

Clim. Past Discuss., referee comment RC3
<https://doi.org/10.5194/cp-2021-10-RC3>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on cp-2021-10

Anonymous Referee #3

Referee comment on "A Modified Milankovitch theory that reconciles contradictions with the paleoclimate record" by Robert E. Wong, *Clim. Past Discuss.*,
<https://doi.org/10.5194/cp-2021-10-RC3>, 2021

The article introduces and computes a new insolation summary based on the concept of e-season. These e-seasons are defined by dividing the Earth orbit in four quadrants, two of which are centred on the perihelion and the aphelion, respectively. The so-called "daily solar energy anomaly" during the perihelion season is a quantity which closely follows eccentricity (Figure 2) and the author considers that this quantity is a predictor of the occurrence of interglacials. He therefore calls for a revision of our current understanding of the dynamics of glacial interglacial cycles.

As the insolation defined by the author closely follows eccentricity, the potential interest of this contribution would have been to suggest an interpretation or justification for introducing direct eccentricity forcing in models of glacial-interglacial cycles. The current understanding of experts is that such term is not essential. Quite a number of conceptual or semi-mechanistic models, which reproduce pretty convincingly the SPECMAP or LR04 benthic curves (with all terminations), assume a summer insolation forcing, only; the key is that some instability mechanism is needed to trigger terminations when glacial volume is large/sea level is low. There is nowadays no longer a "100-ka mystery" or "MIS 11 mystery", but rather a number of competing hypotheses or plausible mechanisms which all follow a same broad scheme. The variations in eccentricity are important, but the way they impact glacial interglacial cycles dynamics is understood to be mainly through the modulation of summer insolation variations. Likewise, there isn't much mystery about glaciations being "global". Northern hemisphere ice sheets are forced by summer insolation; the response of the rest-of-climate involves temperature, CO₂, and Antarctica, the latter being little sensitive to direct insolation changes because it is so cold; it grows and shrinks with sea level. Again, there are many possible variations around this broad scheme, attributing CO₂ a more or less active or passive role, giving more or less attention to snow accumulation, but the main idea is clear.

Of course, science evolves by breaking consensus, so let's be open and examine the present proposal. Does it present compelling evidence that the current understanding is flawed, by explaining some element, observation, perhaps a phasing between different observations, that would have remained unnoticed so far and not explained by current

theories ? Does it "reconcile contradictions" ? I regret not to have seen any evidence of this here. Once insolation curves are introduced, the text is qualitative, pretty confusing, and doesn't provide any physical, quantitatively-supported argument, beyond speculation. It seems that one invokes either a summer mechanism (for not melting snow, the Milankovitch argument) or a winter one (for bringing snow, the Croll argument) as it fits best, without any regard to knowledge gained by detailed analysis of climate records and physical modelling accumulated over a century since the pioneering works.

Consequently, I regret not to encourage the publication of the current manuscript.