

REVISITING THE ANALOGUE FOR THE COMING ICE AGE

When paleoclimatologists gathered in 1972 to discuss how and when the present warm climate would end, termination of this warm climate we call the Holocene seemed imminent and it was expected that rapid cooling would lead to the coming Ice Age.

These ideas were based on the 1 million year record which shows how climate has regularly and predictably responded to the variations in energy or Insolation reaching Earth from the Sun as Earth orbit slowly changes under the influence of the complex gravity changes due to planetary movements in our solar system.. It was first proposed by Milutin Milankovitch (1941) that these cycles correlate with major transitions in climate between Interglacial and Ice Ages on a regular nominally 100 000 year (100KY) cycle.

It was recognized that the Northern Hemisphere was most sensitive to the onset of a climate transition and later in 1991 the following chart (Fig.1)was derived by mathematicians Quinn, Levine et al to show the complex variations in Insolation at Lat.65N due to orbital variations . This was compared with climate based on the stages of Glaciation derived from proxy by Lisieki and Raymo over a 1M year history as shown in FIG.1.

The predominant driver in the major long term climate transitions is the insolation factor due to Eccentricity which describes the elliptical shape of our orbit as Earth moves toward and away from the Sun in a 100KY cycle , and from an elliptical to an almost circular orbit in a 400,000 year (400KY) cycle.

The sum of all of the factors affecting insolation including Eccentricity, Precession and Obliquity is shown in yellow as Solar Forcing in FIG.1.

Stages of Glaciation derived from ocean floor sediment proxy samples by Lisiekie and Raymo are shown beneath on the same time scale and follow a remarkable correlation as predicted by Milankovitch and we can see from the projections below that the sudden transitions from the warmer Interglacial climate to Ice Age conditions shown in gold, occur whenever insolation due to Eccentricity approaches a minimum. The Glaciation data closely correlates with Ice core Temperature data as shown in FIG.3 and is accepted as a true indication of climate.

By simple projections we will examine these orbital data which have been in the public domain for over 16 years to test the orbital/climate analogue for an imminent transition to ice age conditions which was generally accepted in 1972.

The 1972 consensus which was based on the orbital/ climate analogue has been completely disregarded since the opposing case for an extended Holocene and the claim for continued global warming due to anthropogenic CO2 emissions which has been heavily promoted by the IPCC. The global warming proposal is based entirely on computer climate modeling and the unproven hypothesis that CO2 causes net warming. We will compare the two divergent global climate forecasts.

The penalty for a wrong assessment by the modelers cannot be overstated.

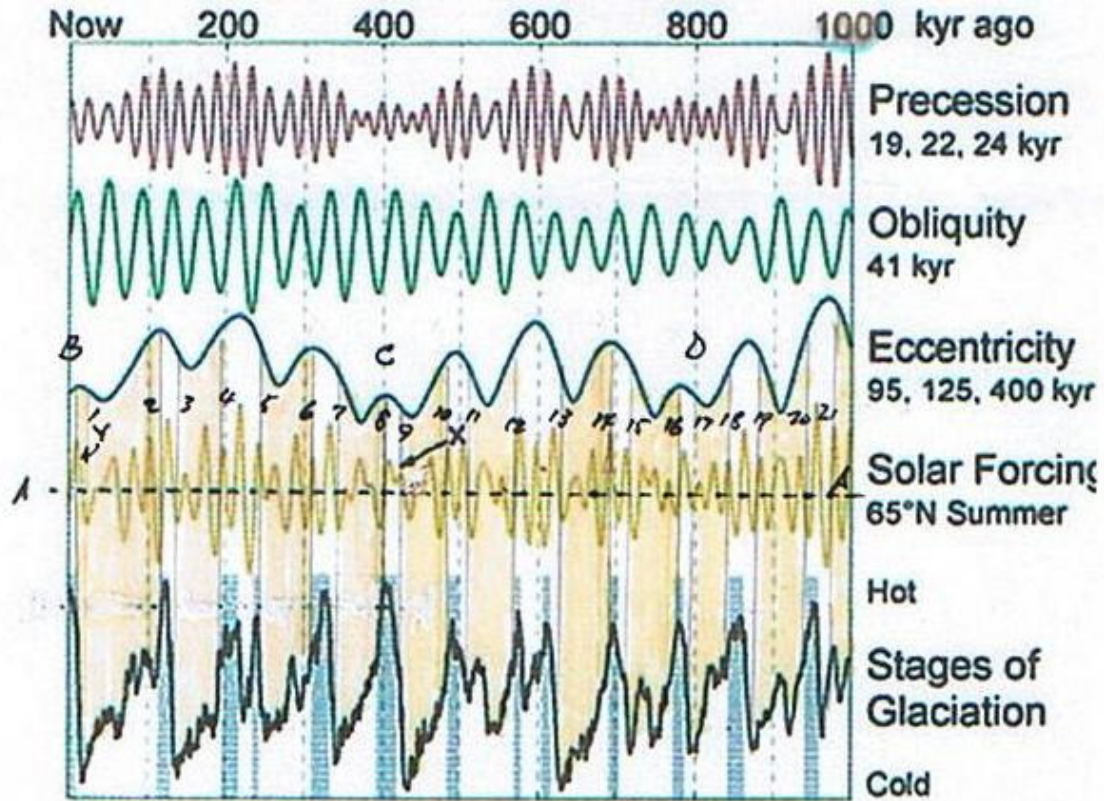


FIG.1 QUINN, LEVINE, RAYMO ET AL ORBITAL GEOMETRY VS CLIMATE

ECCENTRICITY CORRELATION WITH GLACIAL TRANSITIONS

The chart shows that every ice age (shaded gold) coincides with a half cycle of minimum Eccentricity. By inspection we can say with 100% certainty that based on the 1M year history there will be another transition to an Ice Age at the next Eccentricity half cycle minimum.

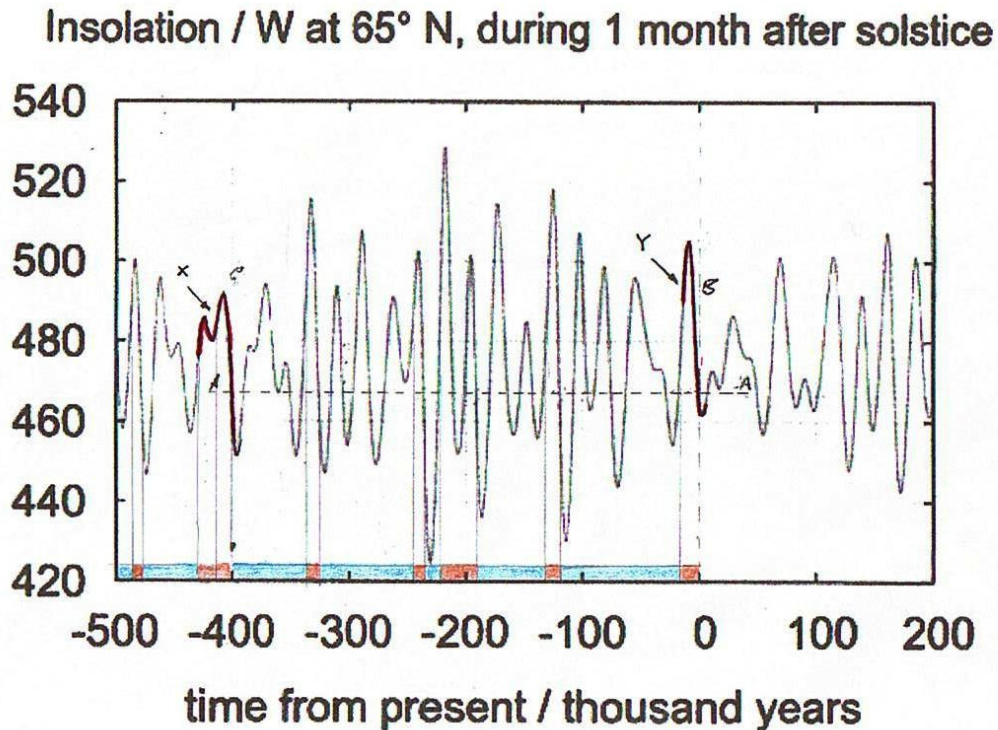
By inspection we are close to the half cycle Eccentricity minimum now and this confirms the opinions based on good science in 1972. Based on this test we should expect a transition to icy conditions soon.

SOLAR FORCING CORRELATION WITH GLACIAL TRANSITIONS

The Solar Forcing shown in Fig.1 represents the sum of Insolation from Eccentricity, Obliquity and Precession. We have seen that Eccentricity minimums correspond with each period of glaciation.

Close observation of the Solar Forcing data shows that each transition to ice has occurred when Solar Forcing was similar to the present level. (see intercepts AA)

SOLAR FORCING CORRELATION WITH ICE AGE TRIGGERS



**FIG.2 SOLAR FORCING PAST PRESENT AND AND FUTURE
ICE AND INTERGLACIALS ARE COLOUR CODED AT BASE**

The 400KY past interglacial has been identified as a precedent for present conditions because of muted Eccentricity (FIG.1) and muted total Insolation or Solar Forcing (FIG.2) . It is the composite 400KY cycle in Eccentricity which controls this recurring muted phase in Solar Forcing.

The IPCC report (6.4.1.5) states that the Solar Forcing cycle (marked C in Fig.2) was identified by Paillard (1998) as the solar Forcing maximum at 427KY before present (BP) which triggered the 400KY deglaciation and the following minimum in Solar Forcing (X) was not sufficiently low to start another glaciation .”The interglacial thus lasts an additional precessional cycle, yielding a total duration of 28KYr.”

This finding has been misconstrued by many to account for an extended Holocene. The decline then in peak Solar Forcing at “C” in FIG.2 can be regarded as the trigger for the 80KY ice age that followed in 400KY .

We have no such additional cycle in precession (refer “B” in FIG.3) and therefore no indication of an extended Holocene from this cause .The present solar Forcing cycle (B) which is in rapid decline can be regarded as the trigger for the coming ice age.

SOLAR FORCING AMPLITUDE 400KY BP VS NOW

The extended 400KY BP interglacial has also been attributed by Berger and Loutre to the low orbital Eccentricity , “which reduces the effect of climatic precession on insolation “ (Berger and Loutre 2003) (IPCC6.4.1.5)

The 400KY transition to ice was triggered by a decline of approx. 38w/m² in insolation from C in Fig.2.

We are near the limit of a 42w/m² decline in insolation from B in Fig.2

Present solar Forcing level is close to the level at which the 400KY transition occurred (see AA in Fig.1) and it follows from the analogue that a transition is due very soon. There is no reason to expect an extended Holocene due to limited amplitude of Eccentricity and Solar Forcing.

SOLAR FORCING TEMPLATE FOR GLACIAL TRANSITIONS

Referring to Fig. 1 it can be seen that each interglacial phase survives for only one peak in Solar Forcing. (An exception at 200KY BP is caused when obliquity and precession combine in phase in opposition to eccentricity to cause a temporary return to glaciation.)

There are 21 sudden climate changes identified in Fig.1 including 10 terminations from interglacial to ice age conditions. All 10 ice age transitions occurred at similar levels of Solar Forcing to the present level (see the vertical intercepts 2,4,6,8,10,12,14,16,18 and 20 with Solar Forcing, on AA above)

We are near the end of the single interglacial Solar Forcing peak (B, Fig.2).

Based on the orbital analogue we are near the end of the interglacial and close to the rapid transition to ice.

Anthropogenic Global Warming proponents will argue that warming due to CO₂ will prevent the transition.

EFFECT OF A WARMER EARTH

A simple inspection of the data shown in FIG.1 reveals that the transitions always occur when temperature is at a peak, which follows from the fact that Earth has received increased energy from the Sun for several thousands of years before the decline. It can clearly be seen from the chart below (Fig.3) that these sudden changes in climate have frequently occurred when temperature was up to 5 Deg C warmer than today.

All of the transitions have occurred from peak temperature when insolation was in rapid decline like conditions now.

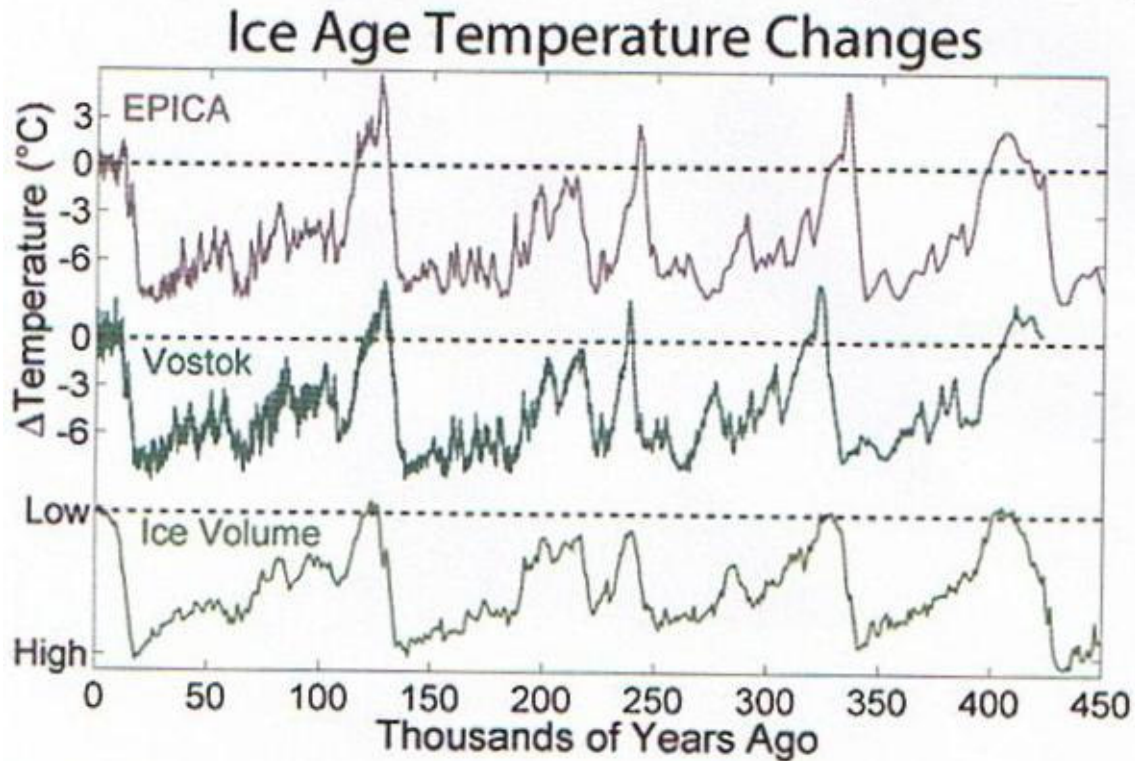


FIG.3 TEMPERATURE HISTORY FROM PROXY RECORDS COMPARE

Based on the 1M KY history there is no temperature projection of global warming due to CO₂ or any other cause that will prevent the coming transition. The archeological record shows that the transitions are independent of temperature over the range concerned.

By analysis of the orbital analogue there is no case for an extended Holocene but there is good reason to expect a transition to ice conditions very soon.

SUDDEN CLIMATE TRANSITION

The rate of temperature change to be expected in the coming transition can be judged by inspection of the past transitions from interglacial to glacial conditions in FIG 1 and FIG 3. The change in temperature is very steep. The geological record shows evidence of sudden changes in the order of decadal decline. The accumulation of ice then continues throughout the glacial phase over approximately 80 -100KY

RECENT TEMPERATURE TRENDS

The data reported in FIG.4 below shows a recent distinct downturn in global temperature while CO₂ continues to rise.

If this down turn continues it may presage the coming transition to ice which is predicted by the climate analogue.

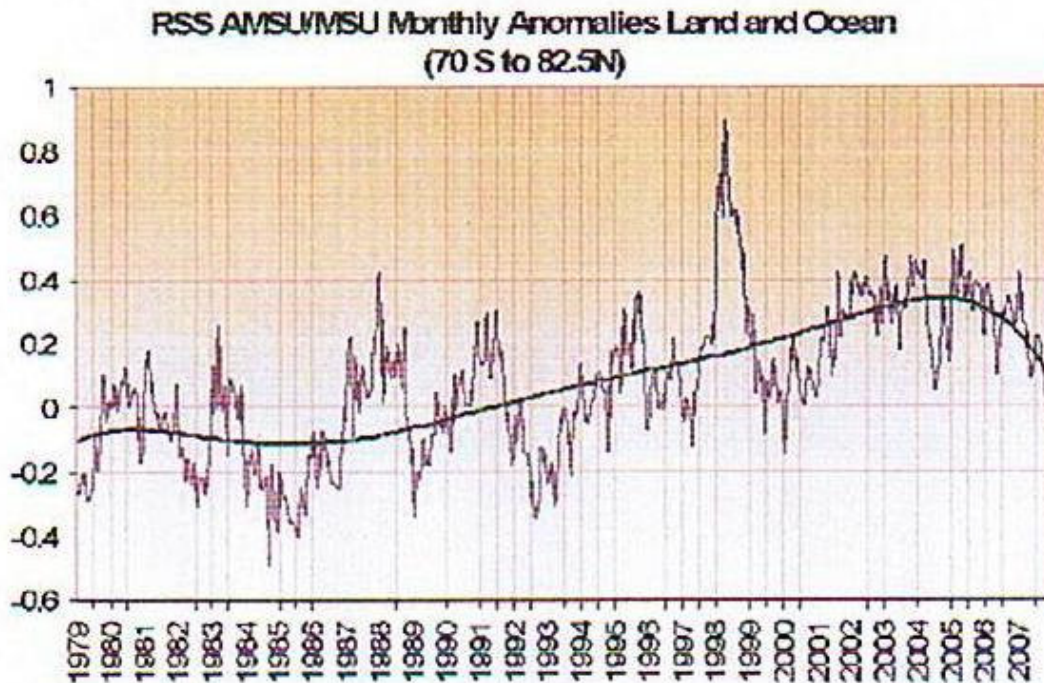


FIG.4 RECENT GLOBAL TEMPERATURE TREND

Analysis of this data is shown here:

<http://wattsupwiththat.wordpress.com/2008/02/27/a-look-at-temperature-anomalies-for-all-4-global-metrics/>

The data shows a recent significant down-turn in global temperature and because of waning solar activity forecast over the next 20 years the downward trend is likely to continue. The trend appears to disprove the CO2 warming hypothesis because declining temperature corresponds with an increase of 4% in CO2 concentration in the period since 1998.

The analysis shown on this attachment also exposes significant warming bias in the GISS data which has been used by the IPCC to claim global warming.

If continued, this type of cooling trend could presage rapid climate change in a transition to ice conditions under the present orbital parameters for climate.

However we are advised by the IPCC that there will be an extended warm climate affected by global warming due to CO2 emissions. *This advice is based entirely on the work of global climate modelers and the use of an unproven hypothesis for CO2 forcing of temperature which conflicts with the actual measurements shown in the data above.*

THE CO2 WARMING HYPOTHESIS

The hypothesis that increased levels of CO2 have already caused and will continue to cause rising global temperature is disproved by the actual temperature trend shown above. The concept of CO2 warming by radiative forcing is also disproved in this detailed rebuttal by Dr Willie Soon

<http://www.jpands.org/vol12no3/robinson600.pdf>

“There is no evidence for warming by CO2 radiative forcing”

The following analysis by Peter Dietze shows overstatement of CO2 radiative forcing by the IPCC <http://www.john-daly.com/forcing/forcing.htm>

As a result of continued promotion of the idea that CO2 is causing global warming and the forecast temperature trends claimed for CO2 forcing, all scientific endeavour has been diverted on the basis of grossly simplified modeled simulations.

The powerful orbital analogue which predicts imminent transition to ice has been completely overlooked.

THE MODELED CASE FOR AN EXTENDED INTERGLACIAL AND FORECAST WARMING

The case for an extended Holocene and continued warming for at least 50 000 years is summarized largely by the work of Loutre and Berger and with reference to the use of global climate models and it depends on the hypothesis for CO2 forcing of temperature. (IPCC 6.4, FAQ 6.1)

But we have seen in FIG 3 above that ice age transitions are independent of temperature over the range concerned and the CO2 warming hypothesis has been discredited in FIG 4 from actual temperature data.

Some of the references to modeled claims for an extended Holocene follow.

1. **“Future Climate Changes: Are we entering an exceptionally long Interglacial?”**

Loutre and Berger, 2000; Universite Catholique de Louvain The paper is shown here: <http://www.dvgu.ru/meteo/library/243887.pdf>

Loutre confirms that Quaternary climate changes are largely driven by the Earth orbital changes (which is the basis for the orbital/climate analogue) and it is proposed that the “best and closest analogue to our near future climate is for the climate some 400KY BP”

The paper examines future climate for the next 130,000 years (130KY AP) using the Louvain-la-Neuve 2 dimensional Northern Hemisphere climate model (LLN 2-D NH), with a range of CO2 forcing.

Based on the climate simulations it concludes that future climate will experience a long lasting Interglacial of the order of 50,000 years or more with a glacial maximum after 100KY After Present (AP).

It is important to consider the model limitations and the method in this simulation.

The prediction of future climate is entirely dependant on the performance of the model which has been validated by using best available parameters to examine the recent past climate. “For the last 200KY..... “ The best agreement with SPECMAP is obtained when a 210ppmv CO2 forcing is used. (Berger et al 1998) Experiments were performed to simulate climate response to 9 different concentrations of CO2 over the next 130KY .The future simulations were started using a simulated present climate based on the 200KY model experience.

The model is tuned to replicate the past 200KY but our climate analogue with diminished insolation is at 400KY. The model should be tuned to replicate the ice age transition at 400KY and must surely then demonstrate a transition in the present Holocene cycle.

The insolation data is shown in FIG. 2 above

It is fundamental to the findings of this paper that Insolation variations in the future 60KY “will barely reach 65W/M2” in the period examined “which is more limited than at the end of stage 5” (quoted as 110w/m2 but shown in FIG 2 as 80w/m2) , and it is observed that the immediate future from 0-50KY AP will witness a variation of only 30w/m2.

We are not concerned with the immediate future, we are concerned with NOW.

The paper has referred to 400KY as the analogue but the 200KY record is used with CO2 forcing as a basis to argue for an extended Holocene.

The 400KY precedent for conditions today made transition to the ice age very close to 400KY when insolation fell by 38w/m2 from 490 by to approx. 452w/m2.

This transition actually occurred at an insolation level very close to the level NOW (see intercepts AA in fig.1)

The present insolation has fallen by 46w/m2 from 508 now close to a minimum of approximately 462w/m2.

The recent Holocene peak insolation at approx 10KY has almost fully declined and is likely to trigger the coming ice age soon, approximately 120KY since the last transition.

There is no reason here to expect an extended Holocene due to limited insolation variance.

Model Limitations

Loutre and Berger correctly list the limitations in their model in which clouds and the hydrological cycle are simplified ie the hydrological cycle is not fully simulated and the heat transport to middle and deep ocean is simplified and CO2 is considered as an external forcing ie the carbon cycle is not simulated. In addition regional changes such as in the North Atlantic and over Europe are not simulated “and might depart from the global trend”

The findings from this simplified simulation have been adopted as evidence for an extended Holocene and continued global warming due to CO₂ is now widely accepted . The orbital analogue for climate which predicts an imminent sudden transition to ice is now completely ignored.

2. An Exceptionally long Interglacial Ahead? Berger and Loutre; Science , Aug. 2002 Vol. 5586 pp1287-1288

This paper appears to be a summary of the Loutre and Berger paper referred above. (Appendix item 1)

3. Confirmation of the 400KY extended interglacial from the EPICA ice cores

The IPCC has written that “evidence of an unusually long Stage 11 (400KY Interglacial) has recently been reinforced by new ice core and marine sediment data. The European Program for Ice Coring in Antarctica (EPICA) ice core record suggests that Antarctic temperature remained as warm as the Holocene for 28KY(EPICA members , 2004)” and this was confirmed by a new stack of deuterium proxy ice records from Lisiecki and Raymo also referred by the IPCC. This finding has been widely misconstrued to support the argument for an extension of the Holocene by up to 30KY.

There is no support for an extended Holocene due to the EPICA result which simply confirms that the 400KY interglacial collapsed at 400KY which is consistent with the decline in insolation at that time and now. (see FIG.5 below and Fig.1) The transition occurred when insolation was in rapid decline as it is now and declined to a level similar to now when the insolation fell by only 38w/m². Our insolation has almost completed the decline by 45w/m².

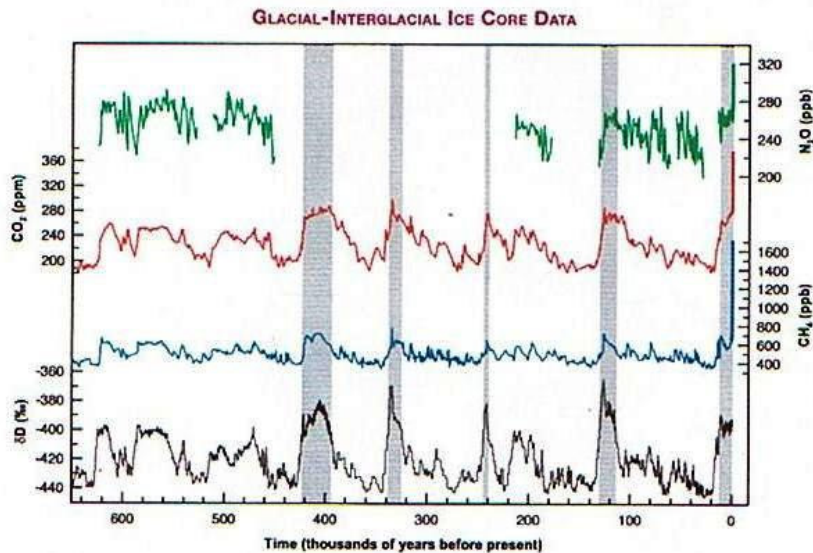


FIG. 5 EPICA Ice Core Data Confirms Extended 400KY interglacial which collapses at 400KY

CONCLUSION

There is a strong case for an imminent change to glacial conditions based on the orbital/climate analogue and historical data.

The case for anthropogenic global warming by CO2 emission is claimed by the use of global climate models that do not fully simulate all climate responses and it depends on a hypothesis for CO2 radiative forcing which is not supported by factual measurement of the recent temperature trend.

There is no evidence to support CO2 warming by radiative forcing.

Based on the orbital/climate analogue there is abundant evidence for a sudden change to glacial conditions.

The diversion of science to the modeling of climate forecasting has been at the expense of sensible evaluation of the simple analogue for sudden major climate transitions which has been forgotten for over 30 years. Climate forecasts from the modeling and the claims for future warming are unsafe.

We should accept the reality that the interglacial climate is an exception to the more extensive glacial phases. The orbital/climate analogue prediction of the coming ice age has been overlooked and should be revisited and validated without further delay. Further work is needed to reach an understanding of the mechanism of sudden climate transitions and to consider and plan for the contingency of sudden cooling.

Peter Harris

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