2009 年臺灣國際科學展覽會

優勝作品專輯

國家：Canada

編號：150010

作品名稱

Orbital Forcing: An Astrophysical Solution to the Puzzle of Climate Change

得獎獎項

Earth Sciences　　First Award

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An Astrophysical Solution to the Puzzle of Climate Change

Abstract

Objectives:

- To study and analyze the effects of orbital forcing on the Earth's climate, through the analysis of four astrophysical parameters.
- To study the solar cycle of sunspots and their relevance to climate change throughout history.
- To propose an astrophysical explanation for the causes of ice ages and global warming.

Procedure:

- Information from a variety of sources was gathered and correlated through systematic analysis to reveal significantly new information and an original solution to a problem.

Results:

Equations being applied: (Sun Elevation=90°- Latitude + Obliquity) & (Sun Overhead=W/m2).

Note: Trans-global degrees of latitude were tested; this table shows: Ottawa, Ont. Results.

Declination°	Sun Elevation°	Solar Insolation	Sun Overhead (Watts/m^2)	Severity of Seasons Compared to Current Declination	
23.5	68.1	1.08	1271		Summer Solstice
-23.5	21.1	2.78	493		Winter Solstice
22.1	66.7	1.09	1258	-1.0%	
-22.1	22.5	2.61	524	6.3%	
24.5	69.1	1.07	1280	0.7%	
-24.5	20.1	2.91	471	-4.5%	
23.5	72.4	1.05	1306	2.7%	
-23.5	16.8	3.46	396	-19.7%	
22.1	71.0	1.06	1295	1.9%	
-22.1	18.2	3.20	428	-13.2%	
24.5	73.4	1.04	1313	3.3%	
-24.5	15.8	3.67	373	-24.3%	
Ottawa Latitude°		Solar Constant (W/m^2)		Orbital Inclination°	
45.4		1370		4.286870223	

Discussion, Conclusion, & Application:

As stated in our introduction, we believe that the process of orbital forcing may be responsible for climate change on a long-term basis. While analyzing each parameter of the Earth's orbit, we discovered the Stage 11 Problem, where eccentricity fails to match climatic data on a cyclic basis. Through additional research, we showed that the average amount of sunlight received over the course of a year remains the same. As a result, we can rule out the orbital cycle of eccentricity as a major contributor to ice ages. We also analyzed the astrophysical cycle of precession. We concluded that the wobble of the Earth's axis cannot independently affect the climate of Earth, as it mainly contributes to

the time of year that seasons occur. Additionally, we tested the effects of obliquity on the Earth's climate (Table 1 top), and discovered that it had a significant effect on long-term climatic change. However, we remained skeptical as to whether or not alone, obliquity could force ice ages. This led us to the analysis of orbital inclination, a previously ignored parameter of the Earth's orbit. After extensively researching scientific articles,we discovered that orbital inclination solved the Stage 11 (O18) Problem of eccentricity. As a result of this discovery, we chose to analyze the combined effect of obliquity and orbital inclination on the climate of Earth (Table 1 bottom). After testing this scenario, we concluded that the long-term effects of orbital inclination and obliquity could be realistically responsible for the patterns of ice ages. To our knowledge, and as a result of further research, we believe that this theory has not been tested in a practical manner.

From our accumulated data, we have proposed a reasonable explanation for short-term climatic changes associated with global warming. In addition, we have formed a plausible, astrophysical theory which links variations in the Earth's orbit to long-term climatic change. The conclusion of this project makes a direct application to one of the most discussed topics in the current world of science; climate change. Based on our research, we are strongly recommending that the orbital parameters of obliquity and inclination be scientifically tested as a possible cause of long-term climatic change, particularly ice ages.

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評語

The present project studied and analyzed the effects of orbital forcing on the Earth's climate through the analysis of four astrophysical parameters. The authors also studied the solar cycle of sunspots and their relevance to climate change and they also proposed an astrophysical explanation for the causes of ice ages and global warming. The authors have broad knowledge on the topics related to the astrophysical solution to the puzzle of climate change. The oral presentations are clear and penetrating. The references cited are adequate and up to date.