Journal of Modern Trends in Physics Research
Online ISSN 2636-4220
DOI: 10.19138/mtpr/(15)1-9
Accepted: 2015-06-01

On the correlation between Earth's orbital perturbations and oscillations of sea level and concentration of greenhouse gases

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Abstract- During the studied period 1996-2007 I noticed that, the rising and oscillations of the sea level, global temperature, carbon dioxide concentration, ice mass of Antarctica, and melting of Greenland ice are highly correlated with Earth's orbital perturbations. Monthly variations of those parameters have two periodicities. Stronger one called "*long-periodic cycle*", it is strongly related to solar activity. It appears as a rising trend during my studied period. Observation data of iceberg mass and its melting, global sea level, and concentration of greenhouse gases such as carbon dioxide is recent and does not cover a millennium or Wolf-Gleissberg solar cycle. So, it does not indicate a global warming. Second cycle is called "*short-periodic cycle*". it is a weaker force but still stronger than human activities forcing. It appears as oscillations around the rising trend. The short periodic cycle of all mentioned parameters is found correlated to Earth's orbital perturbations which are indicating a global warming and global warming is a natural phenomenon. Global warming is strongly corelated to Sun, Earth's orbit, and our space.

I conclude that the productivity of natural greenhouse gases is greater than that produced by human activity. The current proposed global warming is not a result of human activities, rather just temporary epoch and natural phenomena. The Earth's orbital perturbations are in an excellent positive coherence with the Greenland ice mass but in a negative coherence with the Antarctic ice mass. My results are in good agreement with [Yousef (2000) and Akasofu (2010)].

I propose that the natural source of rising in concentration of greenhouse gases can be attributed to two causes: 1) *Comets and asteroids*, which are still carrying water molecules and some of greenhouse gas' molecules to the Earth's atmosphere; 2) *Solar wind*, which is composed greenhouse gases in ionization state. It may react and recombined though upper atmosphere before arriving to atmospheric lower levels at poles by unknown process.

The global temperature is found to be correlated to Earth's orbital perturbation too. This is because the declination angle is varying through the year. Output solar energy that arrives to the Earth depends on Sun-Earth distance too.

Keywords- Sun; Solar Cycle; Global warming; Ice Age; Orbital perturbation; Sea Level; Global Temperature, Greenhouse gas; Carbon Dioxide; CO2; Ice mass; Greenland; Antarctica; iceberg melting.

1. INTRODUCTION

A greenhouse gas in Earth's atmosphere is a gas that absorbs the solar radiation and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect [IPCC (2008)]. The primary greenhouse gases are carbon dioxide, water vapor, methane, nitrous oxide, and ozone. Several researchers are studying the variations of sea level changes, glacier retreat, freezing/break-up dates of rivers, sea ice retreat, tree-ring observations, ice cores and changes of the cosmic-ray intensity.

Previous studies are assumed that the main source of sea level rising is the melting of polar ice caps and glaciers. They depend on the assumption that the Earth is isolated and the total Earth's mass is assumed to be constant. Rising of sea level at the same time of rising of global temperature is causing "global warming" [IPCC (2001)]. The reason of global warming assumed to be the human activities since the beginning of the Industrial Revolution (around 1750). The matter has been blamed for producing 40% increase in the atmospheric concentration of carbon dioxide (CO_2), from 280 ppm in 1750 to 406 ppm in early 2017.

Aerosols play an important role in the radiative balance of the atmosphere. While sulphate aerosols are recognized as the dominant contributor of tropospheric aerosols over and near industrialized regions, smoke aerosols containing soot or elemental carbon are regarded with increasing importance on a global basis. The fate of carbonaceous aerosols is at present poorly understood as a result of various atmospheric processes. The relative contributions of aerosol sources are still poorly known, representing a serious limitation in our ability to evaluate their role in global climate change. For smoke aerosols containing elemental carbon, their fractal properties are significant. They result in not only an increased lifetime, but also different radiative properties [Colbeck (1996)].

This increase has occurred despite the uptake of more than half of the emissions by various natural "sinks" involved in the carbon cycle. The vast majority of anthropogenic carbon dioxide emissions come from combustion of fossil fuels, principally coal, oil, and natural gas, with additional contributions coming from deforestation, changes in land use, soil erosion and agriculture [IPCC (2014a, 2014b)]. The amount of carbon dioxide being released into the atmosphere was increasing. Moreover, Carbon dioxide concentrations would continue to increase as the world's consumption of fossil fuels, particularly coal, increased ever more rapidly [NASA Facts, 1998)]. The Framework Convention on Climate Change (1992) and the Kyoto Protocol (1997) represent steps taken by the international community to protect the Earth's climate from dangerous man-made interference.

On the other hand, some scientists assumed Earth is varying naturally. The multi-decadal oscillation of a period of 50 to 60 years was superposed on the linear change; it peaked in 1940 and 2000, causing the halting of warming temporarily after 2000. The Earth is still in the process of recovery from the Little Ice Age (LIA) [Akasofu (2010)]. These changes are natural changes [Yousef (2000); Akasofu (2010)]. Yousef (2004 ; 2011a ; 2011b) concluded that the Earth is going to a cooling epoch. They depend on the solar-terrestrial connection. Climate change is related to solar activity cycles [Yousef (2000)]. Colbeck (1996) is not assumed that the rising in elemental Carbon indicated to global warming. He reported that the fate of carbonaceous aerosols is at present poorly understood as a result of various atmospheric processes and the relative contributions of aerosol sources are still poorly known, representing a serious limitation in our ability to evaluate their role in global climate change. The Little Ice Age (LIA) is known as one of the coldest stages of the Holocene. Most records from the Northern Hemisphere show evidence of significantly colder conditions during the LIA, which in some cases had substantial socio-economic consequences.

Climate change is a change in the statistical distribution of weather patterns when that change lasts for decades to millions of years. Changing in average weather conditions, or in the time variation of weather within the context of longer-term average conditions is called "climate change". It is defined by the World Meteorological Organization as a 30 years or longer term. Factors of Climate Change may involve increased emission from greenhouse gases, Natural sources and volcanic eruptions that can shape climate are called climate forcing or "forcing mechanisms" [Smith (2013)], and they can be either "internal" or "external". Internal forcing mechanisms are natural processes within the climate system itself. External forcing mechanisms can be anthropogenic (i.e. caused by humans).

The only continuous solar observations that extend over the important climatic time scale of decades to centuries are those of sunspots, yielding a measure of magnetic activity. There are evidences for the modulation of the amplitude of the 11-year solar cycle in a period of about 80 years known as Wolf-Gleissberg cycle. The Cycle seems to be fairly clear in the sunspot record and in its proxy measurements by cosmogenic isotopes. The cycle appears to show up in many meteorological parameters, suggesting that there may be an important sun/climate connection over long periods of time [Hoyt and Schatten (1997)].

Slight variations in Earth's motion lead to changes in the seasonal distribution of sunlight reaching the Earth's surface and how it is distributed across the globe. There is very little change in the area-averaged annually averaged sunshine; but there can be strong changes in the geographical and seasonal distribution. The three types of Kinematic change are variations in Earth's eccentricity, changes in the tilt angle of Earth's axis of rotation, and precession of Earth's axis. Combined together, these produce Milankovitch cycles which affect climate and are notable for their correlation with glacial and interglacial periods, their correlation with the advance and retreat of the Sahara, and for their appearance in the stratigraphic record [Gale (1989)].

The Earth is not isolated from space. It reacts with space through its flying around the Sun. The Sun-Earth distance is varying through a year. The Earth's orbit around the Sun is assumed ellipse. Earth's weather or seasons depends mainly on the Earth-Sun distance. Earth's weather depends on income energy ejected from the Sun. It is varying according to solar cycles.

The Sun-Earth distance is not ellipse exactly. It is perturbing around ellipse orbit because n-body forces. The main forces become from Sun and Moon which is causing tides. Tides is a rising in sea level, but it happens locally. While, global sea level and Earth' global mass are still constant theoretically. Mass of greenhouse gases are rising and varying now. But globally, Earth's mass is assumed constant according to assumption of global warming. It means that the rising of greenhouse gas's mass leads to decreasing in another Earth's component. Such as rising in global sea level is

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correlates with melting of icebergs.

According to Newton's law of gravitation (distance is related to mass), the perturbation on the Earth's orbit is also caused by variation of Earth's mass too. By the assumption that the Earth is not isolated from space (i.e. Earth's mass is varying by inflow and outflow mass), the variation in the mass of greenhouse gases, sea level and ice mass is natural and cyclic related to the Sun, if they are produced or correlated to Earth's orbital perturbation.

The aim of the present research is to study the correlation between global temperature, Carbon dioxide, sea level and ice mass in the context of the Earth's orbital perturbation.

2. ALGORITHM

2.1. *Determining the short periodic cycles*

The charts of the global temperature, Carbon Dioxide, sea level, ice mass of the Antarctica and Greenland gives rising trend, with approximately linear fit. It shows that those variation have two oscillations as follows:

Long periodic cycles: Those are showed as a rising trend and leads to a linear fit through short period through my studied period (1995-2006). It indicates stronger force (i.e. main force).

Short periodic cycles: Those are specified by increasing and decreasing around long periodic cycles (i.e. oscillations around linear fit). It indicates weaker force (i.e. partial force).

Those periodic cycles are easily shown as in figure 1. My goal is to deduce the long periodic cycle from greenhouse gases' variation to show the short periodic cycles only. It is estimated by the following formula:

$$P = P_0 - (a - b * T) \qquad (1)$$

Where, T is the year (time) with its fraction. P is obtained parameter in the short periodic cycle deducted from long periodic cycles such as carbon dioxide (CO_2), sea level (L), ice mass (M). P_0 is obtained value from data source (include short and long periodic cycle). a and b are the parameters of linear regression between the two variables P and T. a is the "*noise*" around linear fit between the dependent variable. b is the inner product.

I have determined the both values during the selected period of study for all parameters as shown in table 1. In the global temperature, I used the anomaly value of the annual mean.

Table 1: list of *a* and *b* values.

Greenhouse element	*a*	*b*
Carbon Dioxide	-3443.2	1.9061
Ice mass of Greenland	4.1261×10^5	-206.07
Ice mass of Antarctica	83089	-41.536
Global Temperature	-39.059	0.019774

2.2. *Estimating the Earth's orbital perturbation*

The Sun-Earth distance is obtained from the Geocentric ephemeris data by the Astronomical Ephemeris Data from NASA data center. It includes Earth orbital perturbation. Naturally without n-body effect, The Earth travels around the Sun in an ellipse. The distance in order to elliptical orbit can be determined by the following formula:

$$R = r - e \times \cos((360/365.256363) \times (D-4)) \qquad (2)$$

Where, R is the Sun-Earth distance, r is the mean distance between Earth and Sun, it is equal to about one astronomical unit. e is the eccentricity of the Earth's orbit around the Sun, it equals 0.01672. This is of course the cosine function, but with argument in degrees rather than radians. D is the day number of the year. Since this is an approximate expression, whether I start with the first of January being zero or one is irrelevant. The Earth currently reaches perihelion between the fourth and sixth of January, depending on the year [Meeus (1998)].

$$\Delta R = R_0 - R \qquad (3)$$

Where R_0 is the obtained distance from Geocentric ephemeris.

3. DATASET:

I used the Geocentric ephemeris data from the Astronomical Ephemeris Data from NASA data center with 2 days resolution (http://eclipse.gsfc.nasa.gov/TYPE/ephemeris.html) in order to obtain Sun-Earth distance. I selected the

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available period 1995–2006.

Global temperature is obtained from NASA/GISS (NASA's Goddard Institute for Space Studies (GISS) (https://data.giss.nasa.gov/gistemp/graphs/graph_data/GISTEMP_Seasonal_Cycle_since_1880/graph.txt).

Ice mass measurement (of Antarctica and Greenland) is obtained by NASA's GRACE satellites. Carbon Dioxide data is obtained from Atmospheric Infrared Sounder (AIRS) (https://airs.jpl.nasa.gov/) and Orbiting Carbon Observatory (OCO-2) (http://oco.jpl.nasa.gov/). Arctic Sea Ice obtained from NSIDC/NASA.

4. RESULT AND DISCUSSION

Figure 1 shows the long and short periodic cycles. Long periodic cycle is shown as a line. Its linear equation parameter is determined by linear regression fitting. It is listed in table 1. Figure 1 shows short periodic cycles too. It is shown as oscillations around the fitted line. Other parameters of my study have the same behavior, and their parameters are listed in the table 1.

Figure 2 shows the relation between Earth's orbital perturbations and the corresponding short periodic cycles of concentration of mid-tropospheric carbon dioxide. It shows strong anti-correlation. The time series of short periodic cycles of both variables are reversed approximately for each cycle, except during the period 1997-2000.

During 1997-2000, it is shown that the variation of both concentration of carbon dioxide and Earth's orbital perturbation were positive and have similar behavior. Of particular interest is the 1999 positive correlation that reversed to negative in 2000.

Sunspot number variations and solar irradiance at the start of the weak solar cycle number 23 suddenly increased after 1997.7. This sudden jumps in sunspot and solar irradiance are contemporary with start of rise of Lake Victoria [Yousef (2011b)]. There was also a sudden rise in The Mediterranean Sea level that can be attributed to negative NAO due to weak cycle 23 that brought rain to the Mediterranean Sea, which results in solar induced climate change. She is concluded it was because of the sudden increase in solar radiation and sunspots, which was between two solar cycles, one strong and the other weak (such as the period 1997.7-2000) which resulted in solar induced climate change.

Figure 3 shows the relation between Earth's orbital perturbations and the corresponding sea level oscillations. It can be found as strong correlation. The behavior of both curves is moving positive coherence in one short cycle, and negative coherence in next cycle, and so on.

Figures 4 and 5 show the time series of ice mass of Greenland and Antarctica respectively. Greenhouse ice mass is oscillating negative coherence with Earth's orbital perturbation, while Antarctica ice mass has positive coherence for the period 2002-2007. Both of the linear fitting parameters are listed in the table 1.

Global temperature is correlated to Earth's orbital perturbation too as shown in figure 6. The both time series have positive coherence. The curve of global temperature is moving with peaks of Earth's orbital perturbation. I also suggested that, the sudden rise in solar irradiance induced perturbation in Earth's orbital.

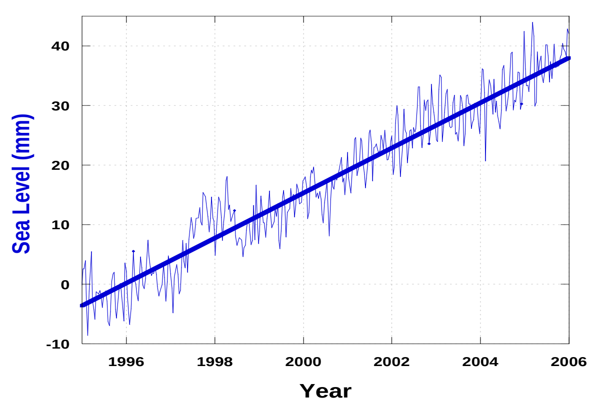

Fig. 1. Time series of Sea level variations. All global warming elements have a variation behavior such as sea level variation.

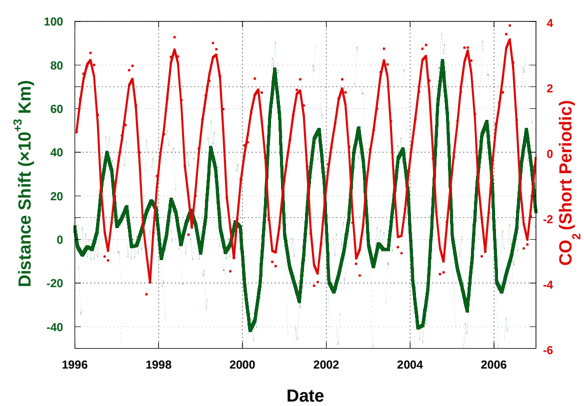

Fig. 2. Coherence between orbital perturbation and the concentration of mid-tropospheric carbon dioxide in parts per million.

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The Earth is moving around the sun in an elliptical orbit with the sun being located at one of the ellipse foci. The Sun-Earth distance depends on the Sun and the Earth masses according to Newton's law of gravitation

$$r^2 = \frac{G}{F} m_{\odot} m_E \qquad (4)$$

where r is the sun-earth distance, G is the gravitational constant, F is the gravitational force of attraction, m_E is Earth's mass and $m_{\odot}$ is solar mass. Assuming a constant solar mass, I can say,

$$r^2 \propto m_E, \qquad (5)$$

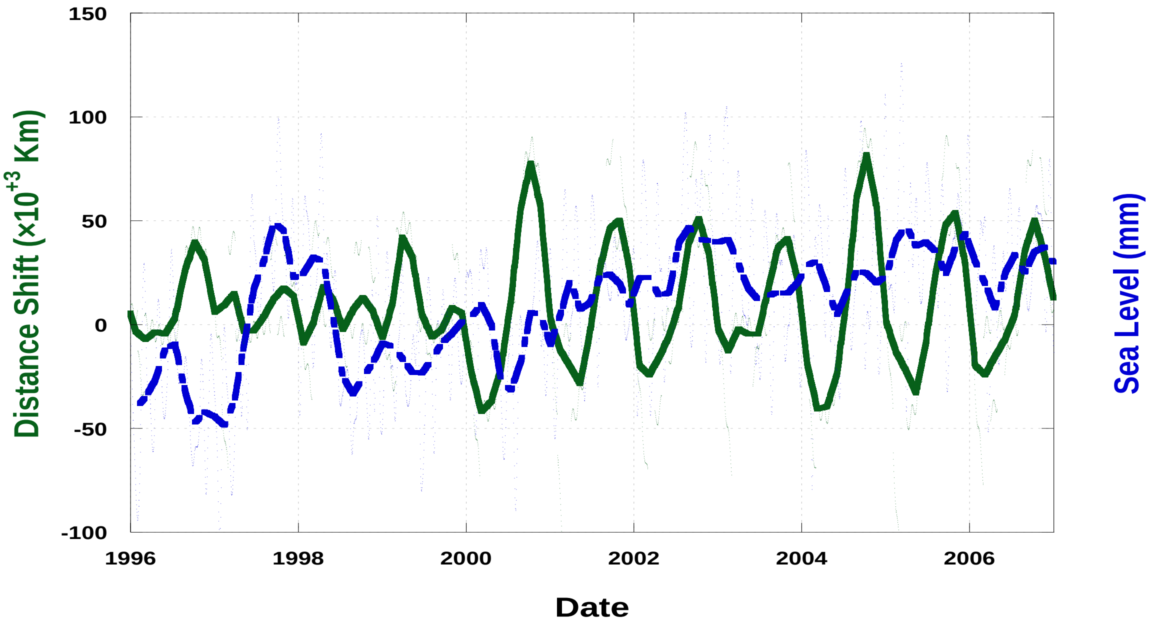

Fig. 3: The variation of Earth's orbital perturbation and short-periodic cycle of sea level.

This means that the square of the Sun-Earth distance is related to Earth's mass variability, i.e. The Earth's mass variation causes orbital perturbation according to Newton's law. The Earth's mass enclosed within the top of the atmosphere (magnetosphere) is equal to the summation of Earth's components (land, water and atmosphere). Consequently, the change of the mass of any portion of the Earth leads to a change in the total Earth's mass. The Earth' mass correlation with orbital perturbation points to mass variability according to Newton's law.

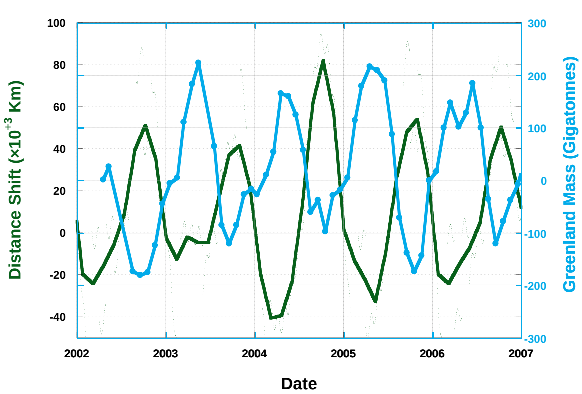

Fig. 4: The Coherence between Earth's orbital perturbation and short-periodic cycle of ice mass of Greenland (Distance ×10^3).

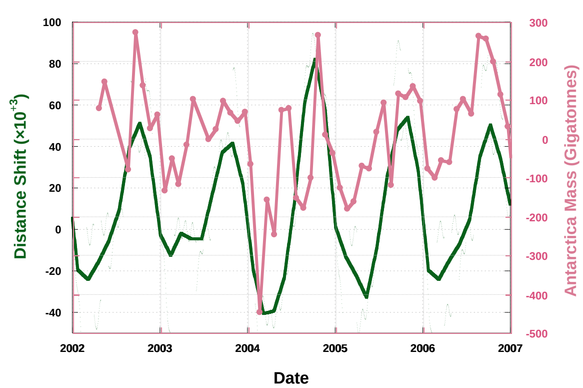

Fig. 5: The Coherence between Earth's orbital perturbation and short-periodic cycle of ice mass of Antarctica.

Tide leads to motion of the Earth's central mass of gravity, but total Earth's mass is still constant. While, global sea

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level, iceberg mass, and carbon dioxide concentration oscillations which are correlated to Earth's orbital perturbation indicates variation in total Earth's mass.

The mass of Earth's water is variable because sea level oscillation is correlated to Earth's orbital perturbation according to Newton's law. The Earth's mass (including ocean mass) exchange its mass with outside matter. Thus, I suggest a space sources like small comets which are observed to bringing water to Earth's upper atmosphere.

The Air including water vapor in the atmosphere may escape from atmosphere to space *outflow* and the solar wind precipitation enter onto the upper atmosphere's *inflow*. Both cases have been detected in many solar system planets and compatible previous researches. Stenberg et. al. (2014) used the Ion Mass Analyser (IMA) to investigate both the atmospheric escape *outflow* from planets (Mars and Venus) and the solar wind precipitation onto the upper atmosphere's *inflow*. They found; On Venus they move mainly anti-sunward and on Mars towards the tail center. Studying the inflow. I conclude that on Mars I regularly observe precipitating solar wind ions (H (+) and He (2+)) inside the IMB, while on Venus no precipitating alpha-particles have been detected and only a few cases of solar wind proton precipitation.

The Earth's atmospheric mass changes due to the leak of some of the solar wind and coronal mass ejections into the magnetosphere. The Aurora is the signature of arrival of coronal mass ejections into the Earth's upper atmosphere. Unfortunately, there are no accurate measurements or estimations for atmospheric mass, and it is so difficult to trace the change in the mass or motion of the atmosphere.

The composition of the solar wind is a mixture of materials found in the solar plasma, composed of ionized hydrogen (electrons and protons) with an 8% component of helium (alpha particles) and trace amounts of heavy ions and atomic nuclei: C, N, O, Ne, Mg, Si, S, and Fe ripped apart by heating of the Sun's outer atmosphere, that is, the corona (Feldman et al., 1998). Solar wind composed water vaper and carbon dioxide (Electron, Proton, Carbon, and Oxygen) but in ionization state. Other Earlier studies indicate oscillation in the altitude of magnetopause attributed to changes in the solar wind pressure. This is an indication of inflow process in the Earth's atmosphere [Mawad *et al.* (2011); Mawad (2014)]. The annual Earth's precipitation is closely related to the variation of sunspot numbers, and that solar activity probably plays an important role in influencing the precipitation on land [Zhao (2004)].

Small comets and asteroids are still carrying water to the earth upper atmosphere, sun and all solar system planets [Javoy (2010)]. Very hot water detected in the solar sunspots' regions [Tennyson and Polyansky (1998)]. The Sun ejects plasma to space "solar wind" which have water composition and may have water composition ionized hydrogen (electrons and protons) and Oxygen [Teodoro *at al.* (2009)]. The cometary nuclei are composed of an amalgamation of rock, dust, water ice, and carbon dioxide molecules, methane, and ammonia [Meech (1997); Greenberg (1998); Baldwin (2010)].

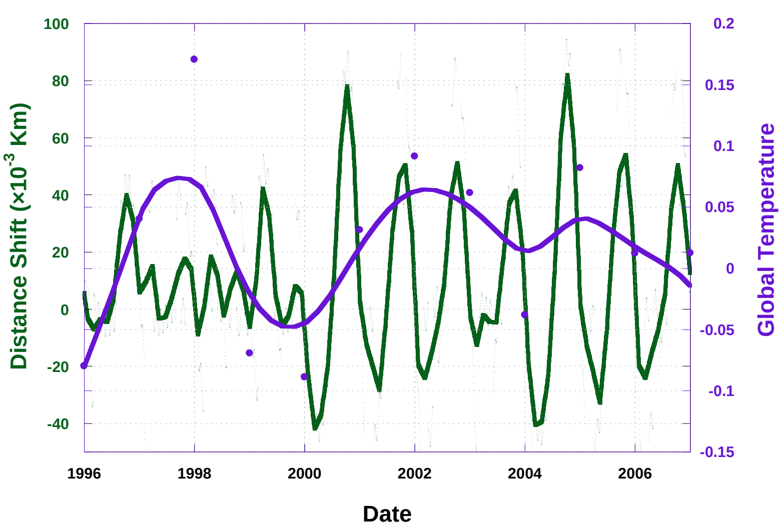

Fig. 6: The Coherence between Earth's orbital perturbation and short-periodic cycle of global temperature.

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Online ISSN 2636-4220
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Comets which are arriving to the Earth daily is carrying water and carbon dioxide molecules with other greenhouse gases.

CO_2 is continually released into Earth's atmosphere through volcanic eruptions, forest fires particularly in California and Indonesia, etc.

Both of El Nino and Volcanic Eruptions are subjected to solar forcing. CO_2 is depleted from the atmosphere through several processes, Algae gets Oxygen from the atmosphere and release in the oceans, with the effect of reducing CO_2 from the troposphere. This process has two important implications namely the reduction of Earth's troposphere temperature and the increase of the temperature of the stratosphere leading to the closure of the Ozone Hole. CO_2 is also depleted from the troposphere through the formation of calcium carbonates, formation of shells through photosynthesis ice Masses in the two poles.

5. Conclusion

I studied the variation in concentration of atmospheric greenhouse gases, iceberg mass, and sea level with the Earth's orbital perturbation. It is found that the short periodic cycles of all those parameters are strongly correlated with Earth's orbital perturbation. It means that, the concentration of carbon dioxide and sea level are varying naturally in periodic cycles. This means that the assumption of isolated Earth (i.e. "global warming") is wrong; Earth's atmosphere is interacting with the space. The main source in the space affecting the Earth is the Sun. the atmospheric mass is varying according to Sun's distance from Earth and its output energy.

I found that, the short periodic cycle indicates correlation to the apparent Sun's orbit and its output energy. The long periodic cycle (i.e. rising trend) correlates long solar activity cycles such as a millennium solar cycle and a Wolf-Gleissberg cycles, but our current observation data of concentrations of greenhouse gases are not covering this epoch. Because it, we can not assume the rising of sea level, melting of icebergs, and rising in concentration of greenhouse gases are due to global warming. The covered observation periods are so short. According to my study, we can conclude that the rising in sea level, melting of iceberg, and concentration of greenhouse gases are naturally, because those are correlated with Earth's orbital perturbation. Assuming global warming caused by human activity only is not completely correct. The human activities cannot be stronger than the natural impacts. I concluded that the productivity of natural greenhouse gases is greater than that produced by human activity.

Global warming is temporarily epoch for the time being. I strongly suggest that the Earth is going towards a cooling epoch. This result is compatible with Yousef (2000) and Akasofu (2010).

Earth's Orbital perturbation is asymmetric around mean Sun-Earth distance. Outward perturbation is about four times the inward perturbation. This may be referred to the compression of its magnetosphere sunward and its extension of the magnetotail outward that it can reach the moon. The other point is that the solar mass is continually decreasing owing to Hydrogen burning and expel of coronal mass ejections from the sun, the solar gravitation must be continually decreasing due to this mass loss.

This is leading to the reduction of the grasp of the Sun on the planets and eventually the expansion of the solar system with continual increase in Sun-Earth distance. The interplanetary magnetic pressure, plasma pressure and the radiation pressure also contribute to the increment of outward perturbation over inward perturbation.

I found an impressive positive coherence between Greenland ice mass with Earth's orbital perturbations. On the other hand, a negative coherence of Antarctic ice mass with Earth's orbital perturbations is shown. This opposite coherence leads to stability of the Earth's motion. This result leads to changing in central gravity of the Earth. In addition, it is causing perturbation in Earth's orbit.

I suggested that the two sources of rising in concentration of greenhouse gases: 1) *Comets and asteroids*, which are carrying water molecules and some of greenhouse gas' molecules to the Earth's atmosphere; 2) *Solar wind and CME*, which are composed of ionized greenhouse gases. It may react and recombine though upper atmosphere before or through arriving to lower levels in the atmosphere at poles by unknown process.

The global temperature is correlated with Earth's orbital perturbation. Because, the declination angle is varying through the year, and the output solar energy that arrives to the Earth is depends on Sun-Earth distance too.

Variations of solar irradiance cause perturbations in Earth's orbital. Our Results confirm the solar induced climate change between 1997and 2000.

ACKNOWLEDGMENT

I thank Prof. Shahinaz Yousef that she supported my participation in MTPR-014 conference and her revision of this manuscript. I thank my parents specially my mother that they always supporting me from my childhood.

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