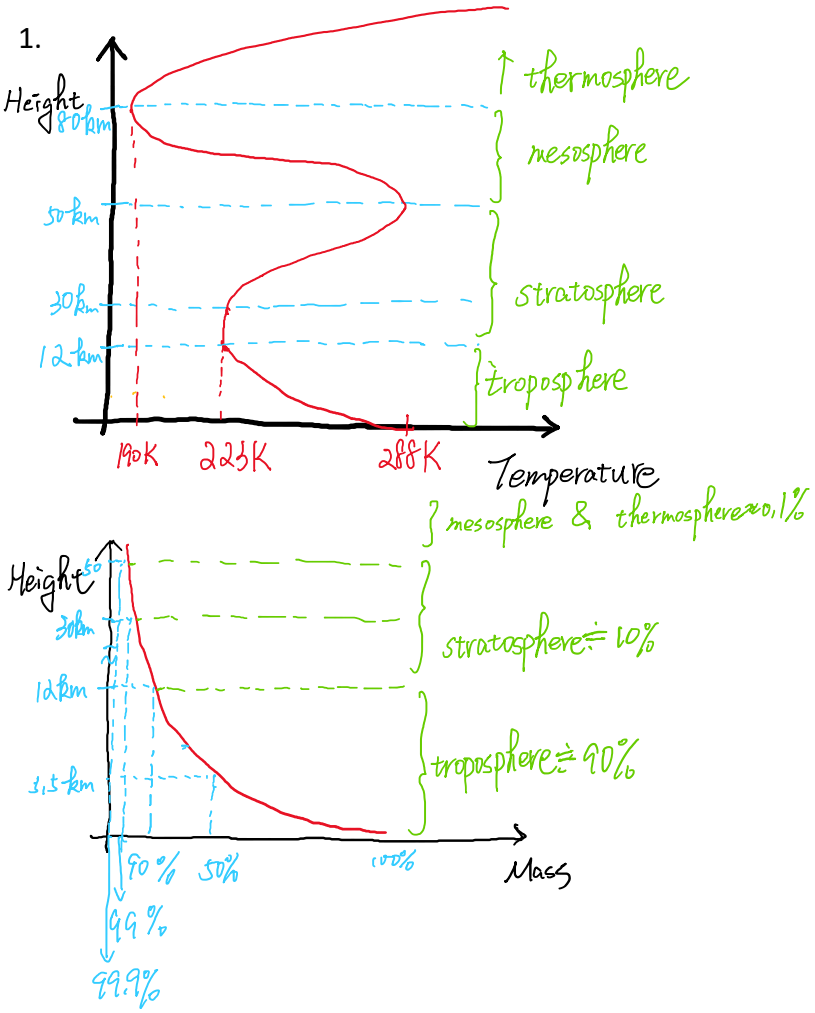
1.



Troposphere:

most of the weather phenomenon happened in this layer

Stratosphere:

airflow in this layer is much more stable

there is ozone layer in lower stratosphere, protecting creatures from UV radiation

Mesosphere:

The lowest temperature in atmosphere happened at the top of it.

Thermosphere:

Thin atmosphere that close to 0.1%

Kinematic energy of gas molecule there is quite big.

2.

(1) Although the weather system may seems to be quite chaotic, there always are some physical theory to obey.

On the other hand, via the equation, if the initial data is given, then the system would be a "determinstic chaos", and the consequence can thus been predicted.

(2) Because computer has always limited by the precision.

Due to atmosphere is a chaos system, once there is a little difference at the initial condition, the consequence would be totally different from the origin.

However, computer can't compute too small digits, then the error happened.

3. (1)convection, radiation

convection: if the ground temperature is high, air parcels would be heated faster, density would decrease at the mean time, so the air parcel would arise into the atmosphere quickly.

Radiation: if temperature of atmosphere is high, the speed that emit energy into space would be quickly.

3. (2) "selective" means that the matter couldn't absorb electromagnetic wave of all wavelength, it can only absorb electromagnetic wave with specific frequency.

Why this kind of feature exist is because molecules in every matter has its own vibration and rotational frequency, and molecule is much likely to absorb electromagnetic wave with the same frequency.

Water vapor: concentration is 0%~3%, water vapor can absorb electromagnetic wave that wavelength greater than $10^{-2}m$.

Carbon dioxide: about 400ppm at near ground atmosphere, it can absorb infrared wave($10^{-6}m$<wavelength<$10^{-4}m$).

3. (3) solar radiation: Emitted by sun, and totally transmit to top of atmosphere. In atmosphere, solar radiation may be absorbed, reflected, and diffracted. And this it can heat the atmosphere. If the energy still go through atmosphere, it can also heated the ground.

Terrestrial radiation: when ground is heated , it can transmit heat energy to the near ground atmosphere, causing convection between near-ground and high-air atmosphere. Sometimes it'll cause convective precipitation.

4. (1)

$$S \cdot \pi R_E^2 (1 - A) = \sigma T_e^4 \cdot 4\pi R_E^2$$
$$T_e \approx 255K$$

4. (2) T_e will be higher than (1), the solar constant is inversely proportional to the distance, so it'll be greater than the original value.

4. (3) T_e would be higher than (1).

Make S' is the solar constant when the distance between sun and the Earth being 0.9 times from the origin distance.

Due to the solar constant is inversely proportional to the square of distance.

Thus, $S' = \frac{1}{0.81} * S$.

$$T_e = \sqrt[4]{\frac{S'(1-A')}{4 * 5.67 * 10^{-8}}} = \sqrt[4]{\frac{1366 * (1-0.4)}{4 * 5.67 * 10^{-8} * 0.81}} \approx 258K$$

If we want to get higher planetary albedo, increasing the surface area of ice can do so.