

Homework—Module 1

Name:

- 1) Explain why an increase in cloud cover surrounding the earth would increase the earth's albedo, yet not necessarily lead to a lower earth surface temperature.¹

There is a 600-character limit for all questions.

- 2) Explain how the surface temperature often increases on a calm, cold night when a low cloud moves overhead.¹

¹ [Ahrens, C.D. and R. Henson \(2018\), *Essentials of Meteorology: An Invitation to the Atmosphere*, 8th Edition. 508 p.](#)

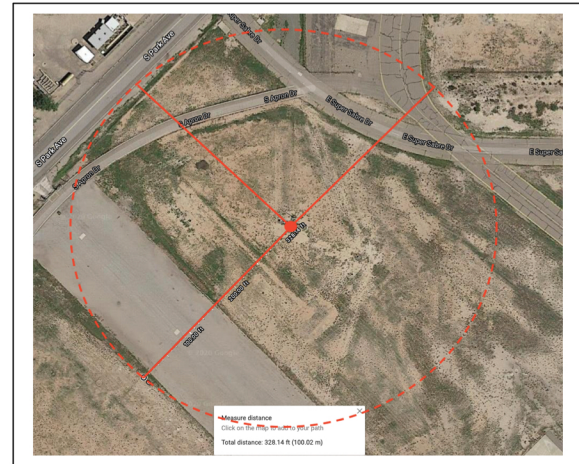
- 3) The World Meteorological Organization (WMO)² sets standards for the installation of surface weather stations. The WMO states for temperature measurements that:

“Neighbouring artificial surfaces may heat the air and should be avoided. The extent of their influence depends on the wind conditions, as wind affects the extent of air exchange. Unnatural or artificial surfaces to...(consider)...are heat sources, reflective surfaces (e.g., buildings, concrete surfaces, car parks) and water sources (e.g., ponds, lakes, irrigated areas).”

One requirement (among several) for a thermometer siting to be considered Class 1 (the best) is the measurement point be situated “more than 100 m from heat sources or reflective surfaces (buildings, concrete surfaces, car parks, etc.)”

The document later states, “A source of heat (or expanse of water) is considered to have an impact if it occupies more than 10% of the surface within a circular area of 100 m surrounding the screen³ ...”

The red dot in the figure below shows the location of the ASOS weather station at TUS (Tucson International Airport). The dotted circle marks 100 meters from the station. Several asphalt roads are within 100 meters of the site, and their total area clearly “occupies more than 10% of the surface within a circular area of 100 m surrounding the screen.”



Explain under what weather conditions the asphalt would be a potential heat source that could produce an unrepresentative temperature reading. Be certain you consider the joint impact of sky conditions, wind speed and direction, the calendar day and time of day, etc., and how each element might contribute to a biased temperature (too high or too low) reading at TUS.

² https://www.wmo.int/pages/prog/www/CIMO/CIMO15-WMO1064/1064_en.pdf, pp. 48-49.

³ The term “screen” refers to the thermometer.

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