

Research Article

THEORIES OF CLIMATE CHANGE

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ABSTRACT

The earth has experienced the phenomena of climate change since it was born. These changes occurred over a very long time involving thousands of years. But at present the temperatures are raising causing adverse impacts on the planet. Also recent international forums have popularized the term 'Climate Change' as it is expected to cause devastation effects by the end of this century. It is generally believed that anthropogenic causes are solely responsible for climate change. The paper looks at the various theories relating to the natural processes suggested behind this phenomenon, like role of sun-spots, earth's magnetism, volcanoes etc.

Key Words: *Climate Change, Eccentricity, Astronomical Theories, Volcanoes*

INTRODUCTION

The role of insulation is fundamental in weather and climate producing processes. Hence most climate change theories deal with possible effects of alterations in the earth's energy budget.

One of the simplest theory states that any change in the kind and amount of energy emitted sun causes changes and increased solar radiation warms the atmosphere and account for events such as the glacial melting.

Sun Spot Activity: Few theories based on a examining the number of sunspots during more than two centuries reveals a cycle of about 11.3 years, but the period has been as short as 9 years and as long as 16. Multiples of the 11-year cycle and secondary cycles having lengths of 35 years, 80 years and other periods have also been suggested. Based on these some correlations between sunspot numbers and weather have been established for specific regions only. Changes in the heat budget, the general circulation and precipitation patterns on the earth can be seen because of the combined effect of sunspot activity and sun's rotation and the solar wind.

Geo-Magnetism: Paleo-climatologists have found correlations between earth magnetism and climatic changes, especially those associated with ice ages and the extinction of species in the fossil record as the earth's magnetic field is known to be affected by the emissions of charged protons by solar flares during maximum sunspot periods.

Asteroid collision too has been held responsible for causing an instant climate change by destructing various forms of life in the geological past. However, the large size impacts of this intensity occur only rarely, with a gap of 50-100 million years. Such impacts were felt on the earth during the Permian-Triassic and Cretaceous-Tertiary boundaries.

The *astronomical theories* consider five principal effects.

1. Changes in the *angle which the earth makes* with the plane of the ecliptic. During a cycle of about 41,000 years the tilt angle varies slowly between 22.1° and 24.5° which are believed to affect temperature distribution, seasons and the general circulation.
2. With the *changes in the eccentricity of the earth's orbit-period* of 96,000 years the mean distance from earth to sun could have varied and these variations affected the temperatures on earth.
3. *Precession of the equinoxes*, the regular change in the time when the earth is a given distance from the sun. At present the earth is closest to the sun in the Northern Hemisphere winter. About 10,500 years ago the Northern Hemisphere winter came at a time of year when the earth was farthest from the sun. Other things being equal (which they never are), winters should have been colder and summers warmer than they are now. In the Southern Hemisphere the reverse applies.

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4. The hypothesis of *shifting of the earth on its polar axis* as suggested by Robert Hooke in 1686 to explain tropical fossils in England, also suggests “polar wandering”. This could be responsible for climate change.

5. Changes in the *rate of the earth's rotation* on its axis affect the diurnal heat budget. This in turn impacts the world climates.

Volcanic Eruptions: Insolation gets affected by the processes of absorption, reflection and scattering in the outer limits of the atmosphere. It's possible causes are known to be showers of meteoric dust and time to time increase of volcanic ash. Effects of eruptions like Mount Tambora on the Indonesian Island of Sumbawa (1815), Katmai (1912), Agung (1963), Taal (1965), Mayon and Fernandina (1968) are felt in local climates deeply but their global climatic impacts were undetectable. During volcanic eruptions Sulphur dioxide and chlorine are also emitted which can react chemically and reduce ozone. Hence, its increase would lead to a small rise in surface temperatures; a decrease would tend to produce surface cooling.

Continental drift during past geologic eras witnessed land masses shifting to different latitudinal positions. Geophysicists since the middle of the twentieth century support crustal movements as explanations of climatic change by giving refined plate tectonics theory.

Increase in CO₂ levels: Carbon dioxide and water vapor selectively absorb part of the long wave terrestrial radiation and a greenhouse effect is created by transmitting short-wave radiation. An increase of CO₂ is thought to produce slightly higher surface temperatures and it has been proposed as a cause of the warming trend from about 1885 to 1940.

Impact of humans too can be felt on climate change, as pollution created by cities and industries, burning of vegetation along with the solid particles resulting from wind erosion too contribute as factors of climate change.

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