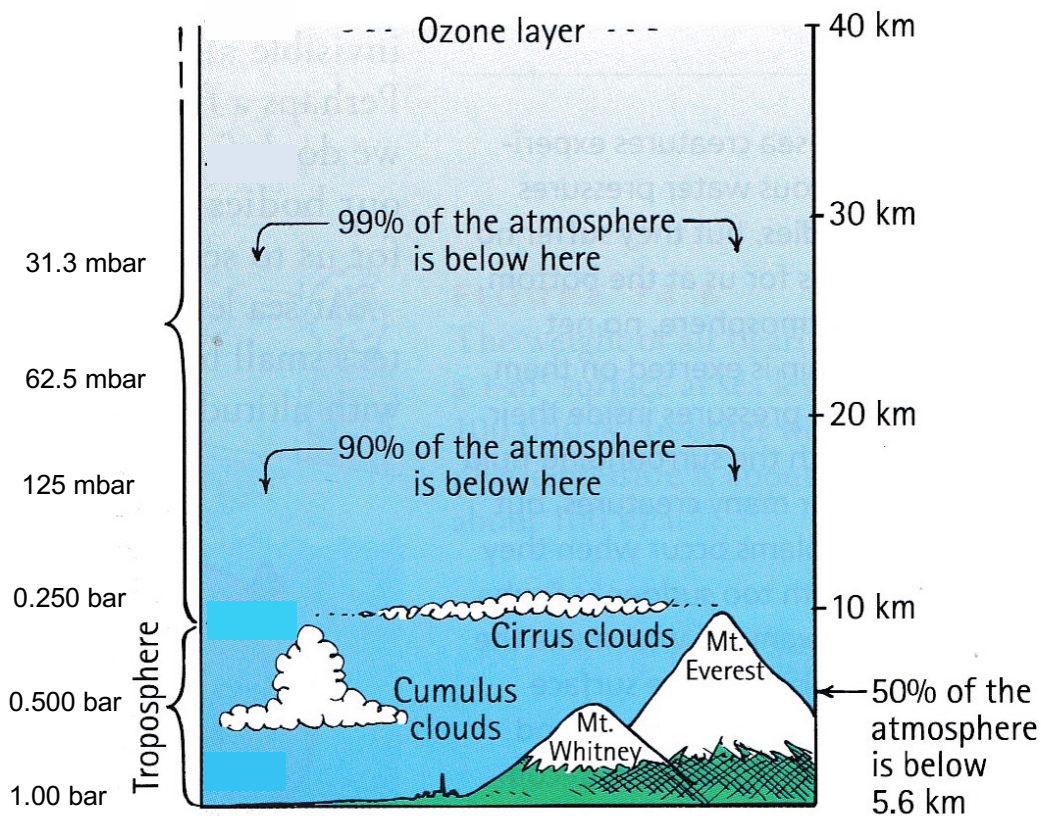# Atmospheric pressure

The atmosphere

We live at the bottom of an ocean of air. The weight (or gravitational force) of the air above us exerts pressure. However, unlike a liquid, air can be compressed and its density is greater at sea level than at higher altitudes. Air gets thinner and thinner as we move upwards and thins out into space without forming a surface.
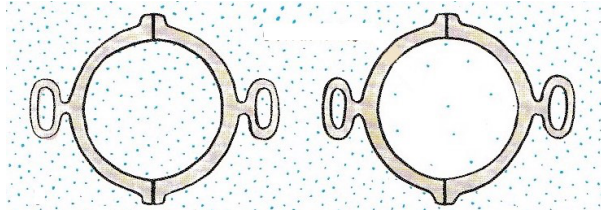
- atmospheric pressure at sea level is 1.013 bar = 1'013 mbar = 101'300 Pa

- with increasing height, every 5.5 km air pressure is reduced by half; that is at 5.5 km above sea level atmospheric pressure is approximately 0.50 bar, at 11 km above sea level it is approximately 0.25 bar, etc

picture: Conceptual physics, Paul G. Hewitt

The hemispheres of Magdeburg

Otto von Guericke (1602 – 1686) was a German engineer and mayor of Magdeburg. In 1650 he invented an air pump and used it to create a vacuum.

In a famous experiment he placed two copper bowls together to form a hollow sphere and removed the air from it with his pump.

pressure is the same outside and inside the sphere

pressure is larger on the outside of the sphere than inside

The spheres were pressed together by the surrounding atmospheric pressure and 16 horses were needed to pull them apart.

Measuring pressure

Gauge pressure is the pressure relative to atmospheric pressure. It is positive for pressures above atmospheric pressure and negative for pressures below atmospheric pressure.

In a balloon, the pressure on the inside is greater that on the outside. The gauge pressure is the difference between atmospheric pressure and gas pressure, that is, if it the pressure inside the balloon is 1'050 mbar and the pressure outside is 1'000 mbar, then the gauge pressure is 50 mbar.

There are many devicese for measuring gauge pressure, e.g. manometers and aneroid barometers.

Absolute pressure can be measured by a mercury barometer.