LAB 3

1. E = σ T^4 = 5.67 x 10-8 W m^-2 K^-4 x 300^4 K^4 = **459.27 W m^-2**

λmax = 2897 / T = 2897/300 = **9.66 µm**

2. Solar radiation : λmax sun ~ 3000/6000 K ~ **0.5 µm**

Earth radiation: λmax earth ~ 3000/300 K ~ **10 µm**

Solar radiation is shortwave radiation.

Earth radiation is longwave radiation .

3a. The Northeast and Northwest of the US are covered by clouds or snow. Thus, the areas have high albedo.

3b. Areas covered by clouds and/or snow look white in the visible satellite images, where a large amount of the incoming visible light is being reflected back to space (meaning there is high albedo).

3c. Southern US is not covered by either clouds or snow (Texas, Oklahoma).

4a. Temperatures of the cloud-covered areas are lower than the temperature of non-cloud-covered regions. The infrared satellite image, dark areas represent regions of large IR emission (high temperature) while light areas (color-coded areas) represent regions of small IR emission (cold temperature).

4b**.**Temperature generally decreases with height in the troposphere. This is because clouds form in the lower to middle troposphere, and this region of the atmosphere is typically colder than the surface. As air rises and expands, it cools and its temperature decreases. Therefore, cloud cover in these regions can further reduce temperatures compared to non-cloud-covered regions. The general decrease in temperature with height in the troposphere is due to the decreasing atmospheric pressure with height. As air rises, it expands and cools due to the decrease in pressure. This relationship between pressure and temperature is known as the adiabatic cooling process. Therefore, in addition to the effect of cloud cover, the temperature decrease with height is also related to the adiabatic cooling process.

5a. Temperature of the cloud free area remained almost the same.

5b. Many factors can influence temperature changes, including weather patterns, atmospheric pressure, humidity, and other environmental factors. However, changes in time can also play a role in observed temperature changes. When local times in the USA lag behind UTC time, it means that the local time is behind the standard time used to coordinate time across the world. If a temperature change is observed during a time when local time is lagging behind UTC time, it could be due to the time difference itself. For example, if the temperature change is being measured at a specific time of day (such as noon), and local time is lagging behind UTC time by several hours, the temperature could be affected by the time difference. This could be due to the fact that the sun's position in the sky (which can influence temperature) may be different at that specific time in the local time zone compared to the same time in the UTC time zone.