

Instructions for Energy Balance

Background

A Watt is a Joule/sec. So Watt/m^2 equals Joules/(area time).

So Watt/m^2 is the units of an energy flux. 341 Watt/m^2 is the energy flux from the Sun to the Earth system, averaged over the surface of the entire planet.

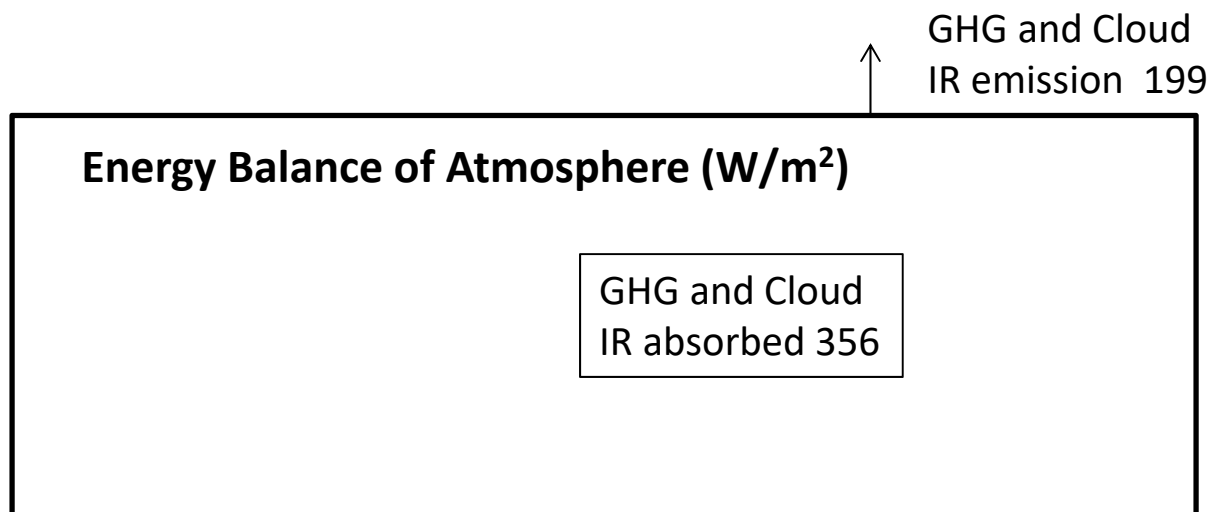
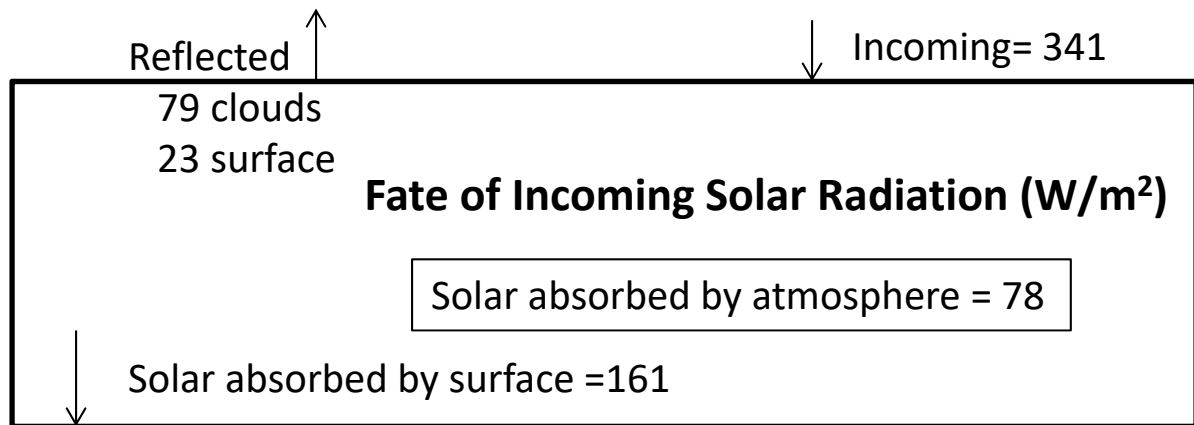
For the system as a whole, all the energy must be accounted for ($\pm 1 \text{ W/m}^2$ for rounding errors). The same is true of the atmosphere and the Earth's surface.

Question 1: The top-most box shows the fate of incoming solar radiation. Verify that all the incoming light flux is accounted for by absorption or reflection.

Question 2: The bottom of the Figure shows the energy balance for the surface of the Earth. Verify that all the energy coming in is balanced by the energy coming out ($\pm 1 \text{ W/m}^2$).

Question 3: There are flux terms missing from the middle box ("Energy Balance of the Atmosphere"). Add these missing flux terms directly to the Figure. You will need to add at least one flux **into** the atmosphere and at least one flux **out** of the atmosphere.

Then verify that all the energy coming into the Atmosphere is balanced by the energy coming out ($\pm 1 \text{ W/m}^2$).



Boxes indicate heat inputs to atmosphere

