The atmosphere is a life-giving blanket of air that surrounds our Earth, composed of gases that protect us from the Sun’s intense ultraviolet radiation, allowing life to flourish. Greenhouse gases like carbon dioxide, methane, and nitrous oxide are steadily increasing from year to year. These gases trap infrared radiation (heat) emitted from Earth’s surface and atmosphere, causing the atmosphere to warm. Conversely, clouds as well as many tiny suspended liquid or solid particles in the air such as dust, smoke, and pollution—called aerosols—reflect the Sun’s radiative energy, which leads to cooling. This delicate balance of incoming and reflected solar radiation and emitted infrared energy is critical in maintaining the Earth’s climate and sustaining life.

Research using computer models and satellite data from NASA’s Earth Observing System enhances our understanding of the physical processes affecting trends in temperature, humidity, winds, and aerosols, and helps us assess the impact of a changing atmosphere on the global climate.
Earth's atmosphere is home to among the planets in the Solar System. The thin veil of gas surrounding Earth is a vital layer for life as we know it. It shields us from the harsh rays of the Sun, affects the climate, and creates the tubes that the Earth orbits the Sun. The atmosphere is composed of many gases. Some trap heat and radiation and are called greenhouse gases—carbon dioxide (CO₂), methane (CH₄), and water vapor (H₂O). Another important gas is ozone (O₃), which is primarily found in the stratosphere and plays a critical role in blocking the Sun's ultraviolet radiation. However, CO₂ can also contribute to the lower atmosphere and increase its temperature, a phenomenon known as the greenhouse effect.

The atmosphere forms a protective layer above Earth that helps to protect us from the dangers of the Sun's radiation. It is composed of layers that have different properties and functions. The gases that make up the atmosphere are crucial for maintaining a habitable environment on Earth. They provide oxygen for life, regulate the temperature of the planet, and protect us from harmful space radiation. Understanding the composition and behavior of these gases is essential for predicting climate change and ensuring the well-being of all life on Earth.

There's Something in the Air

The images show 2008 satellite retrievals of aerosol optical thickness (AOT) and surface atmospheric visible reflectance (VRE) from the Moderate-resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua, respectively, across a wide spectral range of 0.4-2.3 microns. Aerosols are tiny particles of dust, sea salt, and smoke that can reflect sunlight or absorb it, which can affect the climate. The images are color-coded to show the amount of aerosol present, with red indicating high concentrations and blue indicating low concentrations.

The Weekend Effect

The weekend effect refers to the observation that traffic and industrial activity tend to be lower on weekends, leading to reduced levels of pollution. This effect is particularly noticeable in urban areas with heavy traffic and industrial activity. The weekend effect is significant because it can help to reduce air pollution and improve air quality. For example, the lower levels of pollution on weekends can help to reduce the risk of respiratory and other health problems associated with air pollution. It is important to understand the factors that contribute to the weekend effect and how it can be used to improve air quality and public health.

Profile of the Atmosphere

The Earth's atmosphere is a layer of gases surrounding the planet that helps to maintain life. The atmosphere is composed of layers that have different properties and functions. The gases that make up the atmosphere are crucial for maintaining a habitable environment on Earth. They provide oxygen for life, regulate the temperature of the planet, and protect us from harmful space radiation. Understanding the composition and behavior of these gases is essential for predicting climate change and ensuring the well-being of all life on Earth.

Our Atmosphere: A Mission Sampler

The Aura satellite was launched on June 17, 2004 as a mission of NASA's Earth Observing System (EOS) to improve our understanding of the Earth's atmosphere and climate. Aura is part of the EOS mission, a network of satellites and ground-based instruments that monitor the Earth's atmosphere, oceans, and land. Aura collects data on the composition of the atmosphere, the distribution of aerosols, and the interaction between the atmosphere and the oceans. This information is used to improve our understanding of the Earth's climate and to help predict changes in the atmosphere.

Human Footprints on the Atmosphere

The images here show two examples of the impact that human activities have on the atmosphere and the oceans in particular. Examples of these include the plumes of pollution from factories, power plants, and vehicles, and the effects on the climate. This information is used to help us understand how human activities are affecting the atmosphere and the oceans, and to help us make decisions about how to reduce these impacts in the future.

Dust in the Wind

As the first generation to experience Earth's orbit, we have the ability to observe and understand the phenomena that make up our planet. These phenomena include the Sun, Earth, and the complex interactions between them. By studying the Earth's orbit, we can gain a deeper understanding of the forces that shape our planet and the conditions that support life.

Balancing the Energy Budget

The Earth's climate is governed by the energy balance between incoming solar energy and outgoing thermal energy. If the Earth warms it also seems Earth should just keep getting warmer. The energy budget helps to explain how Earth's climate changes and how it is maintained in a state of balance.

Models of a different kind are being used to simulate Earth's energy budget. For example, the Energy Balance Model (EBM) is a simple model that can be used to understand how Earth's climate works. The EBM is based on the idea that Earth's energy budget is the sum of the energy received from the Sun and the energy lost to space. By comparing the two, we can understand how Earth's climate works and how it is maintained.

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