

The Atmosphere

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The Composition of the Atmosphere

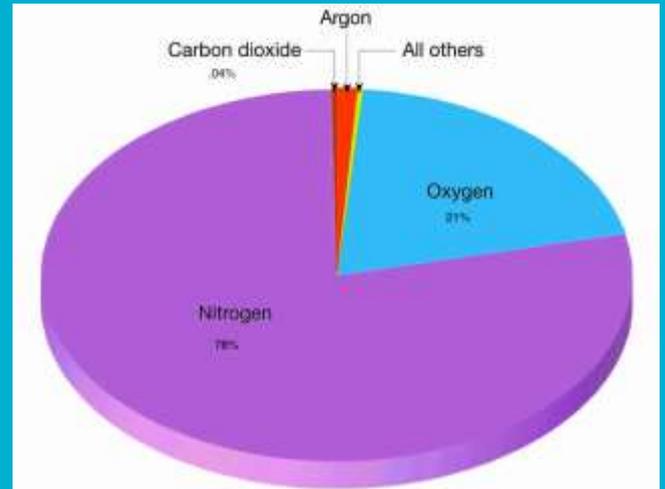
The **atmosphere** is the layer of gases that surrounds the Earth.

Main components:

- Nitrogen → 78% of the atmosphere
- Oxygen → 21% of the atmosphere

Variable components:

- Carbon dioxide → 0.035% of the atmosphere
- Water vapor → 0% to 4% of the atmosphere

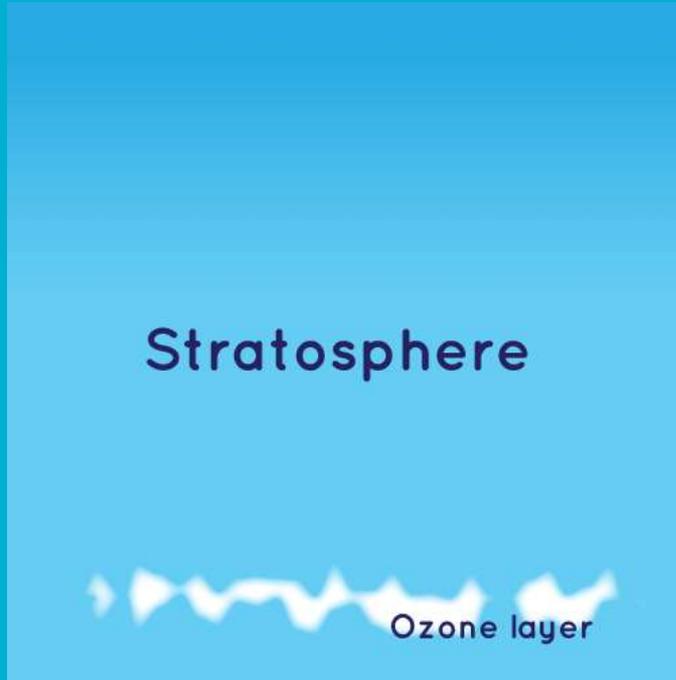


The Structure of the Atmosphere

Troposphere: The layer closest to the Earth's surface. It contains 75% of the total mass of the atmosphere. Almost all of the **water vapor** and dust in the atmosphere are in this layer. The top of this layer is called the tropopause.



The Structure of the Atmosphere



Stratosphere: The second layer of the atmosphere. The gas **ozone** absorbs UV radiation from the Sun, and the temperature of the atmosphere increases until the top of the layer. The top of this layer is called the stratopause.

The Structure of the Atmosphere



Mesosphere: The third layer of the atmosphere. **Meteors** burn up in this layer (shooting stars). The top of this layer is called the mesopause.

The Structure of the Atmosphere

Thermosphere: The fourth layer of the atmosphere. In this layer, the density is very low. Here, charged particles from space collide with atoms causing them to emit light, what we call the colorful **auroras** (aurora borealis). This part of the thermosphere is called the ionosphere.



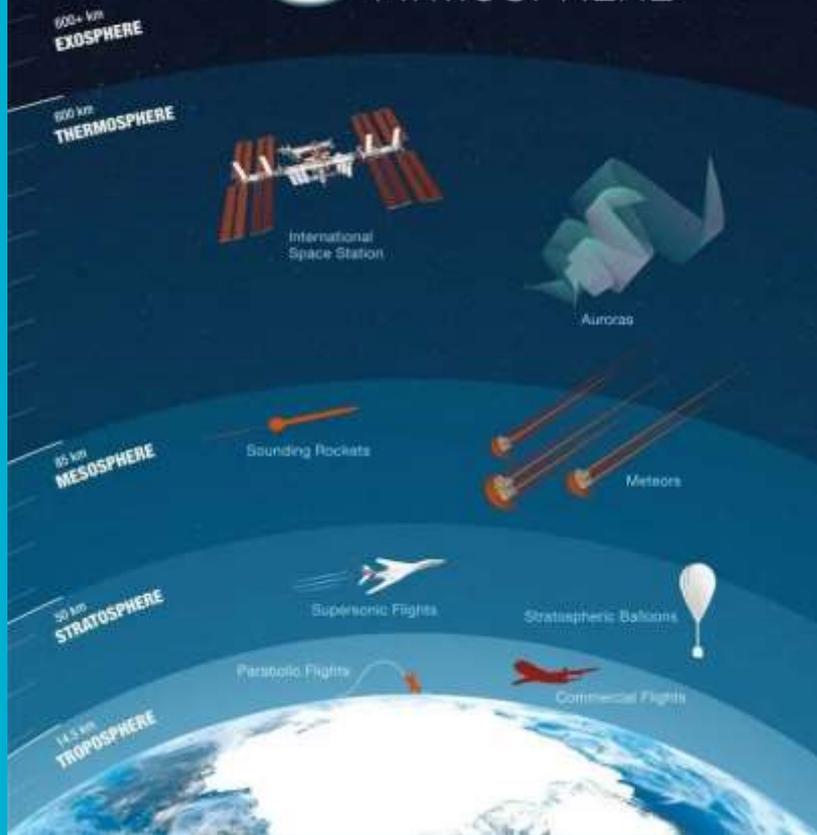
The Structure of the Atmosphere



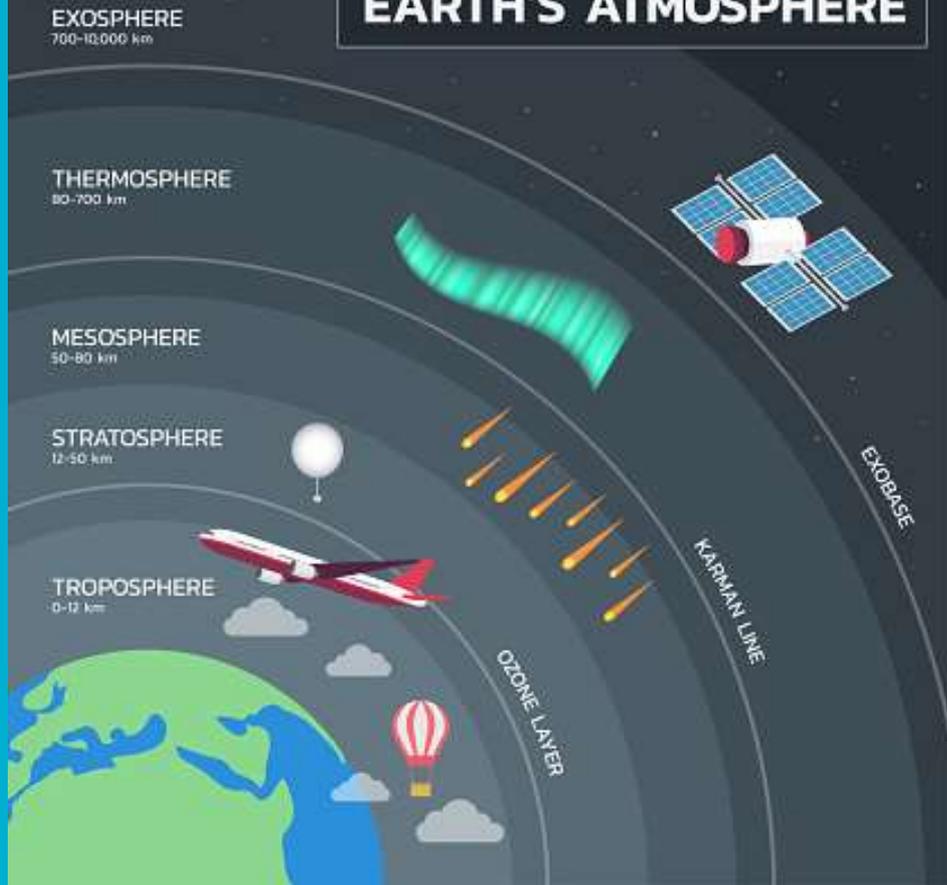
Exosphere: The highest layer of the atmosphere. It is extremely **thin**. It is composed of widely dispersed particles of hydrogen and helium.



5 LAYERS of EARTH'S ATMOSPHERE



EARTH'S ATMOSPHERE



— <https://www.youtube.com/watch?v=LGvewk5d-zM>

Atmospheric Dynamics

Air movements in the atmosphere can be:

- **Vertical:** The air expands and rises when it is heated by the Sun. When it moves, it leaves an empty space beneath it. This produces a low pressure area called a **depression**. On the other hand, when the air gets cold, it contracts and descends. This cold air pushes the air masses that are beneath it and generates pressure. That's how high pressure areas are produced, and they are called **anticyclones**.

Surface Cyclones and Anticyclones

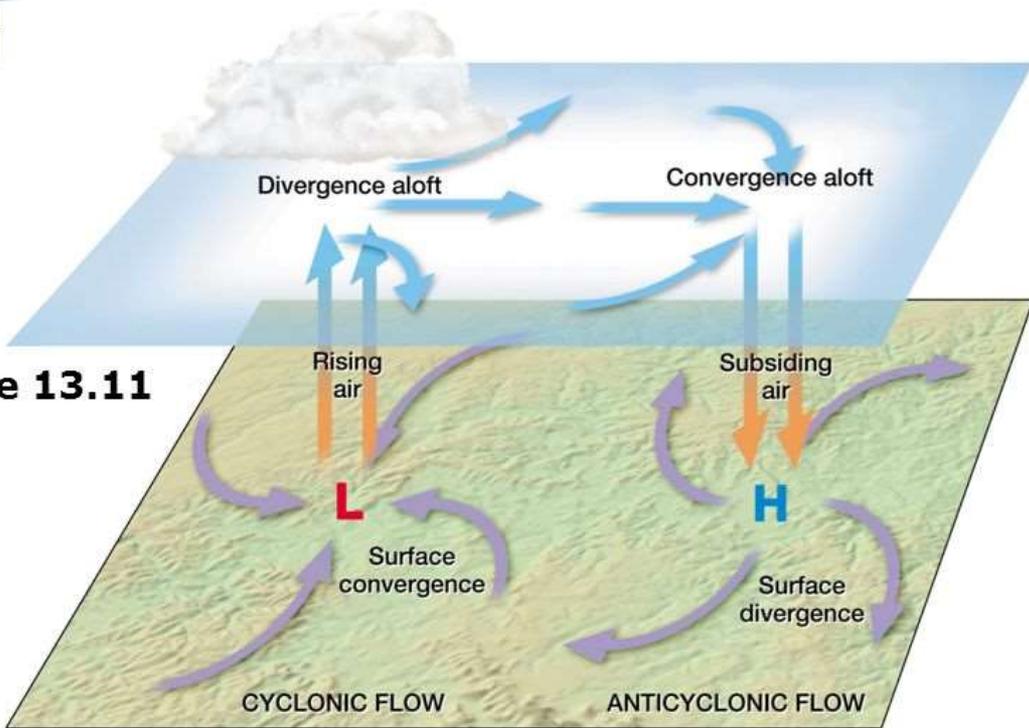
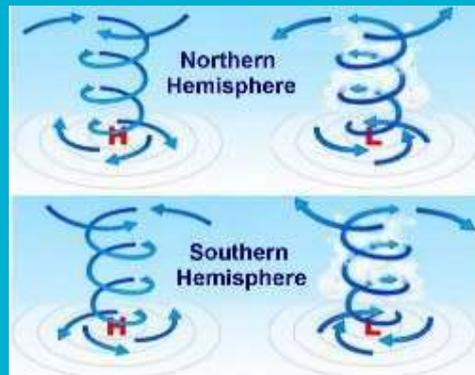


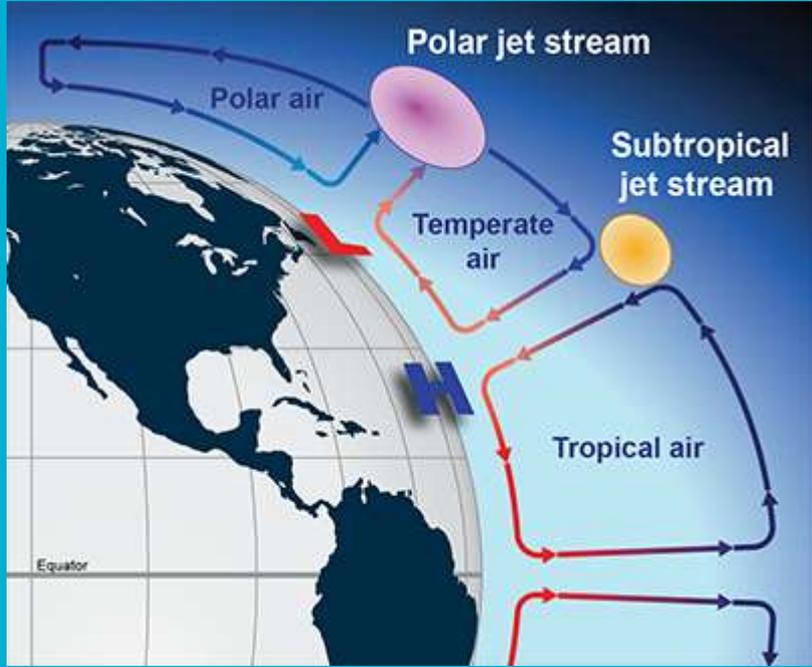
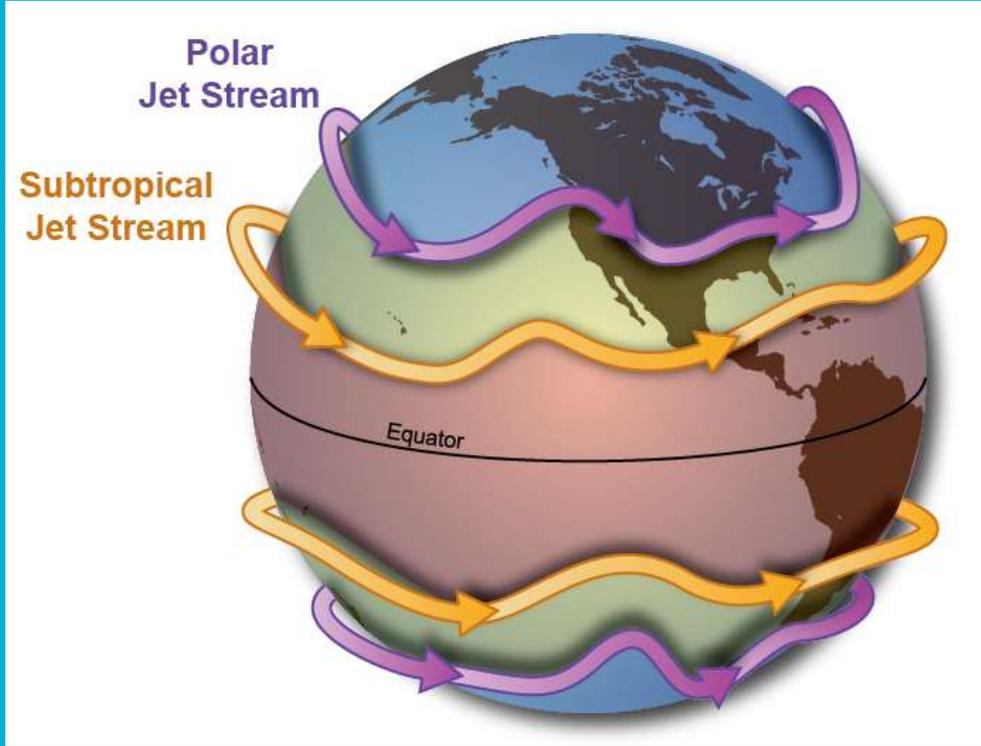
Figure 13.11



Atmospheric Dynamics

Air movements in the atmosphere can also be:

- **Horizontal:** These movements are caused by pressure differences between depressions and anticyclones. That's how air streams are formed, and we call them **winds**.



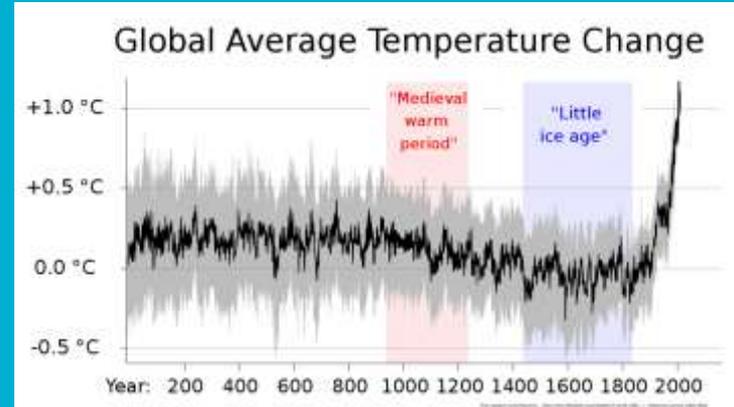
Meteorology and Climatology

Weather is a set of atmospheric conditions that exist during a short period of time (a few days).

Meteorology is the study of the weather.

On the other hand, **climate** is the set of atmospheric conditions observed during a longer period of time (decades).

The study of climate is **climatology**.



<https://www.youtube.com/watch?v=YbAWny7FV3w>

Atmospheric Phenomenon

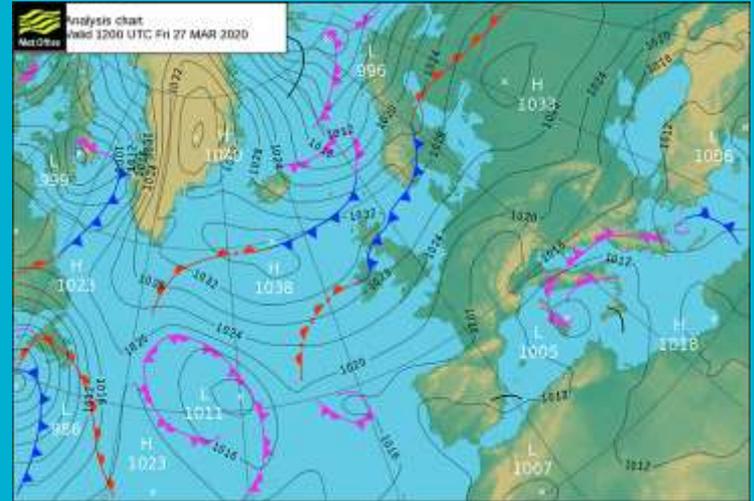
Atmospheric phenomena happen in the **troposphere**. They are:

- **Winds:** They are produced due to temperature and pressure differences between different parts of the Earth. They deliver precipitation around the planet.
- **Clouds:** They are visible masses of ice crystals or microscopic drops of water suspended in the atmosphere.
- **Precipitation:** It's the condensation of water vapor in the atmosphere.



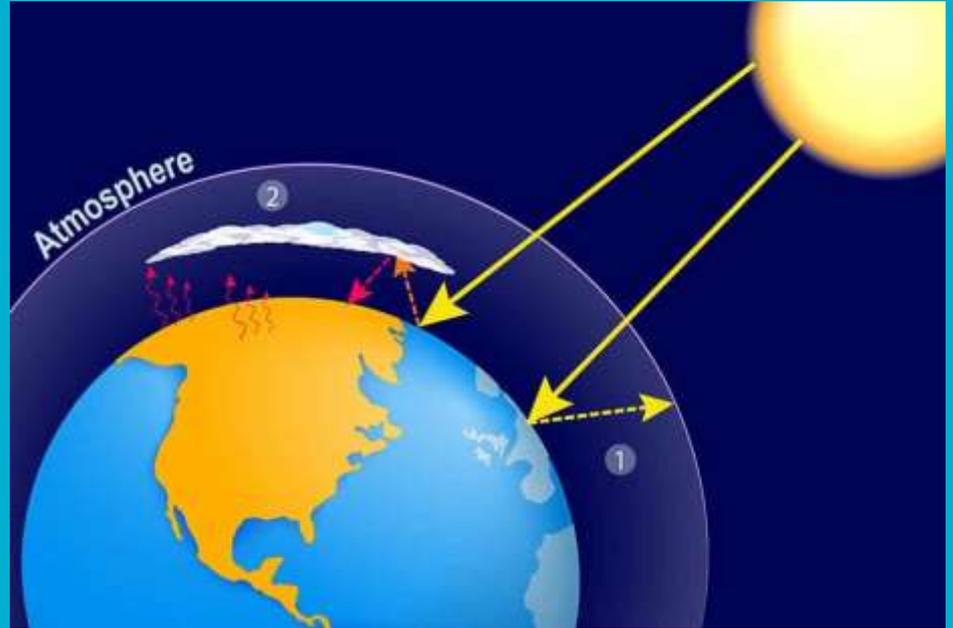
Weather Charts

To enable meteorological forecasting, some variables are studied, such as temperature, humidity, wind, cloud cover, precipitation and atmospheric pressure. All this information can be represented by two types of weather charts. They can be synoptic or significant weather forecast charts.



Importance of the Atmosphere

The atmosphere enables the development of life on Earth. It **protects** us and **regulates** certain factors, such as **temperature**.



The Protective Effect of the Atmosphere

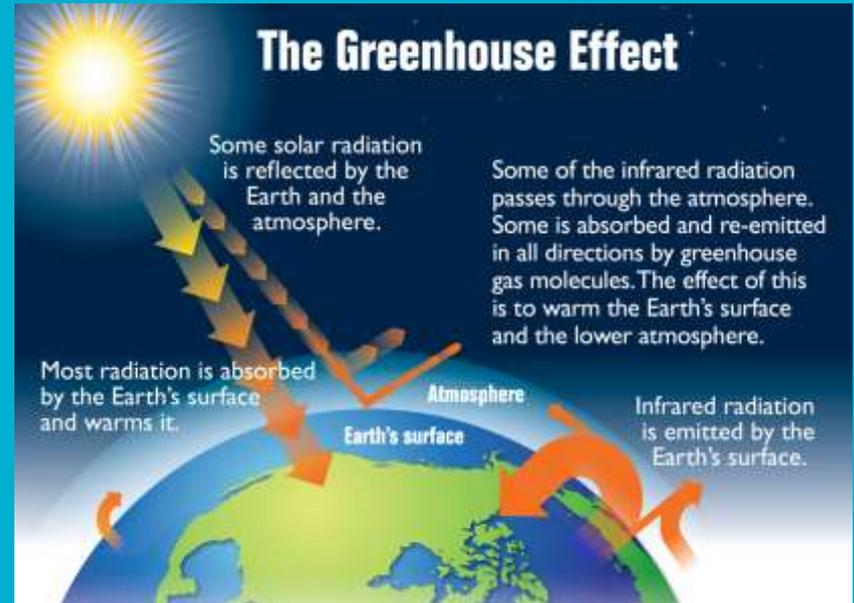
The atmosphere protects the Earth in two ways:

- **Barrier against meteors:** Earth's gravity attracts objects from space. Meteors enter the atmosphere, where they get hot and burn. Only big meteors can reach the Earth's surface and cause damage.
- **Solar radiation filter:** In the **thermosphere**, gamma radiation and X-rays are absorbed. In the **stratosphere**, the **ozone layer** absorbs ultraviolet rays that are dangerous for humans. Finally, in the **troposphere**, clouds reflect or absorb some solar radiation.



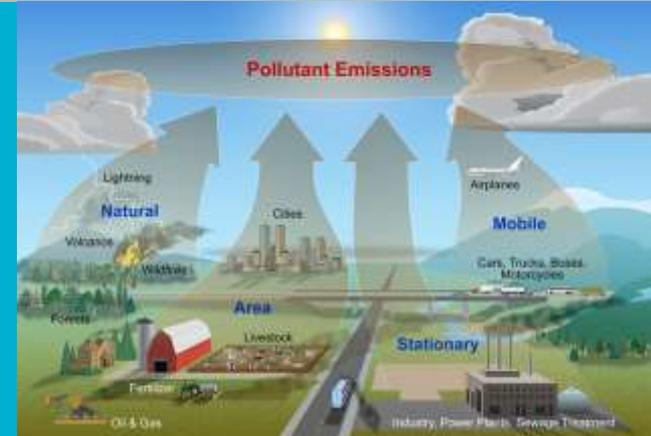
Regulatory Action of the Atmosphere

The atmosphere distributes water. It is composed of gases essential to living things and controls temperature thanks to its natural greenhouse effect.



Atmospheric Pollution

Atmospheric pollution is the presence of substances in the atmosphere that can cause harm or damage to living things. Pollution has **environmental impacts**. These impacts can be caused by things that humans do to the natural environment.



Pollutants

Pollutants are classified into:

Material substances:

According to their physical state, they can be:

- **Solid:** They can be **natural**, like the dust from the erosion of rocks, or **artificial**, like particles from industry.
- **Liquid:** They are **little drops** suspended in the air, and they can be **natural** (sea spray) or **artificial** (pesticides).
- **Gas:** They can be **natural**, such as gases from volcanoes. Most of them are produced by humans, by burning of fossil fuels, for example.

Energy forms: **Light** or **noise** are generated by urban activities. **Heat** is generated by industrial activities.



Measures Against Pollution

We can adopt different individual measures to fight pollution: Save energy, recycle and reuse waste, use public transportation, plant trees and be respectful in public parks.



<https://www.youtube.com/watch?v=7IwPFXzLH8c>