

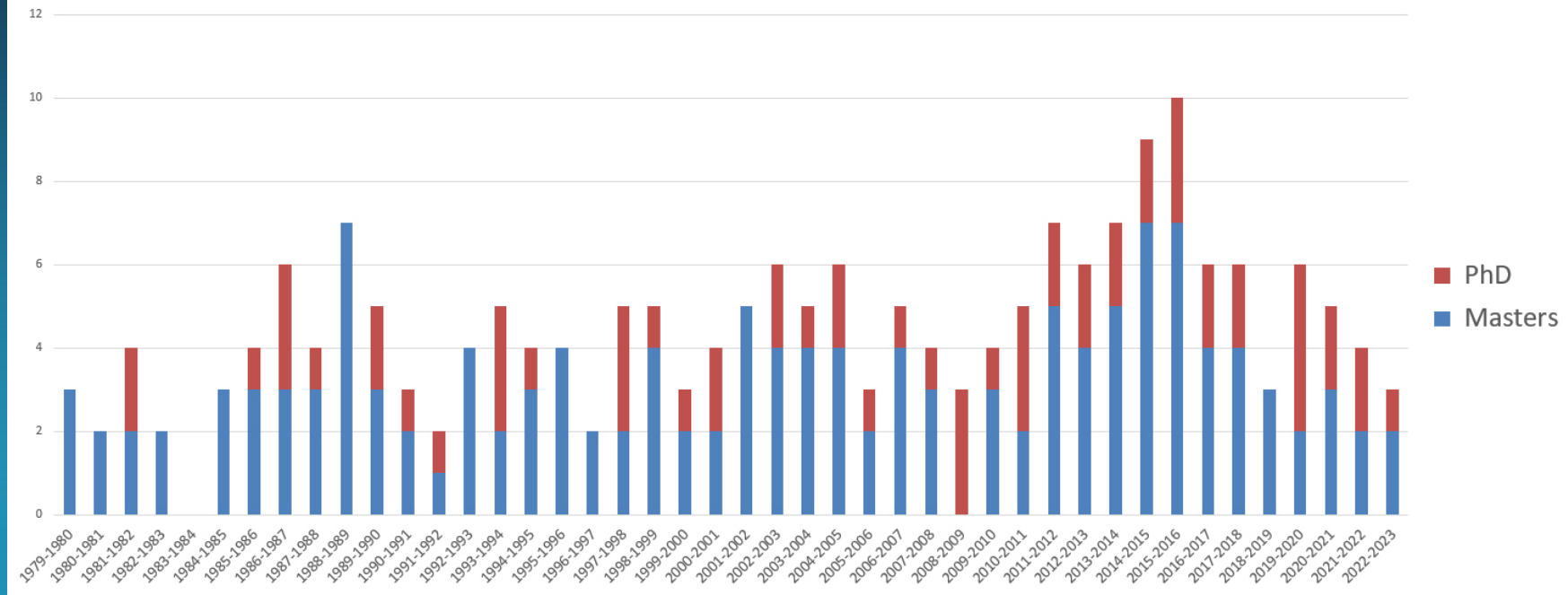
Education and Training at CIMSS

Margaret Mooney

NOAA's Cooperative Institute for Meteorological Satellite Studies



CIMSS supported AOS Degrees 1979-2022



CIMSS Student Workshop on Atmospheric, Satellite, and Earth Sciences – since 1995!



The Workshop was created by CIMSS scientists who wanted to share the exciting nature of scientific research and technology with the pre-college education community.



To attract the best and brightest students into scientific careers, organizers wanted to stimulate young people's interest by showing them that science is interesting, exciting, and fun!



CIMSS Student Workshop on Atmospheric, Satellite, and Earth Sciences



2019



2023

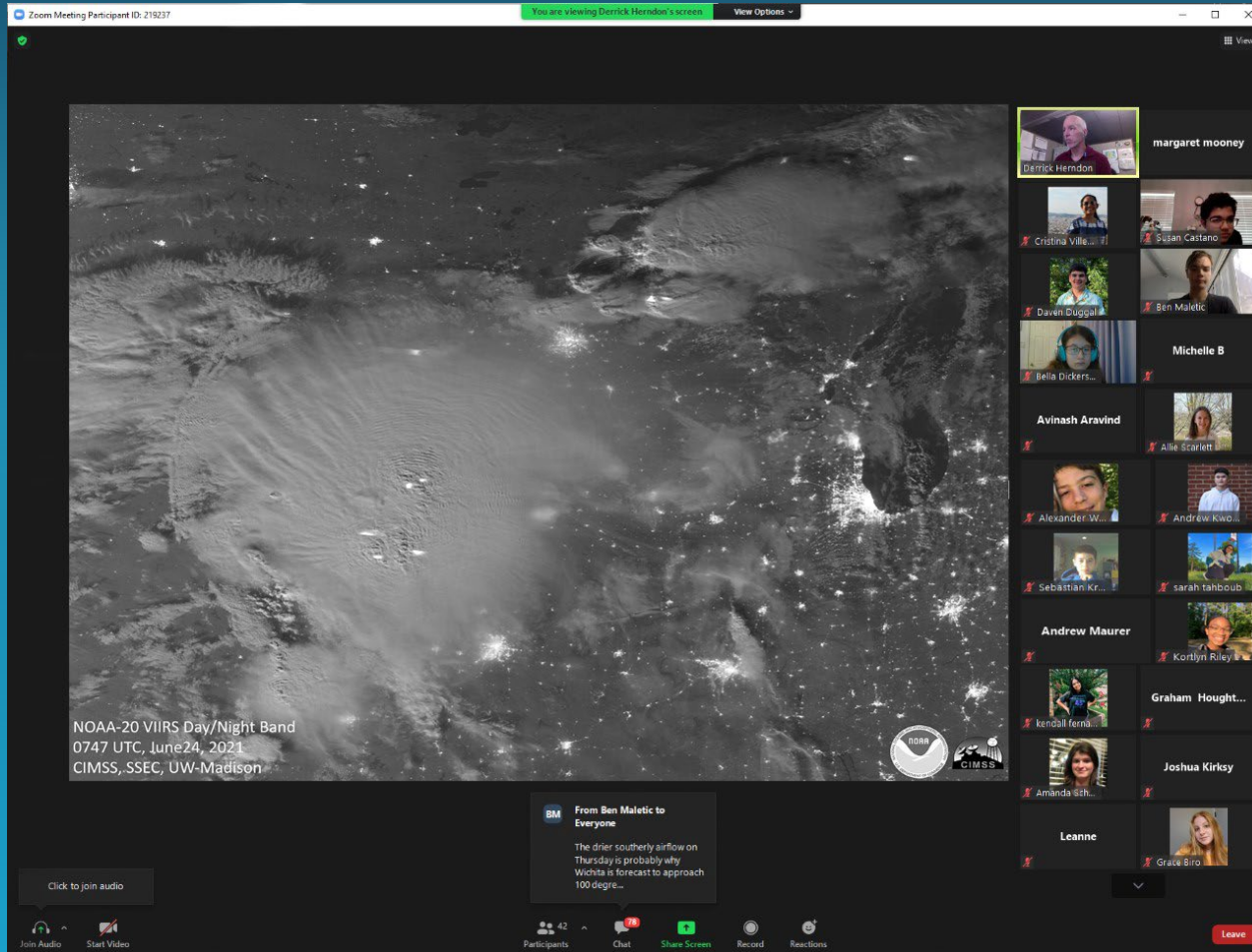


CIMSS Weather Camp

CIMSS debuted an on-line Weather Camp in 2021 co-directed by Derrick Herndon and Margaret Mooney, hosting 42 high school students from more than 30 states, including Alaska and Puerto Rico.

Initially conceived as a one-time event to substitute for the CIMSS residential Earth Science Camp, which was not offered in 2020 or 2021 due to the pandemic, the program will continue every summer.

Numerous researchers shared their expertise throughout the week and students learned about a different "weather job" daily, including NOAA's National Weather Service. The camp culminated with a forecast challenge and student presentations.



TEACHER WORKSHOPS ON SATELLITE METEOROLOGY



2003



2004



2005



2006

Satellite Meteorology Resources for Grades 6-14

SATELLITE METEOROLOGY
FOR GRADE 7-12

Learning Modules | For Teachers | Resources | About

WELCOME

Satellite Meteorology Learning Modules

Meteorology is an excellent topic to introduce middle and high school students to geoscience, physics, chemistry and applied mathematics. Satellite Meteorology learning modules provide scientists and educators with exciting activities and hands-on tools for investigation, inquiry, analysis and stewardship.

May we suggest:

- To maximize learning from this Satellite Meteorology course we recommend that students:
- Go through each module in the order they are presented
- Engage in all hands-on exercises in the modules when they are offered
- Tackle "Problems with Solutions" and "Assessments" at the end of each module before moving on to the next one

Note: "Problems and Solutions" and "Assessments" pages are only accessible on the last page of each module)

- 1 INTRODUCTION TO SATELLITE METEOROLOGY**
- 2 WEATHER SATELLITES & ORBITS**
- 3 ELECTROMAGNETIC RADIATION**
- 4 CLOUD IDENTIFICATION**
- 5 SATELLITE IMAGES**
- 6 SATELLITE WINDS**
- 7 WEATHER FORECASTING**
- 8 WILD WEATHER**
- 9 MONITORING THE GLOBAL ENVIRONMENT**
- 10 THREE NEW SATELLITES: SUOMI NPP, JPSS & GOES-R**

WEATHER AND CLIMATE ACTIVITIES TO EXPLORE THE ATMOSPHERE!

Please note that all the webapps on these pages use HTML5 and require an up-to-date browser! These are also "touch-friendly" and will run on mobile devices. (Older Java and Flash versions are [available here.](#))

- Friction and Fly Balls
- Precipitation Type
- Make a Thunderstorm
- Lightning and Thunder
- Tornadoes!
- Satellite Images & Orbits
- Grow Snow Crystals
- Hurricanes
- Exploring Rainbows
- Great Lakes Temperature Interactive
- Relative Humidity
- Past Climates
- Make a Planet
- Seasons
- Sun Angle
- Energy Model
- GOES-R Series ABI Activities
- Phases of the Moon

Conceptual Energy Model

GOES-R Series ABI Activities

NOAA - NASA

<https://cimss.ssec.wisc.edu/wxfest/>

<https://cimss.ssec.wisc.edu/satmet/>



Teacher Workshops on Climate Change

University of Wisconsin-Madison / CIMSS



Climate Literacy Ambassadors A NASA Global Climate Change Education Project

PI: Steve Ackerman Co-I: Margaret Mooney

The Climate Literacy Ambassadors program is a collaborative effort to advance climate literacy led by the Cooperative Institute of Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison. With support from NASA, CIMSS developed workshops and on-line resources to support G6-12 teachers as *Ambassadors of Climate Literacy* in their local schools and communities. The full program included a workshop followed by a 6-week distance learning course culminating in a technology-supported virtual community of climate change educators.

The workshops provide an overview on climate change with demonstrations of cutting-edge resources from NASA, NOAA and the UW-Madison. The first workshop was held in May 2010 at CIMSS in Madison. The last Climate Literacy Ambassadors workshop took place at the July 2013 Earth Science Information Partners (ESIP) meeting in Chapel Hill North Carolina.



May 2010



July 2010



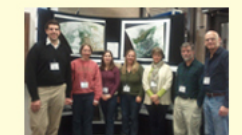
11 January 2011



15 January 2011



July 2011



January 2012



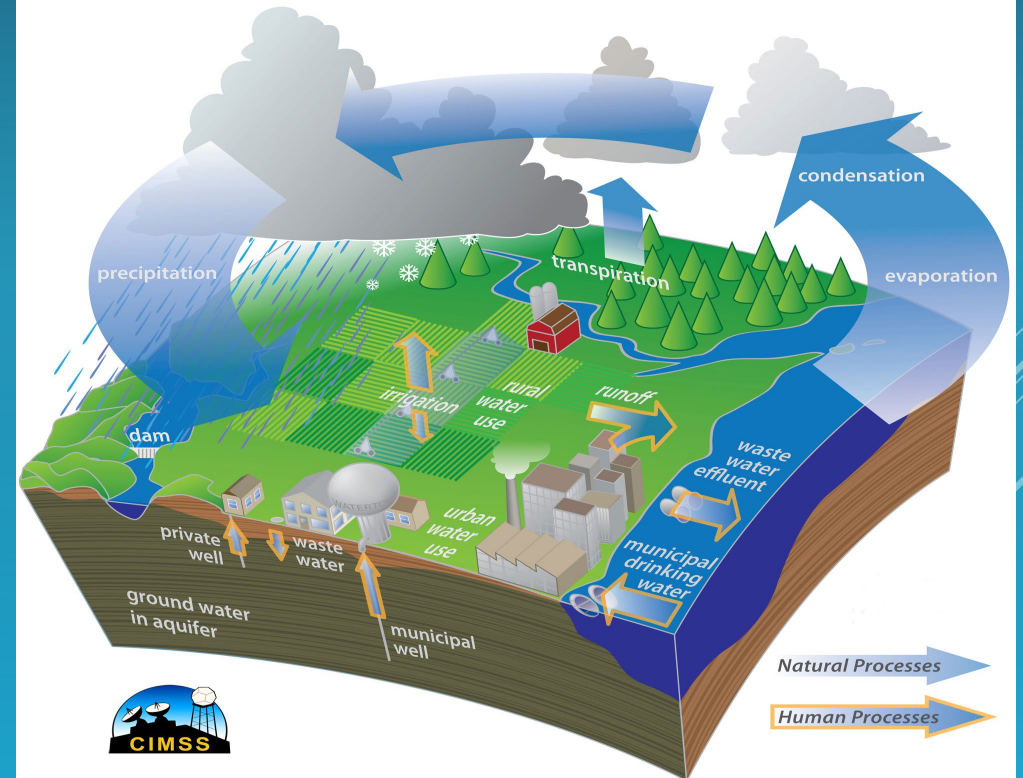
July 2012



July 2013

The distance learning curriculum on **GLOBAL AND REGIONAL CLIMATE CHANGE**, utilizes e-learning technology to clarify graphs and concepts from the 2007 Intergovernmental Panel on Climate Change (IPCC) *Summary for Policy Makers* with content intricately linked to the *Essential Principles of Climate Literacy*.

Great Lakes Water Cycle Diagram



ESIP Teacher Workshops – since 2008

The Earth Science Information Partners (ESIP) is supported by NASA, NOAA and the USGS.

NOAA has supported an ESIP Teacher Workshop since 2008.



Santa Barbara CA, July 2009



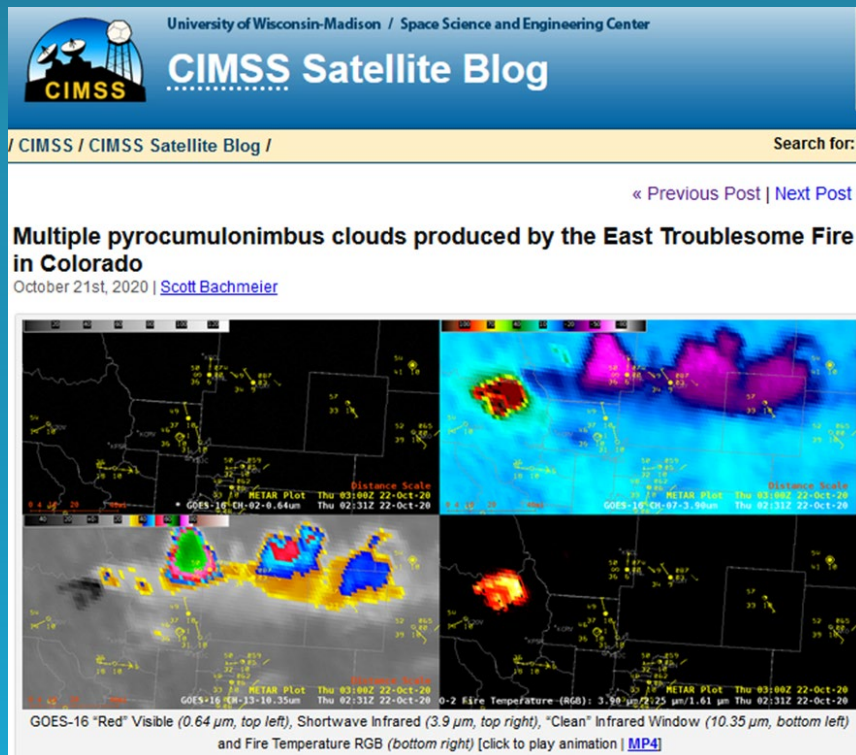
Bloomington IN, July 2017



Burlington VT, July 2023

CIMSS Satellite Blog

An searchable library (by Category, Date or Keyword) library of meteorological cases from 2006 to present, showcasing a variety of satellite images and products that are available to (and/or created by) scientists and researchers at NOAA CIMSS – replacing **CIMSS GOES Gallery**, a less comprehensive collection of events from 1994-2006.



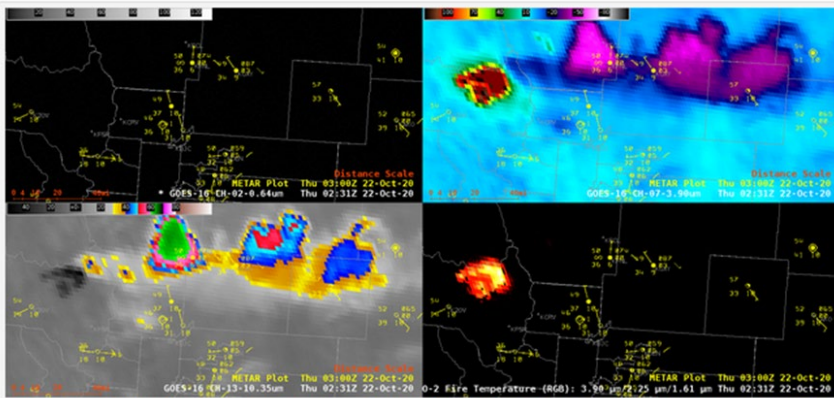
University of Wisconsin-Madison / Space Science and Engineering Center
CIMSS Satellite Blog

/ CIMSS / CIMSS Satellite Blog / Search for: []

« Previous Post | Next Post »

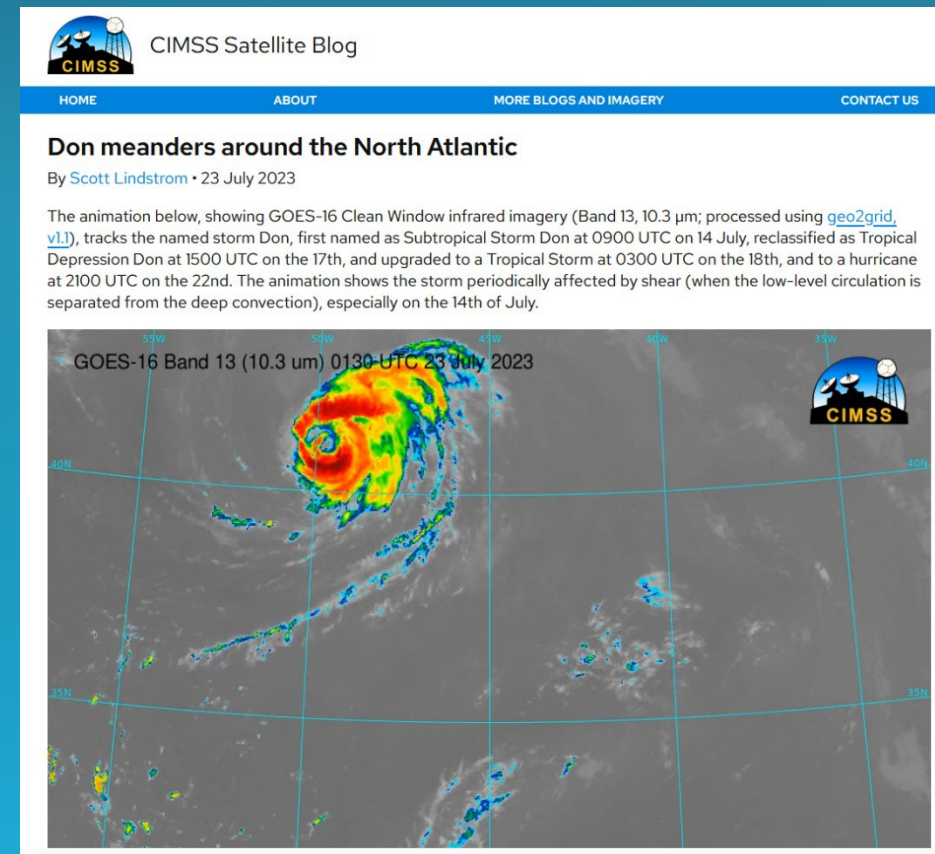
Multiple pyrocumulonimbus clouds produced by the East Troublesome Fire in Colorado


October 21st, 2020 | [Scott Bachmeier](#)



GOES-16 CH-02-0.64um Thu 02:31Z 22-Oct-20
GOES-16 CH-07-3.9um Thu 02:31Z 22-Oct-20
GOES-16 CH-13-10.35um Thu 02:31Z 22-Oct-20
0-2 Fire Temperature (RGB): 3.9um/10.35um/1.61um Thu 02:31Z 22-Oct-20

GOES-16 "Red" Visible (0.64 μm , top left), Shortwave Infrared (3.9 μm , top right), "Clean" Infrared Window (10.35 μm , bottom left) and Fire Temperature RGB (bottom right) [click to play animation | [MP4](#)]



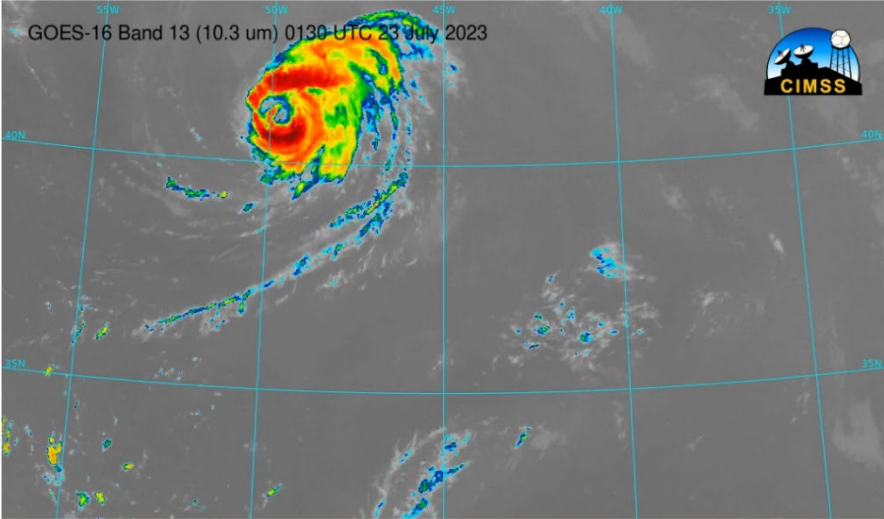
 CIMSS Satellite Blog

HOME ABOUT MORE BLOGS AND IMAGERY CONTACT US


Don meanders around the North Atlantic

By [Scott Lindstrom](#) • 23 July 2023

The animation below, showing GOES-16 Clean Window infrared imagery (Band 13, 10.3 μm ; processed using [geo2grid, v1.1](#)), tracks the named storm Don, first named as Subtropical Storm Don at 0900 UTC on 14 July, reclassified as Tropical Depression Don at 1500 UTC on the 17th, and upgraded to a Tropical Storm at 0300 UTC on the 18th, and to a hurricane at 2100 UTC on the 22nd. The animation shows the storm periodically affected by shear (when the low-level circulation is separated from the deep convection), especially on the 14th of July.



GOES-16 Band 13 (10.3 μm) 0130 UTC 23 July 2023



CIMSS Social Media



Scott Bachmeier
@CIMSS_Satellite Follows you

Satellite research meteorologist • WX-indoctrinated @ NWS KFSD → @sdsmf →
@NASA_Langley → @UWMadison @UWCIMSS

📍 Madison • Wisconsin 🇺🇸 • USA cimss.ssec.wisc.edu/satellite-blog/
📅 Joined June 2009

502 Following 43.7K Followers



UW-Madison CIMSS
@UWCIMSS

NOAA's Cooperative Institute for Meteorological Satellite Studies (since 1980) at the University of Wisconsin-Madison, the birthplace of satellite meteorology.

📍 Madison, WI cimss.ssec.wisc.edu 📅 Joined July 2014

282 Following 20.6K Followers

Edit profile



CIMSS
23K likes • 26K followers

📍 Madison, WI cimss.ssec.wisc.edu 📅 Joined July 2014

Posts About Mentions Reviews Followers Photos More ▾

We strive to create posts that are **engaging and educational**

CIMSS / AOS Climate and Climate Change course (AOS 102)

Taught online every summer Since 2013

CIMSS CLIMATE CHANGE ELEVATOR SPEECHES BY UW-MADISON UNDERGRADUATES

Students who take *Climate and Climate Change* (AOS 102) at the University of Wisconsin-Madison are tasked to create an "elevator speech" for the last week of class imagining they're on an elevator and someone asks "what do you think about climate change?" With less than 2 minutes to respond, here are some recent thoughtful responses.

Alan, 2022 | Eleanor, 2022 | Mason, 2022 | Madeline, 2022 | Jenna, 2021
 Lillian, 2021 | Payten, 2021 | Ashley, 2021 | Gabriel, 2021 | Brenna, 2021
 Zach, 2021 | Ree, 2020 | Nic, 2020 | Josh, 2020 | Paige, 2020
 Connor, 2020 | Maleee, 2020 | Kora, 2020 | Damitu, 2020 | Frank, 2020

Learn about AOS 102 students actions to reduce carbon footprint in this [2022 Bulletin of the American Meteorological Society \(BAMS\) publication](#).

Learn about AOS 102 knowledge gains from this [2020 Bulletin of the American Meteorological Society \(BAMS\) article](#).

© 2022 Cooperative Institute for Meteorological Satellite Studies, Space Science and Engineering Center (SSEC), University of Wisconsin-Madison, 1225 W. Dayton St. Madison, WI 53706 | Phone: 608-263-7435 | Fax: 608-262-5974
 View mobile site Last updated: 26-Aug-2022 by the CIMSS Webmaster

UW-Madison undergraduate carbon footprint survey responses

Topic/behavior	AOS 102 (n = 71/221)	AOS 100 (n = 274/348)
	Climate and climate change	Weather and climate
Shifting diets toward plant-based meals		
Somewhat + a great deal	77%	49%
A great deal	37%	16%
Eliminating food waste		
Somewhat + a great deal	85%	88%
A great deal	37%	32%
Reducing automobile travel		
Somewhat + a great deal	86%	87%
A great deal	31%	26%
Reducing air travel		
Somewhat + a great deal	62%	57%
A great deal	20%	24%
Reducing energy and water usage		
Somewhat + a great deal	94%	87%
A great deal	51%	27%
Sustainable purchasing		
Somewhat + a great deal	85%	71%
A great deal	38%	14%
Civic engagement		
Somewhat + a great deal	63%	69%
A great deal	17%	12%
Likelihood of voting		
Very likely + 100% likely	93%	87%
100% likely	77%	64%
Communicating climate change		
Only if someone else brings it up	6%	20%
Very rarely	6%	18%
Occasionally	65%	58%
As often as possible	23%	5%

81% of AOS 102 students reported increased actions to reduce carbon footprint.

Ninety-three (93%) committed to vote in upcoming elections.

Furthermore, undergraduates who took Climate and Climate Change were nearly 5 times more likely to discuss climate change **“as often as possible.”**

One-third reported sustainable actions that reduce carbon footprint for up to two years after taking the course. This infers lasting lifestyle choices.

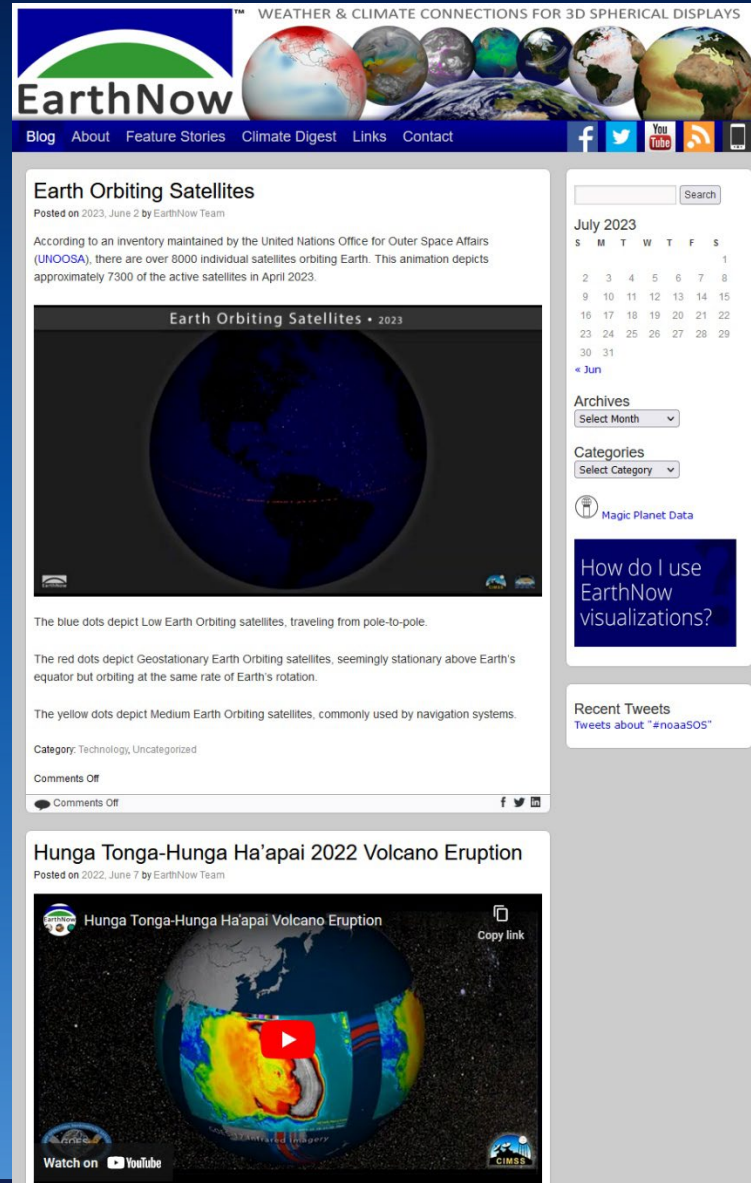
These findings point to education as a mitigation tool.

<https://cimss.ssec.wisc.edu/AOS102>

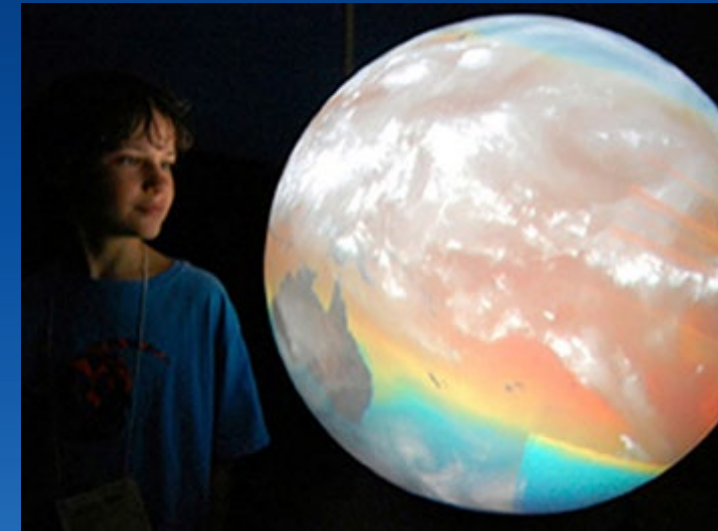
NOAA Science On a Sphere (SOS)

CIMSS got a NOAA Office of Education grant in 2013 on the Interpretation of Real-Time Weather and Climate Data for Spherical Displays

- Content creation
- Docent training
- Monthly climate Digests
- GOES-R videos



The screenshot shows the EarthNow website header with the tagline "WEATHER & CLIMATE CONNECTIONS FOR 3D SPHERICAL DISPLAYS". The main content area features a blog post titled "Earth Orbiting Satellites" dated June 2, 2023. The post text states: "According to an inventory maintained by the United Nations Office for Outer Space Affairs (UNOOSA), there are over 8000 individual satellites orbiting Earth. This animation depicts approximately 7300 of the active satellites in April 2023." Below the text is a video player showing a 3D visualization of Earth with satellite orbits. The video description explains: "The blue dots depict Low Earth Orbiting satellites, traveling from pole-to-pole. The red dots depict Geostationary Earth Orbiting satellites, seemingly stationary above Earth's equator but orbiting at the same rate of Earth's rotation. The yellow dots depict Medium Earth Orbiting satellites, commonly used by navigation systems." The page also includes a search bar, a calendar for July 2023, and a "Recent Tweets" section.



UW MOOC – Massive Open On-line Course - 2015

Changing Weather and Climate in the Great Lakes Region



The course opened with a Suomi NPP satellite image!

CIMSS & AOS partnered with many experts for this Wisconsin Idea effort
(the NWS interview had 10K views on Facebook!)

Changing Weather and Climate in the Great Lakes Region
 by Steven Ackerman, Margaret Mooney

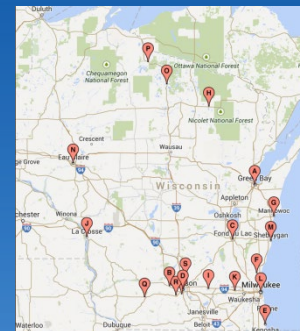
Overview | Reach | Engagement | Content | Polls

Reach >

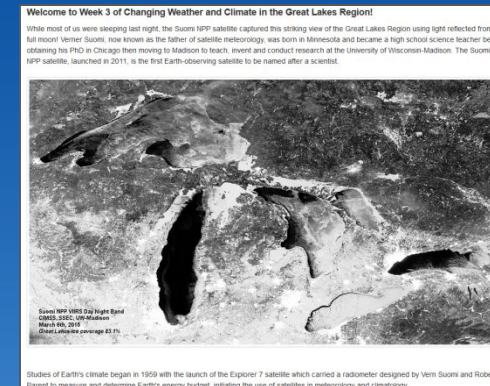
7,962
total learners joined

0
with Signature Track

Nearly 8K took the course!



Weekly discussions were held at 21 Wisconsin libraries



We used a Day/Night Band image to share the Suomi Story

GOES-R Education Proving Ground

The GOES-R Education Proving Ground (established in 2015) features the design and development of pre-and post-launch lesson plans and activities for G6-12 teachers and students.

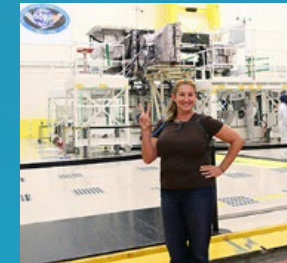
A key element of this effort is a core group of educators working with CIMSS Education & Outreach staff in close coordination NOAA scientists stationed at CIMSS.

The goal was to ensure that the education community was **launch ready** for new satellite imagery and improved products available from the GOES-R Satellite Series. (R, S, T & U)



RESOURCES INCLUDE:

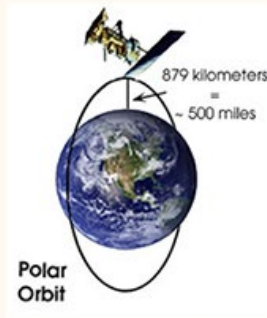
- HTML5 WebApps
- Lesson Plans
- Teacher Workshops



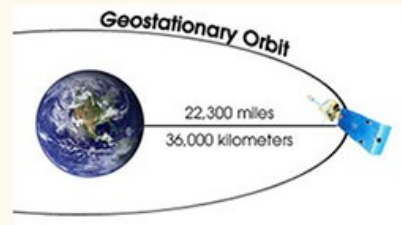
NOAA Satellites Virtual Science Fairs



Work with polar-orbiting satellite imagery to enter the [JPSS VIIRS Virtual Science Fair](#)



Use Geostationary imagery and data for the [GOES Virtual Science Fair](#).



How Weather Conditions Affect Wildfires: Caldor Fire Case Study

Wynne Young
Corona del Mar High School

Abstract

Due to an increasing frequency in droughts and heatwaves in areas such as western North America, wildfires have become an increasingly common occurrence. Given their ability to destroy local ecosystems and worsen air quality, it's important to know how a wildfire will develop in the near future and where it will spread to next. GOES-17 satellite imagery can help to identify trends in how the weather variables of temperature, humidity, and wind speed and direction affect the spread of wildfires, allowing firefighters to combat fires more effectively in the future. To do this, I analyzed the 2021 Caldor Fire in Northern California on two different days as a case study. I used band 7 of GOES-17 to observe the effect of temperature on August 17, 2021, and I used GOES-17 GeoColor imagery from August 25 to measure the effects of wind on wildfire and smoke development.

Research Question

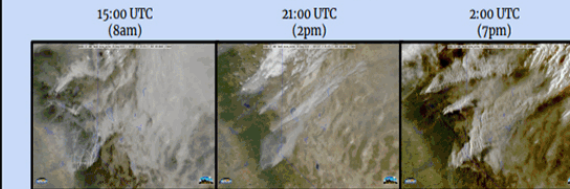
How do temperature, humidity, and wind affect wildfires, and how can this knowledge be used to fight wildfires more effectively?

GOES Data (Caldor Fire, California)

August 25, 2021

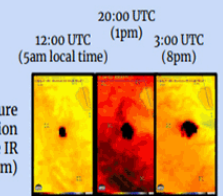
Smoke increases during the day, with a south-westerly wind causing a smoke plume extending northeast
GOES-17 GeoColor
Bands 1, 2, & 3: Blue(0.47µm), Red(0.64µm), Near-IR(0.86µm)

Also combines band 2 of Himawari-8 AHI: green(0.51µm)



Smoke increases and thickens throughout the day as wind speeds increase. The fire also spreads in the direction of the wind, as shown by the development of new smoke plumes northeast of the fire's location of origin..

August 17, 2021
Shows diurnal temperature fluctuation
GOES-17 Band 7: Shortwave IR (3.9µm)



-Fire grows throughout the day due to higher temperatures and lower humidity
-Starts to lose heat in the evening due to greater temperature gradient between fire and surface

Conclusions

- Wildfire strength and size follow a diurnal pattern, strengthening during the day due to hotter and drier conditions and stronger winds, and weakening during the night
- Firefighters should fight fires primarily in the early morning before sunrise when burning is the slowest and weakest
- Wildfires and smoke spread in the direction of the wind
- Firefighters should fight fires in the direction of the wind

References

- CIMSS Satellite Blog: <https://cimss.ssec.wisc.edu/satellite-blog/>
- GOES-R ABI Bands Guide: <https://www.goes-r.gov/mission/ABI-bands-quick-info.html>
- GOES-R GeoColor: https://www.star.nesdis.noaa.gov/GOES/documents/QuickGuide_CIRA_GeoColor_20171010.pdf
- The Rising Cost of Wildfire Protection: <https://headwatersseconomics.org/wildfire/homes-risk/fire-cost-background/>
- Climate Change Indicators: Wildfires: <https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires>
- Caldor Fire(Wikipedia): https://en.wikipedia.org/wiki/Caldor_Fire

<https://cimss.ssec.wisc.edu/education/sciencefairs.html>

Wait there's more ...

CIMSS/SSEC Remote Sensing Seminars

Madison, USA: Mar 2013
Brienza, Italy: September 2011
Moneponi, Italy: September 2008
São Paulo, Brazil: November 2007
Benevento, Italy: June 2007
Ostuni, Italy: June 2006
Krakow, Poland: May 2006
Pretoria, South Africa: April 2006
Andenes, Norway: March, 2006
Bertinoro, Italy: September 2004
Maratea, Italy: May 2003
Bologna, Italy: September 2001

CIMSS Direct Broadcast Seminars

Guam NWS April 2018
Hampton University, Virginia, USA June 2017
Mayagüez, Puerto Rico April 2016
Miami, Florida, USA February 2015
Honolulu, Hawaii, USA August 2013
Citeko, Bogor, Indonesia September 2011
Shanghai, China, June 2011
Stellenbosch, South Africa, July 2009
Sao Paulo, Brasil, November 2007
Pretoria, South Africa, April 2006
Norway 2006

VISIT trainings

The Virtual Institute for Satellite Integration Training (VISIT) distance learning program was created in 1998 with funding from NOAA featuring a distance learning software package developed at CIMSS called VISITview.

The software allows users to simultaneously view and manipulate the images, animation, graphics and text.

The VISIT program is a collaboration between CIMSS, CIRA the NWS and NESDIS.

Some VISIT training topics from June/July 2023:

GOES-R IFR Probability fields, **NUCAPS** and **Gridded NUCAPS Soundings**, Mesoscale Convective Vortex, NOAA/CIMSS ProbSevere, **LightningCast**, & Above-Anvil Cirrus Plumes



1983- 2023

Every 18-24 months

**Grandparents
University at the
UW-Madison**



CIMSS Scholarships

Verner E. Suomi Scholarship Award

Attention College Bound High School Seniors: \$3000 Scholarship Opportunity

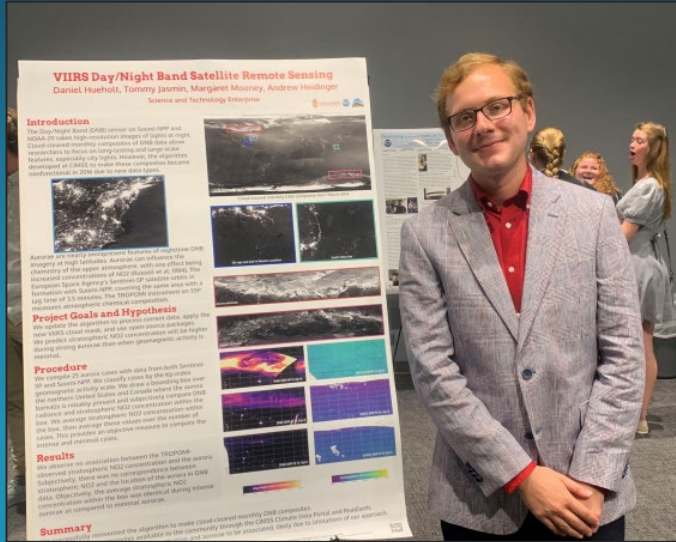


William L. Smith Sr. Graduate Scholarship for PhD students (up to 3 years) at the University of Madison.



Nuo Chen – the first recipient of the Bill Smith Graduate Scholarship

NOAA HOLLINGS Scholars at CIMSS



2018 - Daniel Hueholt, conducted VIIRS Day/Night Band research working with Tommy Jasmin and Andy Heidiinger. This photos shows Daniel presenting his research at the NOAA Student Science and Education Symposium at NOAA Headquarters in Silver Spring, Maryland.



2022 - Peyton Camden's worked with NOAA scientists Mark Kulie and Andrew Heidinger to identify relationships between GOES cloud products, and lightning observations provided by the Geostationary Lightning Mapper.

Looking ahead to the 2024 GOES-U launch



GOES-R 2016



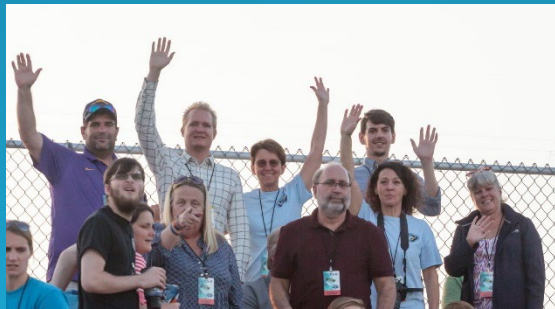
GOES-S 2018



GOES-T 2022

CIMSS will conduct a Teacher Workshop at the Launch!

(with support from the GOES-R program)



CIMSS scientists, staff and outreach specialists are developing the content and resources to train today's researchers, prepare the next generation of scientists, maintain a pipeline to NOAA's future workforce, and share the benefits of our work with the public.

Our success is directly related to being co-located with SSEC, AOS and NOAA STAR.

