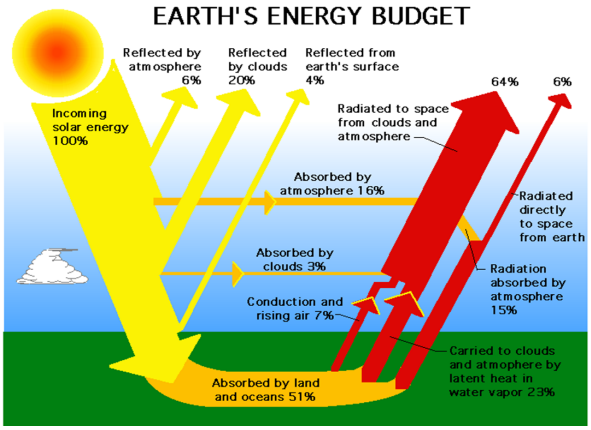
**Lesson 6 - Net Radiation Budget and the Natural Greenhouse Effect**

- Earth is a warm, livable planet b/c some incoming solar radiation is absorbed by the earth's surface and the atmosphere

- Many things can happen to radiation as it comes into the atmosphere and strikes earth:

§ Reflected by the atmosphere (gases) – 6%
§ Reflected by clouds – 20%
§ Reflected by earth's surface – 4%
§ Absorbed by greenhouse gases – 16%
§ Absorbed by clouds – 3%
§ Absorbed by earth's surface – 51%




**- Net Radiation Budget is the difference between the amount of incoming radiation and the amount of outgoing radiation**

- Theoretically the net radiation budget for the entire planet is zero.

§ **This means that radiation coming in equals radiation leaving earth.**

- However the net radiation for a **certain region** can vary due to a few factors:

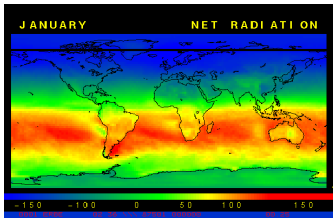
§ Time of the year – **Different regions can have different albedo depending on the season**

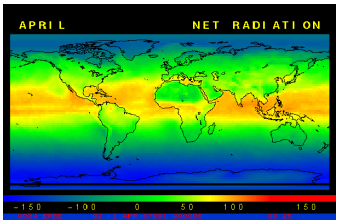
· **Snow (winter), grass (spring/summer)**

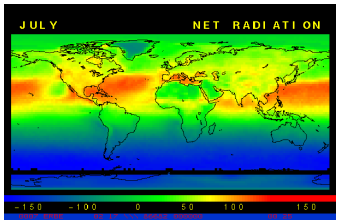
§ Latitude – **higher latitudes receive less radiation than more equatorial regions**

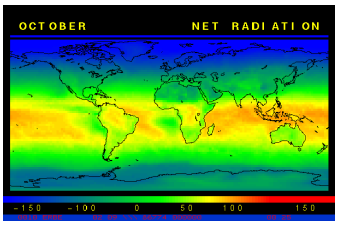
· **Poles get less radiation, equator gets more**

o What would happen if more radiation came in than the amount that left??

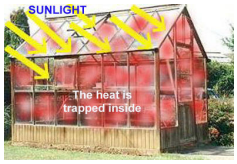


## Natural Greenhouse Effect




- What do you notice about the temperature inside a greenhouse as opposed to the temperature outside a greenhouse? Why do you think the temperature is different?

- **A greenhouse allows solar radiation in, but traps it so it cannot get out.**
- **This solar radiation converts to heat and increases the air temperature inside the greenhouse**
- **The earth has a similar type of system**

- The solar energy absorbed by the earth's surface is re-emitted into the atmosphere as infrared radiation which has high thermal energy (heat).

- This re-emitted energy helps keep the temp. of our planet in the range that supports life.

**- What keeps (traps) the thermal energy in the atmosphere??**

o The thermal energy released from the earth is absorbed in the **atmosphere** by the **gases** present there.

o These gases then release the energy as heat that heats the air

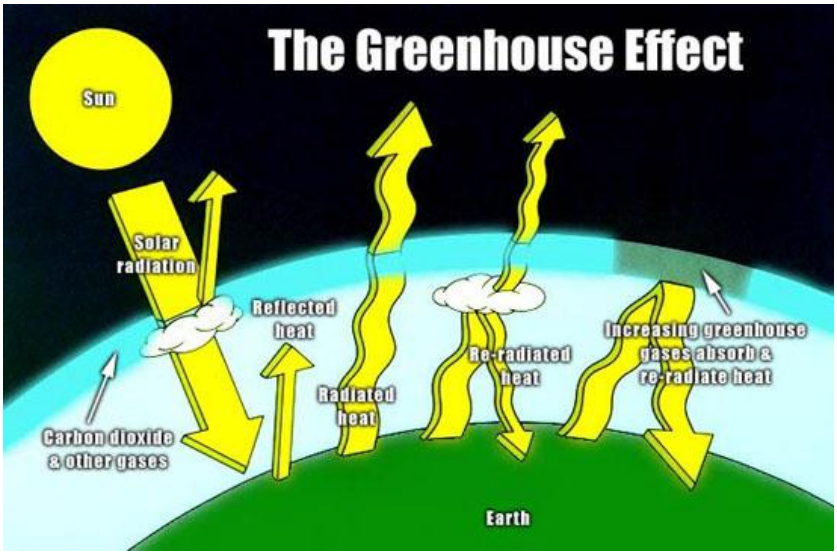
§ **Methane, carbon dioxide, water vapor** are example of these gases

§ **Water vapor** is the most significant trapper of the heat.

o Without these gases, the energy would escape back into **space**.

- The effect that these gases in the atmosphere have on trapping heat and preventing it from escaping to space is what we call the **natural greenhouse effect**.

o The temperature of the earth would be **~33°C** lower without the natural greenhouse effect.



Practice Questions

1. Describe what happens to the solar energy that is absorbed by the Earth's surface.

2. The amount of solar energy reflected by water at midday is 5-10%. Explain why this percentage would vary during the day.

3. How does the net radiation budget for Athabasca vary over the course of the year? Be specific and explain the causes of the change.

4. Describe, in your own words, the natural greenhouse effect.