



Multidecadal Oscillations on Global Warming and its Hiatus

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ABOUT THE STUDY

The dynamics of climate evolution is immensely complex, with nonlinear interdependent contributions from anthropogenic and natural sources. Planetary scale climate evolution such as inter-decadal and 5kyr cycles, long-term regional variations such as the Atlantic Multi-decadal Oscillation (AMO), multi-decadal Pacific climate variability, and natural forcing induced by solar and volcanic activity play a major role in modulating the Earth's climate. The anthropogenic contributions to climate change through greenhouse warming, ocean acidification, and regional radiative forcing have been extensively studied and documented. Multi-decadal oscillations, for example, have been shown to have a positive correlation with the global warming at different time-scales. While the role of AMO in the northern hemispheric climatic variability is now undisputed, a significant factor, i.e., the role of zonal and regional multi-decadal variability in the global temperature dynamics is not yet fully understood. For example, recently, the role of Arctic warming amplification in the global temperature change and a weakening Atlantic Ocean Meridional Circulation, have been recognised to influence surface heat flux, and drought frequencies in the United States.

IPCC reports have been the topics of constant debate amongst scientists, with questions being raised about the legitimacy of these assessments. Many claimed that the impact of global warming has been underestimated, as in the case of Arctic sea ice extent shrinkage, whereas there have been considerable skepticism about the methodology being employed, with some even accusing IPCC for creating the global warming havoc. Berkeley Earth Surface Temperature project have documented,

by the analysis of data from over 37,600 global stations, that approximately a third of earth has cooled, with rest of the two-third being warmed in the last 70 years. They conclude that the global temperature have risen by approximately 1°C since mid-1950. However, human impact on the climate change is still attracting tremendous debate as the cause of these warming remains elusive. IPCC (2001) report was particularly subjected to criticism in this regard, for overestimating the human impact, with arguments that the global rise in temperature may be solely natural. Although the IPCC (2007) report made it clear that there is dangerous human involvement in the present global warming, the reason for disbelief persisted due to lack of information and improper assessment of data. The recent IPCC reports have broadly corroborated the above picture.

According to variations in the thermohaline circulation are reflected as uniform sea surface temperature anomalies in the North Atlantic. These anomalies are associated with a hemispheric wavenumber-1 sea level pressure (SLP) structure in the atmosphere that is amplified by the atmosphere-ocean interactions in the North Pacific. The SLP pattern and its wind field affects the sea-ice export through Fram Strait, the freshwater balance in the northern North Atlantic. As a result, it also affects the strength of the large-scale ocean circulation. It generates sea surface temperature anomalies with compensating signs in the North Atlantic and establishes a negative feedback. Mechanism which involves the analysis of solutions of a hierarchy of multiple models. In the lowest member of the model hierarchy showed variability in a multidecadal oscillatory mode, which is able to destabilize the mean thermohaline circulation

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