

# What Color is the Sky?

## Engaging Students as Atmospheric Scientists through Aerosol Observations

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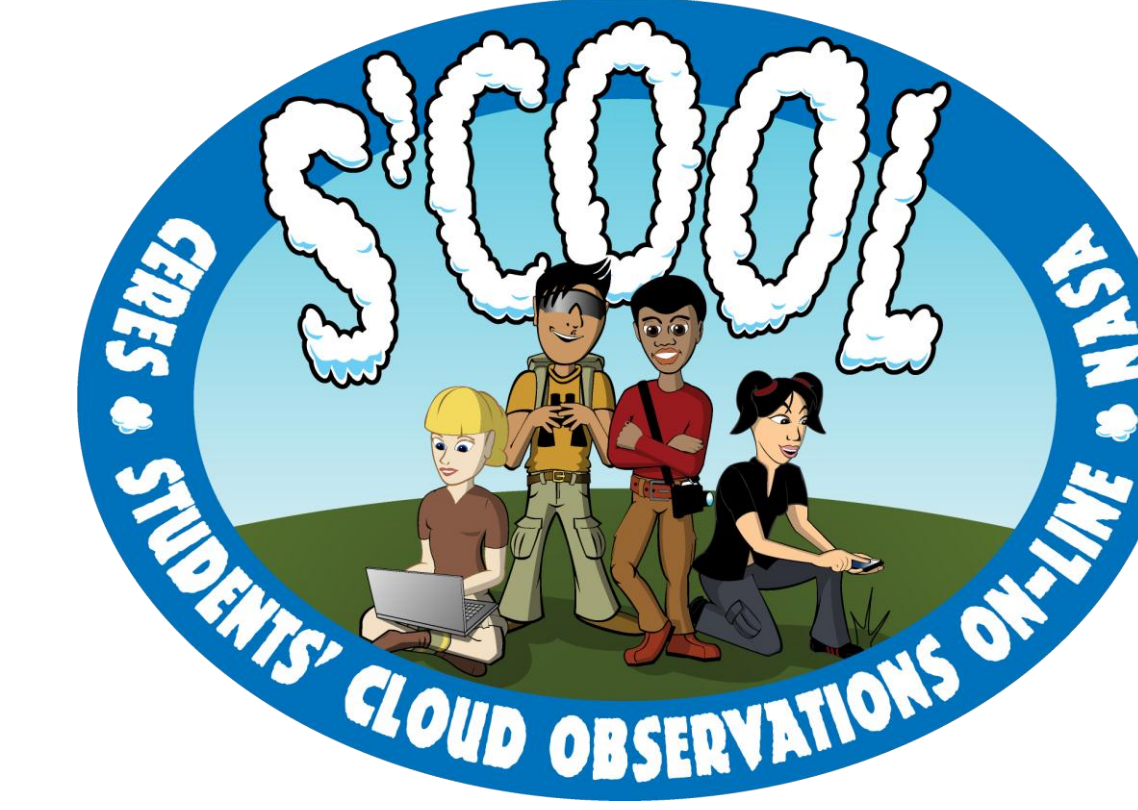
### Background

#### Public Motivation

One reason to promote citizen science observations of sky conditions is because the public is genuinely interested in air quality. Air quality-focused news stories are common. Many of these news features focus on specific events that have a negative impact on air quality such as wildfires, volcanic ash, or extreme smog from vehicle traffic. The public is becoming more knowledgeable about air quality issues both locally and globally, and more interested in how air quality can impact health. As atmospheric scientists, this provides us with a rich opportunity to capitalize on the public interest and engage them in authentic data collection. This direct engagement not only allows the public, both students and adults, the opportunity to learn more about air pollution and atmospheric science, but also helps them appreciate the practice of science.

### Current Citizen Science Opportunities

Two international programs that engage students in sky observations are S'COOL and GLOBE. These programs allow students and the general public to participate in authentic data collection and also serve to inform them about how more rigorous scientific studies are conducted. For example, the CERES S'COOL program matches sky observations to satellite overpass times (for Aqua, Terra, CALIPSO, CloudSat, and NPP) to compare resulting measurements. The GLOBE Program engages various NASA satellites as partners with the teacher and student observation community.



S'COOL observers come from over 4000 schools in over 80 countries and have submitted over 125,000 sky observations.



GLOBE observers come from over 24,000 schools in over 100 countries and have submitted over 100 million Earth/environmental science measurements.

### Ground-based Human Observations

Both the S'COOL and GLOBE Programs include opportunities for students to observe and report Sky Conditions. On a very clear day, with few aerosols, students would report *sky color* as blue or deep blue and the *visibility* as clear or unusually clear.

The purpose of conducting the observations is for students to gain a better understanding of the relationship between these variables and the aerosols in our atmosphere.

### How to Observe

In order to judge color during the daylight, students should look in the anti-sun direction. Observe color in the darkest part in the sky (generally half way between horizon and directly overhead).

In order to judge visibility or the clarity of the atmosphere, students need to be able to look out at a distant scene, such as a distant building or a mountain or hillside. By looking at the same scene or object every day students will gradually develop a sense of whether the day is clear or hazy.

### Expanding to Sunrise & Sunset

Scheduled for launch in 2016, NASA's SAGE III on the International Space Station (ISS) is an Earth-observing instrument designed to tell us about ozone, aerosols, and gasses in our atmosphere. As an educational outreach extension, SAGE will be launching a citizen science effort called Sky Art. The public can submit their sunrise and sunset photos and the photos may be matched with images from SAGE onboard the ISS. To compliment this activity the SAGE mission has partnered with the CALIPSO mission to develop additional resources for student sky observations during sunrise and sunset.



### Resources & References

CALIPSO Mission, <http://www-calipso.larc.nasa.gov/outreach/>

The GLOBE Program, [www.globe.gov](http://www.globe.gov)

Observing Sky Color and Visibility, The GLOBE Program, <http://www.globe.gov/documents/348614/353086/atla-hazyskies.pdf>

SAGE III on ISS, <http://sage.nasa.gov/SAGE3ISS/>

S'COOL, <http://science-edu.larc.nasa.gov/SCOOOL/>

Sky Art Program, <http://skyart.larc.nasa.gov/>

What to Observe, The S'COOL Program, <http://science-edu.larc.nasa.gov/SCOOOL/whatobs.html>

### Visibility - Clarity with which objects can be viewed through the intervening atmosphere.



Denali National Park, National Park Service Air Quality Office  
<http://www.shodor.org/metweb/session8/gallery.html>

#### Visibility

Unusually clear
Clear
Somewhat hazy
Very hazy
Extremely hazy

### Daylight Sky Color

deep blue (azul intenso, bleu foncé)
blue (azul medio, bleu)
light blue (azul claro, bleu clair)
pale blue (azul pálido, bleu pâle)
milky (lechoso, laiteux)

### Draft Sunrise/Sunset Sky Color

Red
Orange
Yellow
Pink
Purple

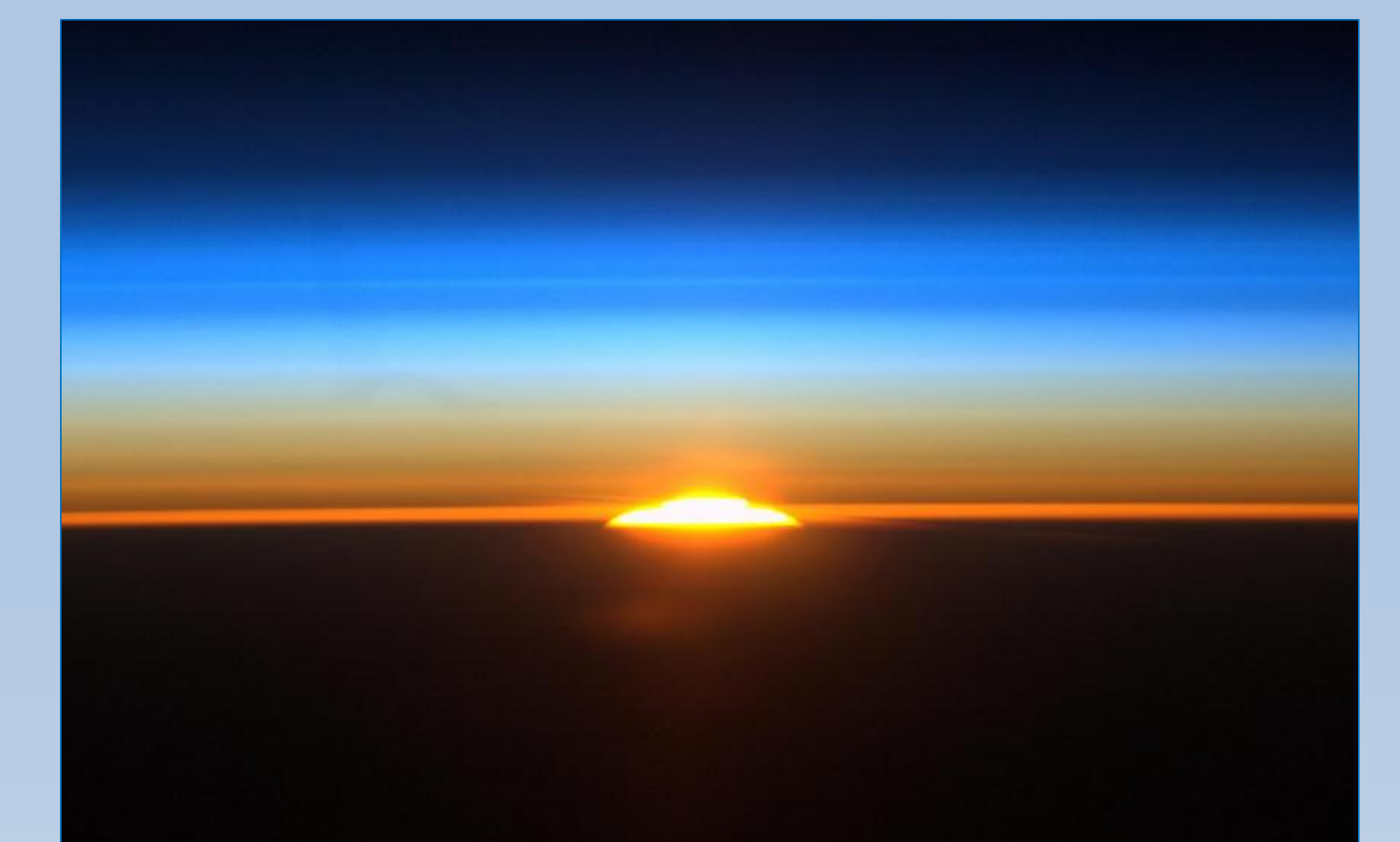


Photo taken Aug. 2011 from the International Space Station by astronaut Ron Garan. It's one of 16 sunrises astronauts see each day.