Abstract

Aerosols have complex and little-understood effects on Earth's climate. In an effort to understand and study these effects, Huntington High students measured the surface temperature of different surfaces at several times throughout the day and took readings of the aerosol optical thickness in the atmosphere during the same times. The data was collected during the months of November and December on surfaces around the school at a range of times from 9am-2pm on most weekdays. The data on surface temperatures followed normal patterns found in previous data on the topic. Our aerosol data, however, was more complex, with no clear correlation between the percent transmission of sunlight and the average temperature of surfaces.

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Key Terms

Greenhouse Effect
Long-wave infrared radiation
Greenhouse gases
Urban Heat Island Effect
Absorption
Albedo
Aerosols

Acronyms/Initialisms

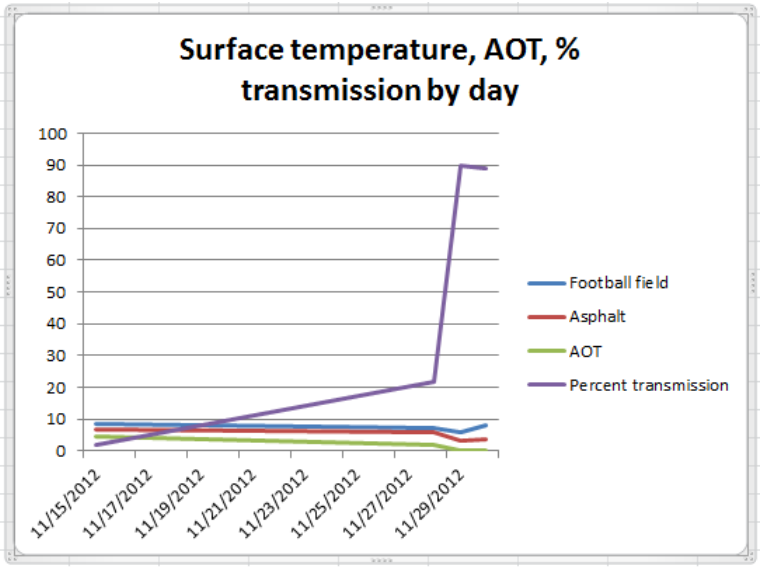
IRT - Infrared Thermometer
AOT - Aerosol Optical Thickness

Procedure

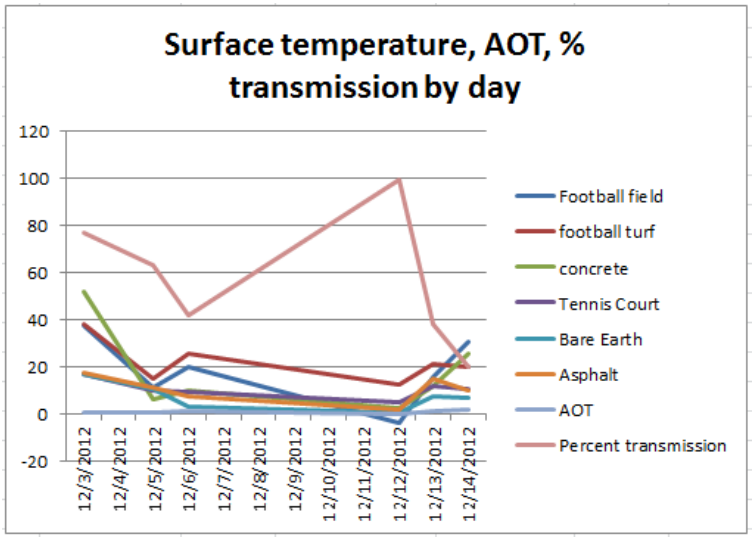
Surface temperature data was collected over a period of two months in six locations around our school: the asphalt parking lot, the grassy practice field, the concrete sidewalk,, the bare earth of the softball diamond, the football field turf, and the tennis courts. During November only the first two surfaces were studied; in December we expanded our research to include all six. IRTs were refrigerated or left outside to match the cooler air temperatures of November and December.

Students, in groups of three, used the IRTs to take nine different surface temperature readings across each surface, which were then averaged to find that surface's approximate temperature for that time. This procedure was repeated 4 times in every day as different classes collected information, and all data for a single day was averaged together to look at for our final results and conclusion.

Additionally, Mr. Sharpe and a few students used a sun photometer to measure the AOT and percent transmission each day. Only days with little cloud cover and therefore an accurate AOT reading were included in our final results.



Data collected, November 2012



Data collected, December 2012

Results & Conclusions

In the graphs produced from our data there is a clear correlation between the temperatures of each surface on a given day. Though the temperature of surfaces with a high albedo like the practice field are lower than higher absorption surfaces like the parking lot, the day-to-day temperature fluctuations of surfaces follow a similar pattern which confirms the basic idea that a surface's temperature relies heavily on the amount of sun reaching it.

The data about aerosols was somewhat unclear. During November, AOT measurements and surface temperature measurements correlated--as the

atmosphere’s aerosol content increased, so did the average temperature of the day. However, at points in the December graph this trend was reversed--low aerosol content was connected to higher average daily temperatures. This may be evidence that our data is flawed, or it may imply that the effects of aerosols on temperature are highly irregular and rely on the types and behavior of the aerosols, not simply the amount. In any case, the largest conclusion to be drawn is that more research must be done on this complex topic to fully do it justice.