

TOPICS OF RESEARCH IN CLIMATOLOGY AND DIFFERENCES IN METEOROLOGY

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ABOUT THE STUDY

Climatology, also known as climate science, is the scientific study of the Earth's climate, which is typically defined as weather conditions averaged over at least 30 years. This modern field of study is classified as an atmospheric sciences branch and a sub field of physical geography, which is classified as an Earth science. Oceanography and bio geochemistry are now included in climatology.

Topics of research

Climatologists study various components of topics: climatological processes, climate variability, and climate change.

Climatological processes

Several factors influence the average state of the atmosphere at a given location. Continental distance to major water bodies such as oceans is another major control in climate. Because oceans act as a moderator, land near them typically experiences mild winters and moderate summers. Winds generate ocean currents that transport heat around the world, and the atmosphere interacts with other spheres of the climate system.

Climate variability

There are various types of variability, such as recurring temperature patterns or other climate variables. They are quantified using technical indicators. Climate indices are used to represent the essential elements of climate in the same way that the Dow Jones Industrial Average, which is based on the stock prices of 30 companies, is used to represent the fluctuations in the stock market as a whole. Climate indices are designed with the twin goals of simplicity and completeness in mind, and each index typically represents the status and timing of the climate factor it represents. Indices, by definition, are simple, combining many details into a generalised, overall description of the atmosphere or ocean that can be used to characterise the factors that influence the global climate system. The El Niño-Southern Oscillation (ENSO) is a two to seven-year cycle coupled ocean-atmosphere phenomenon in the Pacific Ocean that is responsible for the majority of global temperature variability. The North Atlantic oscillation is a type of variability that occurs primarily in the lower atmosphere, or troposphere. The stratosphere, the layer of atmosphere above, is also capable of producing its own variability, most notably in the Madden Julian Oscillation (MJO), which has a cycle of 30 to 60 days. The Inter decadal Pacific oscillation can cause changes in the Pacific Ocean and lower atmosphere.

Climate change

Climate change occurs when changes in the Earth's climate system result in new weather patterns that persist over time. This period of time can range from a few decades to millions of years. The sun provides nearly all of the energy to the climate system. The climate system also emits energy into space. The Earth's energy budget is determined by the balance of incoming and outgoing energy, as well as the passage of energy through the climate system. When the incoming energy exceeds the outgoing energy, the earth's energy budget is positive, and the climate system begins to warm. If more energy is expended, the energy budget becomes negative, and the earth cools. Climate change has an impact on average sea level as well. Human emissions of greenhouse gases from the combustion of fossil fuels are driving up global mean surface

temperatures in the modern era. However, rising temperatures are only one facet of modern climate change, which also includes changes in precipitation, storm tracks, and cloudiness. Warmer temperatures are causing additional changes in the climate system, such as widespread glacier melt, sea level rise, and changes in flora and fauna.

Differences with meteorology

Climatology, as opposed to meteorology, investigates the frequency and trends of short-term weather patterns lasting a few weeks or less. Climatologists investigate the nature of climates, whether local, regional, or global, as well as the natural and man-made factors that contribute to climate change. Climatology studies the past and can help predict future climate change. Climatologically interesting phenomena include the atmospheric boundary layer, circulation patterns, heat transfer, interactions between the atmosphere and the oceans and land surface, and the chemical and physical composition of the atmosphere.

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