

## Climate Change and the Facts

**L Sherjit Singh<sup>1</sup> & Kh Mohon Singh<sup>2</sup>**

<sup>1</sup>Department of Environmental Studies, NEHU Shillong, India

<sup>2</sup>Department of Geology, Imphal College, Imphal, Manipur, India

### ABSTRACT

*In this present ages, climate change becomes one of the most important issues of the world. Most people believe that global warming is caused by anthropogenic activities only and it is said that present age is warming period. With the development of knowledge and technology many researchers realize that global warming is caused by natural processes like orbital and solar variability, large scale oceanographic oscillation, long ocean tide cycle, global distribution of continents and oceans (plate tectonics, sea floor spreading, mountain building activities and continental drift and it is enhanced by anthropogenic activities to some extent by increasing CO<sub>2</sub> concentration from industries and fossil fuels and CFCs from air conditioners and refrigerators. Human influences in climate change are of comparatively low intensity and take place over short time.*

**KEY WORDS:** *Climate change, green house, orbital variations, Milanokovitch cycle, proxy data.*

### INTRODUCTION

Climate change refers to an average increase or decrease in earth's temperature which in turn causes warmer or colder. Many people believe that the present period is warming period but now it is no longer true. Recently researchers confirm that the average temperature is decreasing even though CO<sub>2</sub> concentration increases. Glaciers are growing on Mount Shasta of California, Mount Canin and Mount Montasio of Italy. Antarctic Climate and Ecosystems Co-operative Research Centre confirmed after ice core-drilling that average thickness of ice in Antarctica is increasing. We cannot prevent climate change, but we can minimize its ill effects to some extent.

### CAUSES OF CLIMATIC CHANGE

Researchers collect proxy data from ice cores, sediments (marine and terrestrial) and fossils including, pollen grains, forams) etc. and reconstruct the paleo-climate. Then they theorize the cycle of global warming and cooling. The following table shows climatic cycle with time.

Table no. 1 Climatic conditions of earth through ages

Era/Period	Age in million years before present	Climatic condition	Evidences
Cenozoic	Present ages	Ice house	Ice caps develop in Antarctica and Greenland, growth of mid latitude ice-sheets
Cretaceous	65-135	Green house	Impact of meteorites and production and injection of dust into the atmosphere insulating earth and preventing heat loss
Carboniferous	330-355	Ice house	Formation of high latitude glaciers on many parts of Gondwana located in southern hemisphere
Devonian	359-418	Green house	Abundance of evaporates and absence of humid indicators like coal & bauxite
Pre-cambrian	2500	Ice house	Large scale glaciation

Some of the scientists who oppose the anthropogenic global warming are Milankovitch, Goldberg, Easterbrook, Schimel, Keeling, Whorf, Gerhard, Harrison, Hanson and Berner. According to Milankovitch, (1941) climate changes due to eccentricity, obliquity and precession of the earth (fig.1). Schimel et al (1995) estimated independently that CO<sub>2</sub> production due to anthropogenic activities is about 3% only. Easterbrook (2008) showed climatic cycle graphically (fig.2). Study of the past permits them to predict the future climate. Keeling and Whorf (2000) suggested that present natural warming is independent of any anthropogenic influences. Berner RA (1994) predicted that CO<sub>2</sub> content has decreased over past 600 million years from 18 times the current concentration.

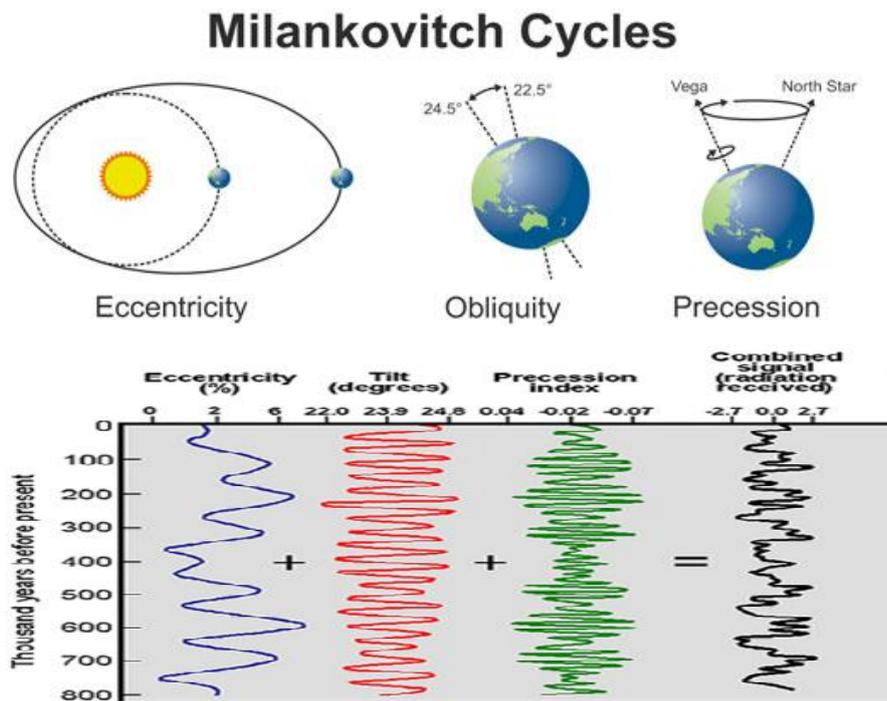


Fig.1 Eccentricity, obliquity and precession of the earth and its graphical representation of effects on climate change (Source; <http://en.wikipedia.org/wiki/Milankovitch>)

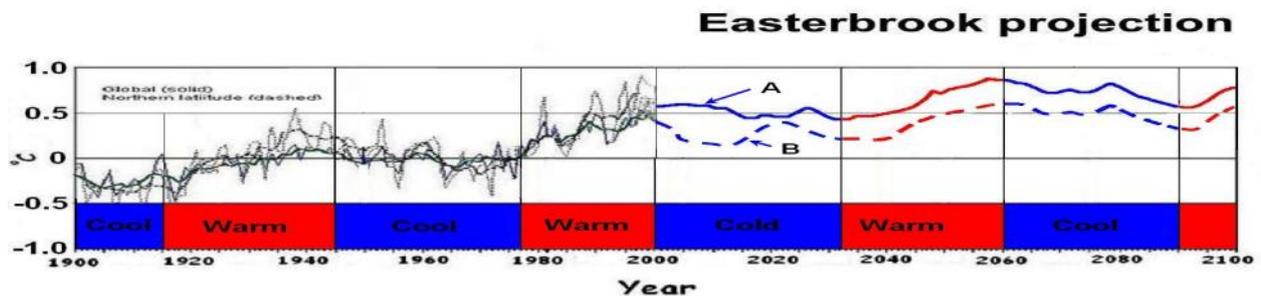


Fig. 2 Easterbrook's climate cycle (Source; Easterbrook, 2008)

Gerhard, Harrison and Hanson (2001) gave details about the climate drivers. They also said that human influence in climate change are of comparatively low intensity and take place over short time.

The actual factors that control the climate include both external and internal factors. The external factors include orbital variations, obliquity, eccentricity and precession of the earth. The internal factors include-orogeny, epeirogeny, volcanic activity and ocean circulation etc. These factors that control the climate are known as climate drivers. They are classified into different orders based on the absolute temperature changes

and the amount of time over which the drivers operate. They can be classified into different orders (Gerhard et al, 2001) as follows-

**1<sup>st</sup> order climate drivers:** 20-40°C, 10<sup>11</sup>-10<sup>9</sup>years;

Green house atmosphere, solar system geometry, solar luminosity

**2<sup>nd</sup> order climate drivers:** 15-20°C, 10<sup>9</sup>-10<sup>6</sup>years;

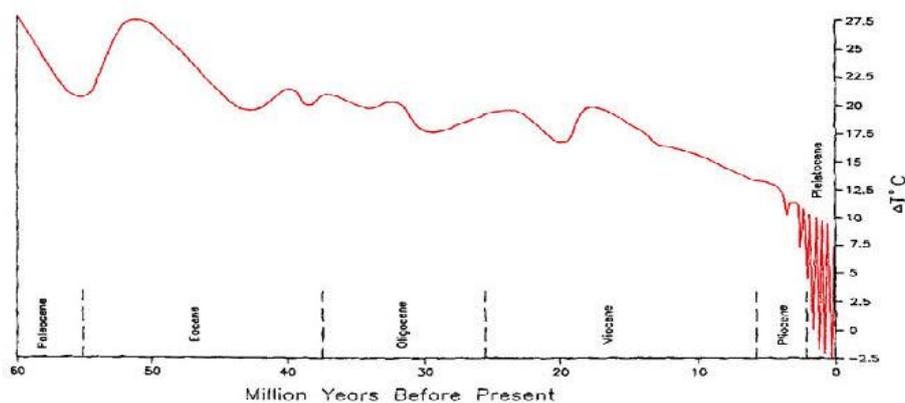
Global distribution of continents and oceans (plate tectonics, sea floor spreading, mountain building activities and continental drift)

**3<sup>rd</sup> order climate drivers:** 5-15°C, 10<sup>6</sup> – 10<sup>3</sup>years;

Orbital and solar variability, large scale oceanographic oscillation and long ocean tide cycle.

**4<sup>th</sup> order climate drivers:** upto 5°C, 10<sup>3</sup>-10<sup>0</sup> years;

El Nino, solar storm, volcanoes, weathering, regional tectonics, smaller orbital cycle, meteorite impact and *human intervention*.



**Fig.3** Temperature fluctuation (mean annual temperatures) in central Europe Tertiary time, the past 60 million years. Except for a peak in early Eocene time, temperature decreased throughout the Tertiary. Beginning in late Pliocene/early Pleistocene time, with the onset of glacial conditions, temperatures fluctuated widely, ranging from full glacial to interglacial conditions. The modern condition is approximately +4 to +5°C.(Source ; Gerhard et al 2001)

### Ice cores

Ice cores taken from the world's glaciers and ice sheets have become a critical source of paleo-proxy data. Ice cores can contain extensive time series, reaching back hundreds of thousands of years, enabling scientists to study climate through glacial cycles and large climatic fluctuations. In addition, some ice cores can be analyzed annually, extending back a few hundred years before the present, allowing for the reconstruction of interannual climatic fluctuations such as El Nino, the North Atlantic Oscillation (NAO), or the Pacific Decadal Oscillation (PDO). Ice fields with the proper characteristics for ice cores are not limited to the polar regions and can be found on 6 of the 7 continents, providing climatic data over a large part of the Earth.

### Analytic Techniques

Ice cores can contain several forms of paleo-proxy data that estimate standard meteorological parameters to help reconstruct past climates. Some of the more common meteorological data that can be reflected in ice include air temperature, atmospheric circulation variations, precipitation amount, atmospheric

composition, solar activity, and records of volcanic eruptions. These parameters can be represented by corresponding proxy records including stable isotopes, radioisotopes, dust composition, snow accumulation rate, air bubbles, and volcanic ash or sulfate. All of the modern analytical techniques used to extract these proxy records have been developed and honed over time, and with the assistance of better technology and new ideas more accurate methods of ice core analyses are being developed. Before scientists can begin reconstructing past climates from paleo-proxies derived from ice cores however, the ice must be drilled and analyzed.

## CONCLUSIONS

The controversy of climate change is increasing day by day. Most people believe that climate change is caused by human activities only. If we look back to past millions of years we will find that both global warming and cooling occurs in cyclic form. Even if we stop all the activities that release CO<sub>2</sub> (e.g. deforestation, agriculture, land use industries and using of fossil fuels) climate change will occur because it is a fact that climate change is natural phenomenon and it is caused by natural processes like orbital and solar variability, large scale oceanographic oscillation, long ocean tide cycle, global distribution of continents and oceans (plate tectonics, sea floor spreading, mountain building activities and continental drift but now-a-days human beings enhance the effect by increasing CO<sub>2</sub> concentration from industries and fossil fuels and CFCs from air conditioners and refrigerators. Because climate change, both natural and anthropogenic, has the potential to alter our way of life in coming decades, paleoclimatology has become critical for atmospheric scientists placing today's climate in the context of past variability. Human influences in climate change are of comparatively low intensity and take place over short time. Ice core records, combined with other paleo-proxy data, are creating a window to the past. Before human civilization and evolution also climate change had already occurred and still continues on. We cannot prevent climate change, but we can minimize its negative effects to some extent by reducing CO<sub>2</sub> and CFCs emissions and large scale forestation

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- ) **About the authors**
- ) Dr Kh Mohon Singh is presently working as Associate Professor of Geology, Imphal College, Imphal . His other areas of interest are geochemical modeling on Igneous Petrology, Environmental Geology and Geohazard.
- ) Laishram Sherjit Singh was Junior Research Fellow at the Department of Geology, Imphal College Imphal. He is now working as Research Scholar at NEHU Shillong. His other areas of interests are Hydrogeology, Environmental geology, Climatology, Disaster management, Geohazard and Sedimentary Environment and Basin Analysis.