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.

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.

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

Visibility
- Unusually clear
- Clear
- Somewhat hazy
- Very hazy
- Extremely hazy

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.

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

The GLOBE Program, www.globe.gov


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


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


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Daylight Sky Color
- deep blue (azure, blue)
- blue (azure, blue)
- light blue (azure, blue)
- pale blue (azure, blue)
- milky (Ivory, white)

Draft Sunrise/Sunset Sky Color
- Red
- Orange
- Yellow
- Pink
- Purple

Resources & References

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


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

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