

Greenhouse Effect

2023-01-18

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Reading: 1

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Required Reading (everyone):

- Understanding the Forecast, Ch. 3, pp. 23–26.

Reading Notes:

Study the one-layer model. We will work through it in detail during class.

Something many people misunderstand is the interaction of longwave (infrared) light with the atmosphere. When the layer model shows longwave heat going up from the ground to the atmosphere and also going down from the atmosphere to the ground, it's easy to think this means the longwave light is reflected from the atmosphere back down to the ground. This is wrong.

The light from the ground is completely absorbed by the atmosphere and stops existing as radiation.

Completely independently of the absorption, the atmosphere has a temperature and emits longwave radiation both upward and downward based on its temperature and emissivity. Thus, the brightness (intensity) of the longwave light going up and down from the atmosphere depends only on the temperature of the atmospheric layer.

Make sure you understand that the light going up and down from the atmosphere is neither *reflected* by nor *transmitted* through the atmosphere. It is *emitted* by the atmosphere as blackbody radiation, and its intensity and wavelength depend only on the temperature and emissivity of the atmosphere (for the layer model, we assume that the atmosphere's emissivity is exactly 1, meaning it absorbs all longwave light that hits it).