Phase problems with the astronomical theory

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The astronomical theory of the Ice Age is based on cyclical changes in the earth's orbital geometry. It is also known as the Milankovitch mechanism after the Serbian scientist who refined the theory. The theory is composed of an eccentricity cycle of about 400 ka (thousand years) and 100 ka, a tilt cycle of 41 ka, and a precessional cycle of about 21 ka. These cycles generally redistribute the solar radiation by latitude (tilt cycle) and by season (the precessional cycle) but barely change the total amount of radiation hitting the earth. When summers have less solar radiation at 65°N latitude, a glacial or stadial climate occurs and for summers with more solar radiation, an interglacial or interstadial climate results. Stadials are short cold intervals of a few tens of thousands of years (assuming the secular timescale) within warmer interglacials, while interstadials are short warmer intervals within glacial periods.

The Milankovitch mechanism was developed in the 1800s and was once rejected by meteorologists because the changes in solar radiation were too small. After Milankovitch improved the theory, it was rejected again. But it was revived in the 1970s by correlations with the fluctuations in oxygen isotope ratios in deep-sea cores.[1] Since many fluctuations occur in deep-sea cores over the past 2.6 million years of the Quaternary, according to the evolutionary/uniformitarian timescale, this translates into numerous glacial/interglacial oscillations caused by the Milankovitch mechanism. In fact the number of glaciations of various sizes is now estimated at over 50 during the Quaternary.[2]

Furthermore, researchers are increasingly using the Milankovitch mechanism to date pre-Quaternary sedimentary rocks in a dating field called 'cyclostratigraphy'.[3] There are many problems associated with the Milankovitch mechanism[4–9] that are essentially ignored by secular scientists.

The phase problem

One of the problems with the Milankovitch mechanism is that the solar radiation at 65°N determines the glacial/interglacial oscillations not only in the northern hemisphere but also for the southern hemisphere. The problem occurs because when solar radiation is below normal in the polar latitudes of the northern hemisphere, it is *above normal* in the polar latitudes of the southern hemisphere. The precessional cycle is out of phase between hemispheres and so when there is more solar radiation in the southern hemisphere, it is a glacial

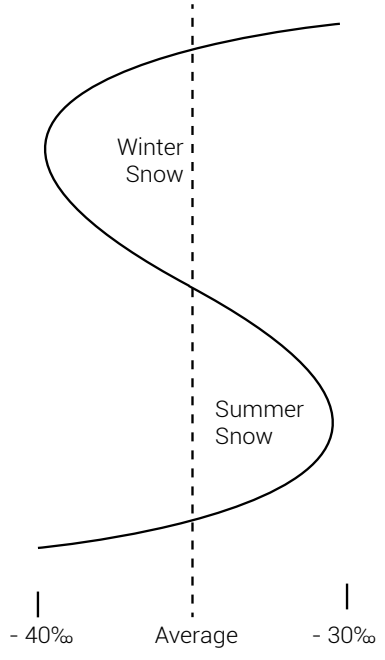

Figure 1. Schematic of the seasonal oxygen isotope ratio of snow that falls on the ice sheets.

or stadial phase, just the opposite of what one would expect. One would think that glaciation cycles in the hemispheres would be out of phase like the solar radiation cycles, but they are *in phase* with each other making the northern hemisphere cycle global:

> "Such a global rhythm of glaciation is surprising—at least if summer solar radiation controls glaciation (3)—because variations in Earth's orbit cause opposite changes in the intensity of northern and southern summer radiation."[10]

Others think the same phase of the two hemispheres is remarkable both with peak glaciation and deglaciation timing:

> "A multimillennial LLGM [Local Last Glacial Maximum] for the APIS [Antarctic Peninsula Ice Sheet] and some sectors of the EAIS [East Antarctic Ice Sheet] and WAIS [West Antarctic Ice Sheet], with onset at ~28 to 29 ka and termination at ~19 ka, is remarkably similar to that established for NH [northern hemisphere] ice sheets, suggesting synchronization of the hemispheric ice sheets through a common forcing. It has long been recognized that local summer insolation is out of phase between the two hemispheres and hence cannot explain the synchronization … ."[11]

The in-phase relationship between the two hemispheres raises the question of how the climate of the north is transferred to the south:

> "However, these findings [of an in-phase relationship] pose the question of how the Northern Hemisphere solar forcing is transferred to the Southern Hemisphere, and why Southern Hemisphere local insolation changes have no imprint on the Antarctic temperature record. Variations in greenhouse gas concentrations are too weak to explain the interhemispheric link; there exists no evidence that atmospheric dynamics can directly transfer the orbital signal to the Southern Hemisphere, and changes in the thermohaline [ocean] circulation are thought to favour an asymmetric pattern."[12]

I agree; it makes no sense. Neither does it make sense that local solar radiation would *typically* have an opposite temperature effect in the southern hemisphere—that more sunshine produces cooler temperatures and vice versa. Temperatures today are largely determined by the local solar radiation.[12] Nor is there any apparent mechanism for transferring the northern hemisphere orbital signal to the southern hemisphere.

Change in seasonal proportion of snow as a variable

Some secular scientists do not believe the northern hemisphere drives glaciation in the southern hemisphere. They have been looking for solutions to the phase problem for a long time, and many hypotheses have been suggested. A clear mechanism should exist but has not yet been identified.

A recent proposal is that changes in the seasonal proportion of snow synchronizes Antarctica with the northern hemisphere.[13,14] Since the matching in ice cores with the Milankovitch mechanism is performed by matching changes in oxygen or deuterium isotope ratios in ice, it is the snow that records the signal. Since there is a strong seasonal contrast with isotope ratios (figure 1), a change in the seasonal proportion of snow can significantly increase or decrease the yearly average oxygen isotope ratio. More winter snow and less summer snow will drive the isotope ratios to more negative values, while more summer snow and less winter snow will drive the ratios to more positive values. The seasonal change in the amount of snow is just one of many variables that can affect the isotopic ratios in ice cores.[15]

The new research has a twist—it assumes the same seasonal proportion of snowfall as today but weighs the measurements by the changes in seasons caused by the precessional cycle. The high plateau of the East Antarctic Ice Sheet has a winter maximum in snow caused by storms and clear sky precipitation (ice crystals directly falling out of a clear sky at very cold temperatures) with sublimation in summer. More summer sunshine from the precessional cycle at perihelion causes more summer snow ablation that reduces the seasonal snowfall. The scientists then use this seasonal change as a weight on the isotopic measurements down through ice cores, producing an in-phase relationship with the northern hemisphere sunshine at polar latitudes and not the local summer sunshine. So, the isotopic signal down ice cores is more an 'artefact' of the recording system:

> "This implies that the interhemispheric symmetry in polar climate change might not be due to a causal relationship between the hemispheres, but is simply an artefact of the recording system."[16]

Problems with a weighted isotope signal

There are problems with the weighting idea in that the researchers had to assume the seasonal accumulation record remained constant between glacial/interglacial cycles as well as stadial/interstadial cycles. Moreover, the change in sublimation in summer is only about 4 mm/yr in water equivalent while the total snowfall is about 27 mm/yr.[17] So, the weighting function is rather small.

Computer models have attempted to account for the seasonal accumulation of snow, but these models produce quite variable results and so cannot address whether the assumption of

using the present seasonal proportion of snow for all the cycles can be true within the evolutionary/uniformitarian ice ages paradigm.

Another problem is that it is difficult to interpret fluctuations in the isotope ratios and demonstrate a link to the Milankovitch mechanism that is pinned to solar radiation changes at 65°N. In an accompanying *News and Views* article, Fujita states:

> "The unveiling of this 'pseudo-rhythm' strikes at the foundation of temperature estimates gleaned by analyzing isotope ratios in ice cores. Does it mean, as Leapple *et al*. suggest, that the evidence from Antarctic ice cores cannot be used to support or refute the Milankovitch theory?"[18]

Another problem within the evolutionary/uniformitarian paradigm is that there are short period cycles of one to two thousand years, called Dansgaard-Oeschger cycles, and these are out of phase between Greenland and Antarctica.[19] Although Dansgaard-Oeschger cycles have little to nothing to do with the Milankovitch mechanism, they do imply that there is a climate connection between the hemispheres which is difficult to discern.

In an exchange over the seasonal weighting function idea, the respondents point out that during glacial phases snowfall decreases by about 50% because cooler air is drier, which is a much stronger effect than the small seasonal weighting function.[20] They also point out that the proportion of seasonal snow probably varied significantly between glacial/interglacial and stadial/interstadial cycles, so that the weighting of the present seasonal cycle is of little use. The authors of the seasonal weighting article comment that the seasonal proportionality is unknown in the past and that models do not help determine this seasonal proportionality.[21]

Creationist earth-science deductions

The above problems arise from within the evolutionary/uniformitarian ice age paradigm. How would creationists explain the phase problem, the Milankovitch mechanism, and cyclostratigraphy? First, the timescale of the Milankovitch mechanism and cyclostratigraphy is too long to work within the creationist timescale, although we still have to explain the oscillations in the isotope ratios in deep-sea cores, ice cores, sedimentary rocks, and other records. The creationist model allows for one ice age, the end of which corresponds to the uniformitarian 'last' ice age. That ice age and its deglaciation are synchronous between the hemispheres because it was a consequence of the biblical Flood, which was a global event that occurred at the same time in both hemispheres. We do not have a phase problem. The Milankovitch mechanism has nothing to do with the rapid, post-Flood Ice Age.

Second, it is unwarranted from within the evolutionary/uniformitarian model to apply the Milankovitch mechanism to pre-Quaternary oscillations in sedimentary rocks. That is because such oscillations cannot be caused by any presumed ice ages since their ice ages did not begin until the Quaternary.

Finally, the dispute emphasizes that the seasonal proportion of snow is important to the interpretation of oxygen and deuterium isotope ratios measured in ice cores. Changes in the seasonal proportion of precipitation may explain some of the isotopic variations within a creationist Ice Age model.

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