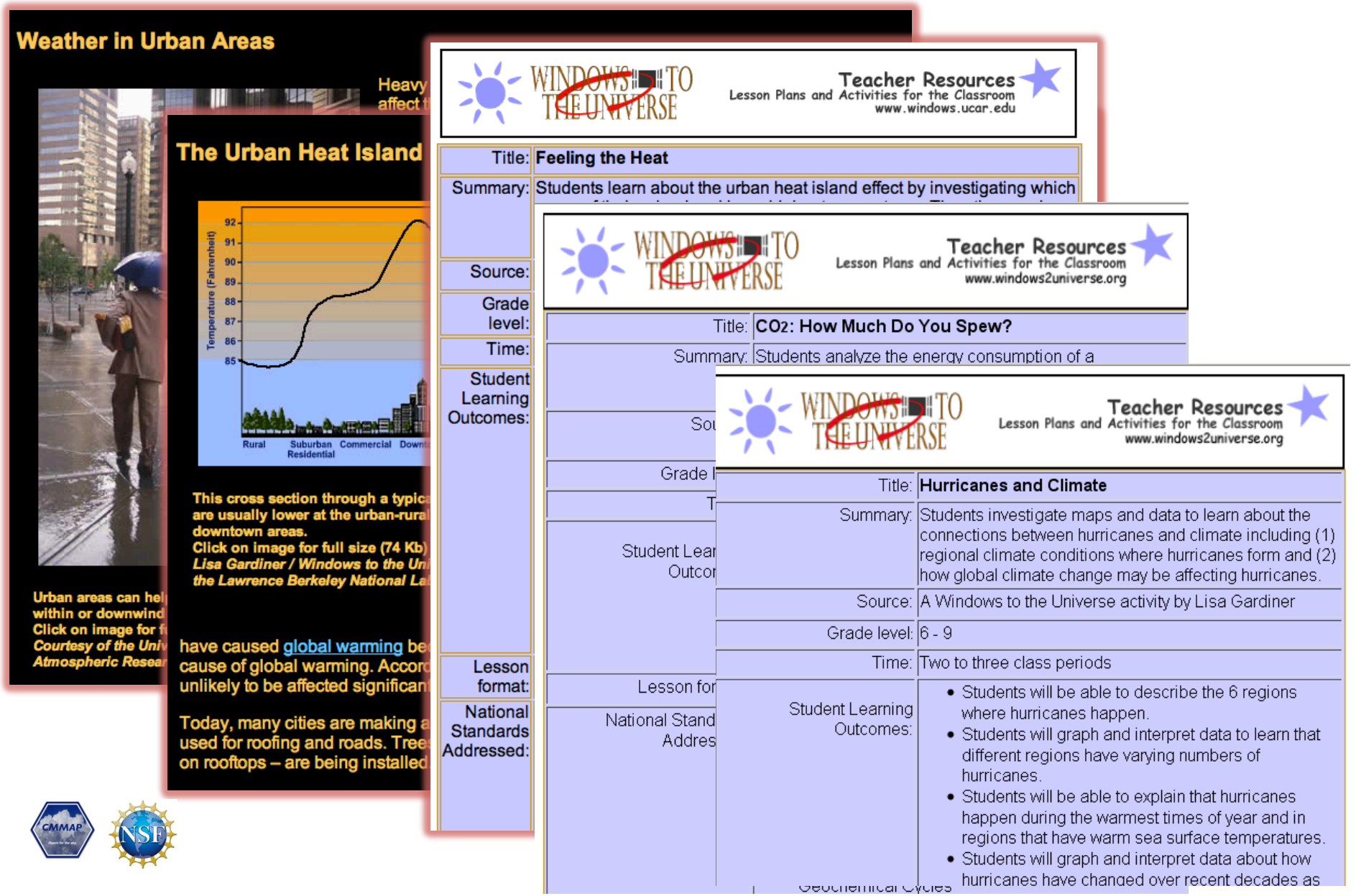
Length: 2 minutes 4 seconds

Last modified November 15, 2010 by Randy Russell.

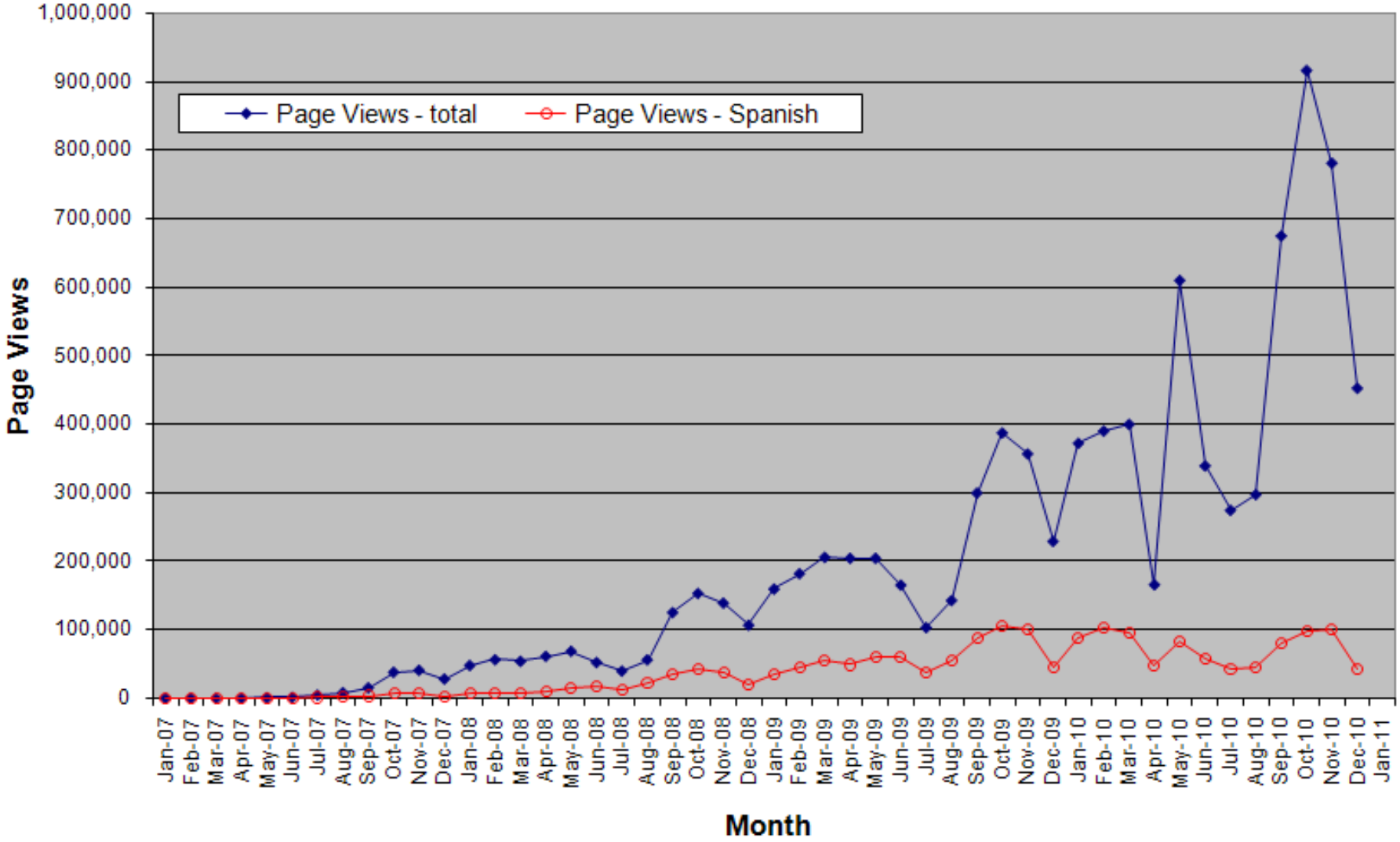
About 20,400 page views from nearly 10,000 "visitors" over past 13 months

UCAR EDUCATION AND OUTREACH

Training Teachers about Weather, Climate, Modeling, and Sustainability

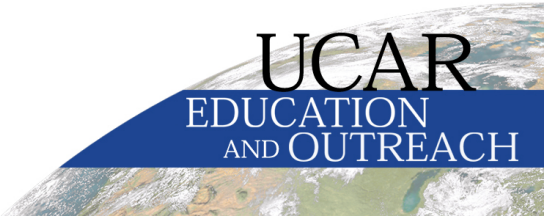


Monthly W2U CMMAP Page Views



News!

- Windows has moved from UCAR to the National Earth Science Teacher Association (NESTA)
- CSU will become a W2U Institutional Partner
- Online audience for CMMAP will continue to grow through
  - Training LSOP and CMMAP educators/scientists to submit resources to W2U
  - Announcements about CMMAP through e-newsletter to thousands of educato



Collaborations: Web Seminars Coming in 2011-2015

Featuring CMMAP Teachers Weather and Climate Workshop

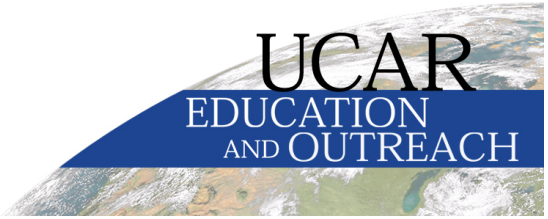
Collaborations: CMMAP-LSOP-UCAR EO AMS

Weatherfest, Seattle, January 23

Collaborations: SOARS protégés training as educators

Collaborations: UCAR Community

- CMMAP Educational partners
  - Exploring closer alignment of themes and products between LSOP and UCAR EO
  - Testing EO's and LSOP new CMMAP resources in NCAR Mesa Lab public visitor program
  - A new NCAR Weather Gallery exhibit and website to provide an outlet for CMMAP science and resources
- UCAR-wide
  - Ongoing contributions of CMMAP scientists to education resource development
  - Expanded science communications experiences for young scientists
  - Closer connections of UCAR EO with COMET, GLOBE, and digital libraries (NSDL and DLESE)
  - Exploring proposal development partnerships with UCAR members



CLOUD ZOOM

demonstration and discussion

- What concepts would be interesting to explore with this tool?
- What phenomena and images do you suggest to represent at specific spatial scales?
- How could CLOUD ZOOM be made most useful to you in your undergraduate courses?

Send ideas to:

rrussell@ucar.edu

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