TEXTO - CLIMATE CHANGE

Climate change is happening

Our Earth is warming. Earth's average temperature has risen by 1.4°F over the past century, and is projected to rise another 2 to 11.5°F over the next hundred years. Small changes in the average temperature of the planet can translate to large and potentially dangerous shifts in climate and weather.

The evidence is clear. Rising global temperatures have been accompanied by changes in weather and climate. Many places have seen changes in rainfall, resulting in more floods, droughts, or intense rain, as well as more frequent and severe heat waves. The planet's oceans and glaciers have also experienced some big changes - oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. As these and other changes become more pronounced in the coming decades, they will likely present challenges to our society and our environment.

Earth's temperature is a balancing act

Earth's

What are climate change and global warming?

Global warming refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change.

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

temperature depends on the balance between energy entering and leaving the planet's system. When incoming energy from the sun is absorbed by the Earth system, Earth warms. When the sun's energy is reflected back into space, Earth avoids warming. When energy is released back into space, Earth cools. Many factors, both natural and human, can cause changes in Earth's energy balance.

Scientists have pieced together a picture of Earth's climate, dating back hundreds of thousands of years, by analyzing a number of indirect measures of climate such as ice cores, tree rings, glacier lengths, pollen remains, and ocean sediments, and by studying changes in Earth's orbit around the sun. [1]The historical record shows that the climate system varies naturally over a wide range of time scales. In general, climate changes prior to the Industrial Revolution in the 1700s can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in greenhouse gas (GHG) concentrations. [1]

Recent climate changes, however, cannot be explained by natural causes alone, especially warming since the mid-20th century. Rather, human activities can very likely explain most of that warming. Human activities release large amounts of carbon dioxide and other greenhouse gases into the atmosphere. The majority of greenhouse gases come from burning fossil fuels to produce energy, although deforestation, industrial processes, and some agricultural practices also emit gases into the atmosphere.

The Greenhouse Effect causes the atmosphere to retain heat

When sunlight reaches Earth's surface, it can either be reflected back into space or absorbed by Earth. Once absorbed, the planet releases some of the energy back into the atmosphere as heat (also called infrared radiation). Greenhouse gases (GHGs) like water vapor (H_2O), carbon dioxide (CO_2), and methane (CH_4) absorb energy, slowing or preventing the loss of heat to space. In this way, GHGs act like a blanket, trapping energy in the atmosphere and causing it to warm. This process is commonly known as the "greenhouse effect". It is natural and necessary to support life on Earth. However, the buildup of greenhouse gases can change Earth's climate and result in dangerous effects to human health and welfare and to ecosystems.

The Main Greenhouse Gases

The most important GHGs directly emitted by humans include CO_2, CH_4, nitrous oxide (N_2O), and several others. The sources are detailed below.

Carbon dioxide

Carbon dioxide is the primary greenhouse gas that is contributing to recent climate change. CO_2 is absorbed and emitted naturally as part of the carbon cycle, through animal and plant respiration, volcanic eruptions, and ocean-atmosphere exchange. Human activities, such as the burning of fossil fuels and changes in land use, release large amounts of carbon to the atmosphere, causing CO_2 concentrations in the atmosphere to rise.

Methane

Methane is produced through both natural and human activities. For example, natural wetlands, agricultural activities, and fossil fuel extraction and transport all emit CH_4.Methane is more abundant in Earth's atmosphere now than at any time in at least the past 650,000 years. [2] Due to human activities, CH_4 concentrations increased sharply during most of the 20th century.

Nitrous oxide

Nitrous oxide is produced through natural and human activities, mainly through agricultural activities and natural biological processes. Fuel burning and some other processes also create N_2O. Concentrations of N_2O have risen approximately 18% since the start of the Industrial Revolution, with a relatively rapid increase towards the end of the 20th century.

Other Greenhouse Gases

Water vapor is the most abundant greenhouse gas and also the most important in terms of its contribution to the natural greenhouse effect, despite having a short atmospheric lifetime. Some human activities can influence local water vapor levels. However, on a global scale, the concentration of water vapor is controlled by temperature, which influences overall rates of evaporation and precipitation. [1] Therefore, the global concentration of water vapor is not substantially affected by direct human emissions.

Tropospheric ozone (O3), which also has a short atmospheric lifetime, is a potent greenhouse gas. Chemical reactions create ozone from emissions of nitrogen oxides and volatile organic compounds from automobiles, power plants, and other industrial and commercial sources in the presence of sunlight. In addition to trapping heat, ozone is a pollutant that can cause respiratory health problems and damage crops and ecosystems.

Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6), together called F-gases, are often used in coolants, foaming agents, fire extinguishers, solvents, pesticides, and aerosol propellants. Unlike water vapor and ozone, these F-gases have a long atmospheric lifetime, and some of these emissions will affect the climate for many decades or centuries.

Other Climate Forcers

Black carbon (BC) is a solid particle or aerosol, not a gas, but it also contributes to warming of the atmosphere. Unlike GHGs, BC can directly absorb incoming and reflected sunlight in addition to absorbing infrared radiation. BC can also deposit on and darken snow and ice, increasing the snow's absorption of sunlight and accelerating melt.

Sulfates, organic carbon, and other aerosols can cause cooling by reflecting sunlight. Warming and cooling aerosols can interact with clouds, changing a number of cloud attributes such as their formation, dissipation, reflectivity, and precipitation rates. Clouds can contribute both to cooling, by reflecting sunlight, and warming, by trapping outgoing heat.