

Field:

Earth Science/Environment

Session Topic:

Solar Activity and Climate

Speaker:

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Title:

The climate oscillations: analysis, implications and their astronomical origin.

Abstract:

During the last century the global surface temperature has warmed by about 0.8 °C. General Circulation Model (GCM) simulations have been used to interpret the observed global warming and have concluded that most of it, more than 90% according to the *Intergovernmental Panel on Climate Change* (IPCC), has been induced by anthropogenic greenhouse gas emissions such as CO₂, as a consequence of the industrial development of the world. This is known as the Anthropogenic Global Warming (AGW) theory. The same GCMs produce alarming estimate projections for the 21st century and these theoretical results are currently used for suggesting global climate change mitigation policies. However, numerous recent studies are challenging the validity of the AGW and the accuracy of the current GCMs by suggesting that natural climate changes may have been seriously underestimated. Herein, we will review some of these new results by showing evidence that climate is regulated by multiple chaotic quasi-periodic natural cycles at all time scales. We will focus on decadal, secular and millennial time scales.

We will show that several global surface temperature records since 1850 and astronomical records deduced from the orbits of the planets present very similar power spectra. Eleven frequencies with period between 5 and 100 years closely correspond in the terrestrial and astronomical records. Among them, large climate oscillations with peak-to-trough amplitude of about 0.1 K and 0.2 K, and periods of about 20 and 60 years, respectively, are synchronized to the orbital periods of Jupiter and Saturn. Schwabe and Hale solar cycles are also visible in the temperature records. At least a 9.1-year cycle is synchronized to the Moon's orbital cycles. On multi-secular and millenarian time scales other astronomical cycles appear to be synchronized with known solar activity and the most recent paleoclimate temperature reconstructions. A phenomenological model based on these astronomical cycles can be used to well reconstruct the temperature oscillations since 1850 and to make partial forecasts for the 21st century. It is found that about 60% of the global warming observed since 1970 has been induced by the combined effect of the 20 and 60-year natural climate oscillations and about 50% of the trending of the secular warming since 1850 has been induced by multi-secular and millennial natural cycles. A partial forecast for the 21st century is proposed. It suggests that climate may stabilize or

cool in the following decades. The empirical solar/planetary model is shown to outperform typical IPCC GCMs in reconstructing climate oscillations and suggests that these models are missing fundamental mechanisms that have their physical origin and their ultimate justification in astronomical phenomena, and in interplanetary and solar-planetary interaction physics.

N. Scafetta, “Empirical evidence for a celestial origin of the climate oscillations and its implications”. *Journal of Atmospheric and Solar-Terrestrial Physics* (2010), doi:10.1016/j.jastp.2010.04.015 [PDF](#)

N. Scafetta, “Climate Change and Its Causes, A Discussion About Some Key Issues”, Nicola Scafetta, SPPI original paper, March 4 (2010). [PDF](#)

N. Scafetta, “Empirical analysis of the solar contribution to global mean air surface temperature change,” *Journal of Atmospheric and Solar-Terrestrial Physics* 71, 1916–1923 (2009), doi:10.1016/j.jastp.2009.07.007. [PDF](#)