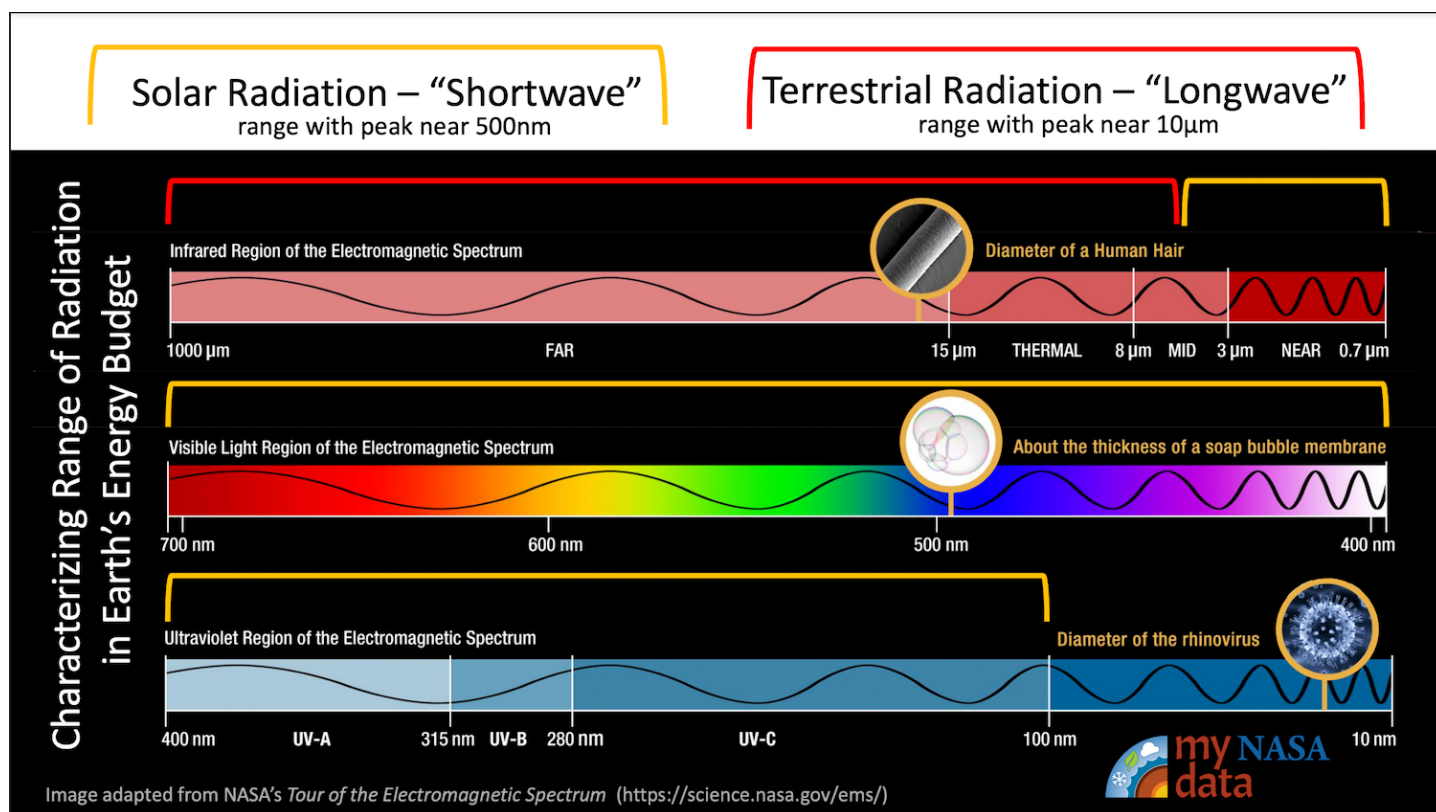


## My NASA Data - Mini Lesson/Activity

### Describing Radiation in Earth's Energy Budget



### Student Directions

Review the infographic below, illustrating the differences between what scientists describe as “shortwave radiation” and “longwave radiation” involved in Earth's energy budget. These are descriptors of electromagnetic waves with certain characteristics. Answer the following questions.

Solar Radiation – “Shortwave”  
range with peak near 500nm

Terrestrial Radiation – “Longwave”  
range with peak near 10 $\mu$ m

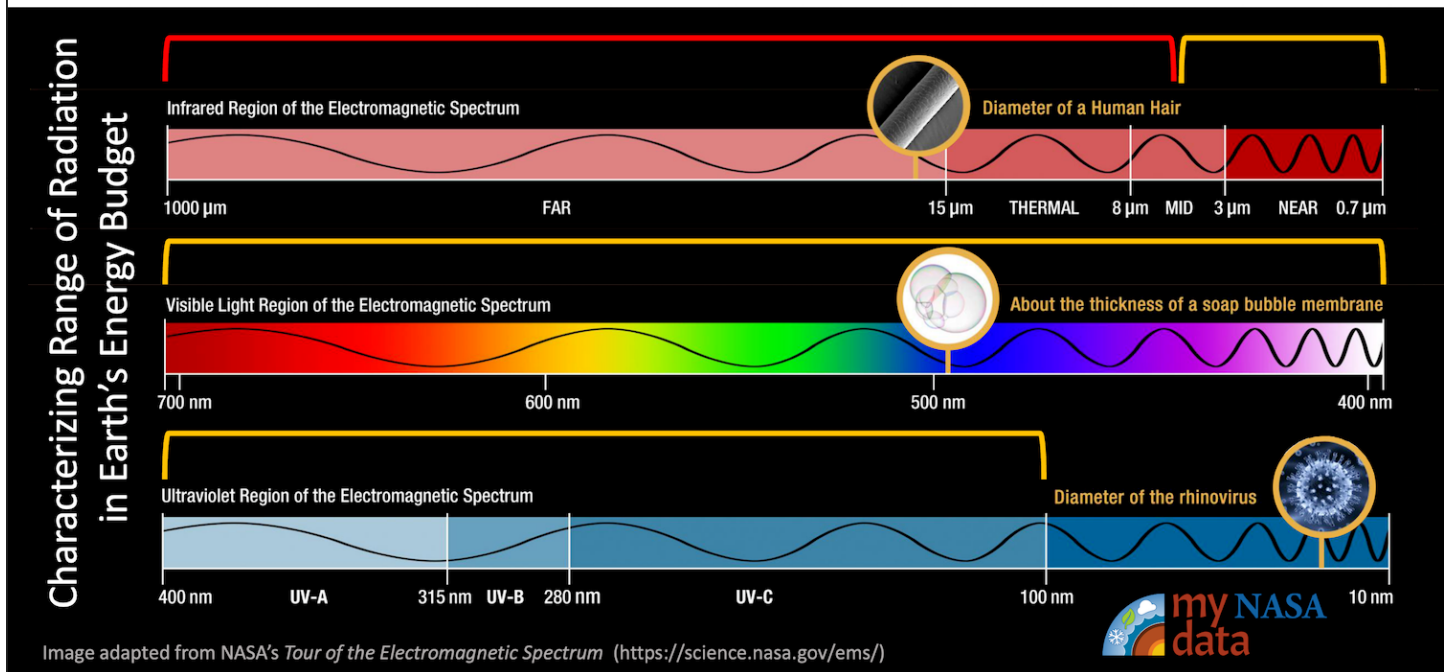


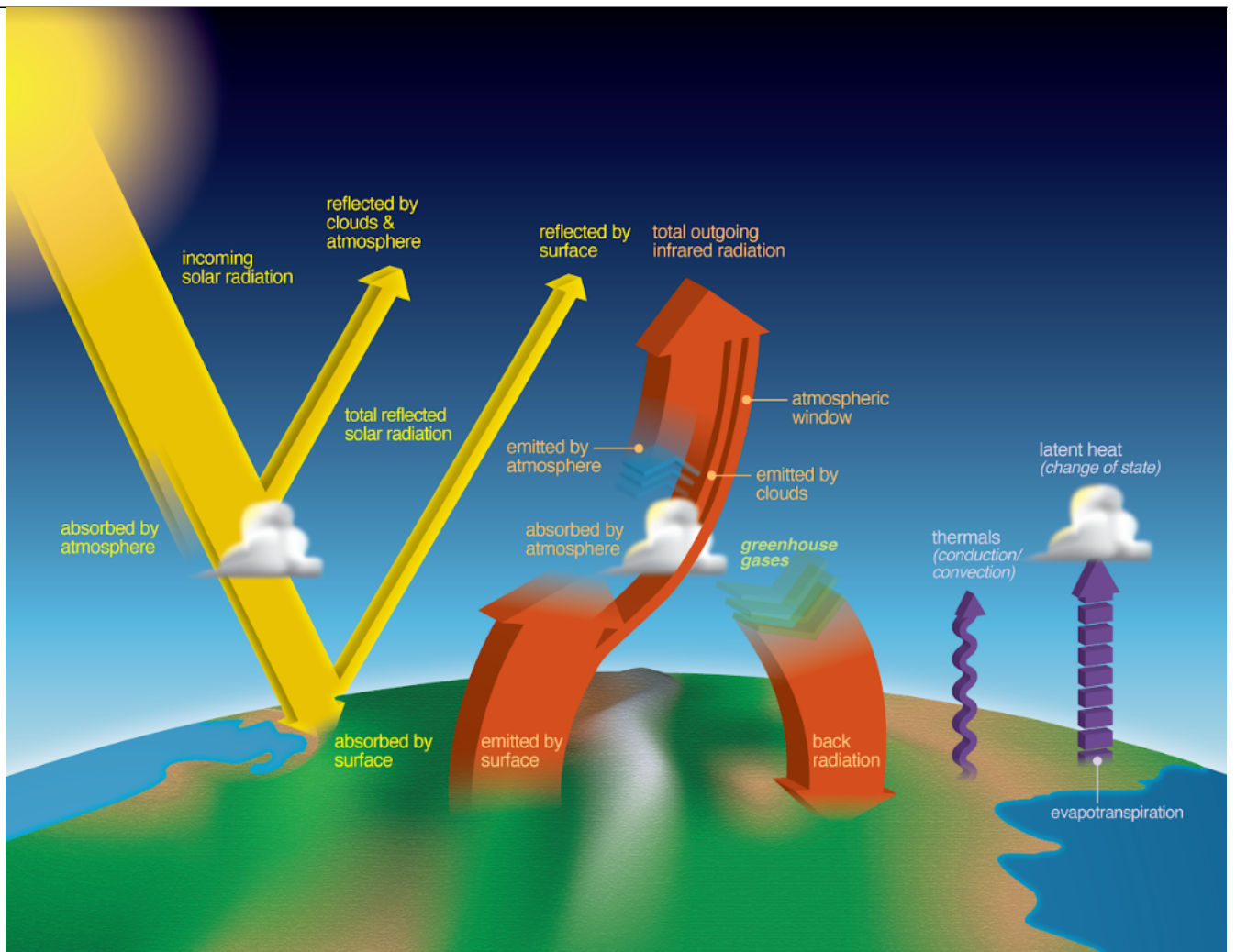
Image adapted from NASA's *Tour of the Electromagnetic Spectrum* (<https://science.nasa.gov/ems/>)

[Ranges of radiation that define shortwave and longwave radiation. Source: Tour of the Electromagnetic Spectrum - 3rd Edition | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Short\\_long%20wave%20radiation.png](https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Short_long%20wave%20radiation.png)

### Steps:

1. Check with your instructor on how to submit your answers.
2. Identify the three distinct classifications of radiation (forms of electromagnetic energy) shown in the infographic.
3. Identify the measured value for each type of radiation. What units are used?
4. Explain why it is important to not simply compare the numerical values when comparing the measurements of each classification.
5. Describe the range of radiation characterized as “shortwave radiation.”
6. Describe the range of radiation characterized as “longwave radiation.”
7. Discuss how the energy associated with shortwave radiation compares to the energy associated with longwave radiation.

Review the model of Earth's Energy Budget below, used to communicate the complex transfer of energy in the Earth system that ultimately drives the climate heat engine. Answer the following questions.



[Earth Energy Budget Diagram. Source: Loeb et al., J. Clim. 2009 & Trenberth et al., BAMS, 2009 | https://myasadata.larc.nasa.gov/sites/default/files/inline-images/Earth\\_energy\\_budget\\_Labels.png](https://myasadata.larc.nasa.gov/sites/default/files/inline-images/Earth_energy_budget_Labels.png)

8. Identify the source of "shortwave radiation."
9. Identify the source of "longwave radiation."
10. Describe how the Earth's energy budget model distinguishes between shortwave and longwave radiation.
11. Look closely at the model and describe the different interactions clouds have with shortwave radiation and longwave radiation.
12. Identify the heat illustrated in the model that is NOT characterized by either shortwave or longwave radiation.

This mini-lesson may be used to support student understanding of a commonly used model of Earth's energy budget and clarify terminology used within the context of that model.

Students should have knowledge of the electromagnetic spectrum prior to this lesson.

## My NASA Data Visualization Tool

- [Earth System Data Explorer](#)

