GSM – Grand Solar Minimum. The real "Climate Change" existential threat is right around the corner. Do the Research!

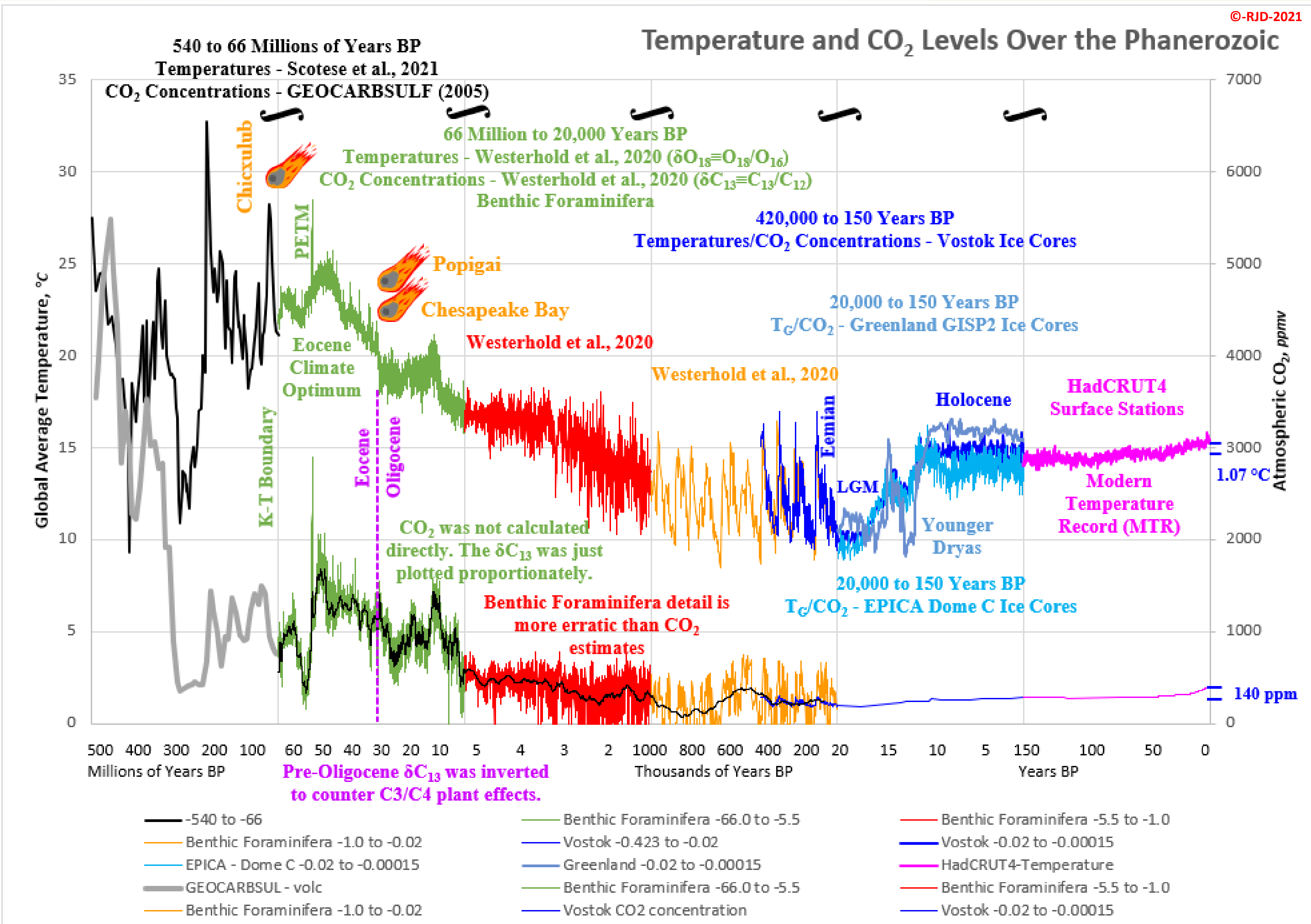
CSS-15a

Phanerozoic Progressive Detail

CO_2 and Temperature

I have always thought that versions of these curves were interesting. With my acquisition of Dr. C.R. Scotese's (2021) Phanerozoic raw temperature data and Dr. R.A. Berner's GEOCARBSULF (2005) and Westerhold et al's (2020) carbon/oxygen isotope ratio compilation, I finally had the data to produce my own version. Historically, these plots, with progressively more detail as the information approaches the present, were focused on the temperature data. I have included the historical CO_2 concentrations with the same plotting format (as well as updated data points). CO_2 and temperature were plotted on vertical scales that reflect the CAGW narrative that the 1.07 °C warming over the MTR is due to the 140 ppm CO_2 increase over that period. CO_2's historical Climate Sensitivity (CCS) is around 1 °C per CO_2 doubling. That means that only roughly 5 °C of the roughly 20 °C difference between Deep Ice Age and Hothouse Earth could be attributed to CO_2 (assuming that the CCS is a constant, it is not). CCS declines as CO_2 rises (CSS-7 – CO_2 - The FECKLESS GreenHouse Gas).

Phanerozoic Progressive Detail



More Detail: climatechangeandmusic.com

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CSS-15b

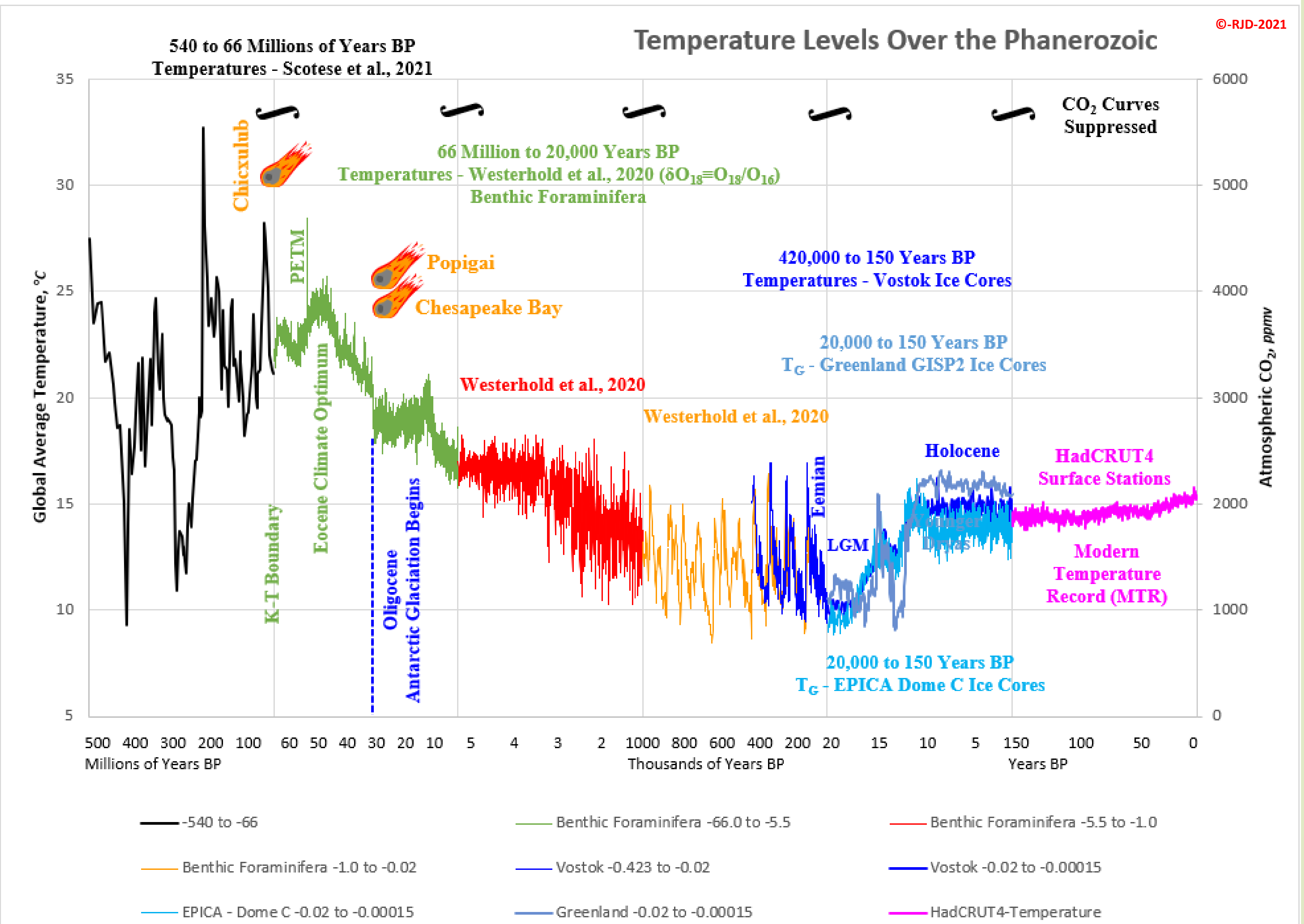
Phanerozoic Progressive Detail

Temperature

The temperature is plotted separately here, allowing a little expansion of detail. For some background stories on the data, I would recommend that you review my CSS-10 – A Ride Through the Cenozoic and CSS-12 – Cosmic Ray Discussion posts. There are some very interesting climate changes going on and most of them have very little to do with CO_2. Most of the CO_2 changes stem from the changes in Global Temperature. The Milankovitch Cycles (CSS-4) are responsible for the major changes in climate (cycling between deep ice age and interglacial warm periods) over the last million years (where we have ice core data available.

Temperature Progressive Detail

Those cycles move the temperature which in turn drive the changes in CO_2 concentration. On longer time scales, the temperature drop is directly related to major geological and celestial events that took the planet from the warm temperatures of the Eocene Climate Optimum down to the depths of the Pleistocene Ice Age that we currently inhabit (thankfully during the relatively short Holocene Interglacial Warm Period).



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CSS-15c

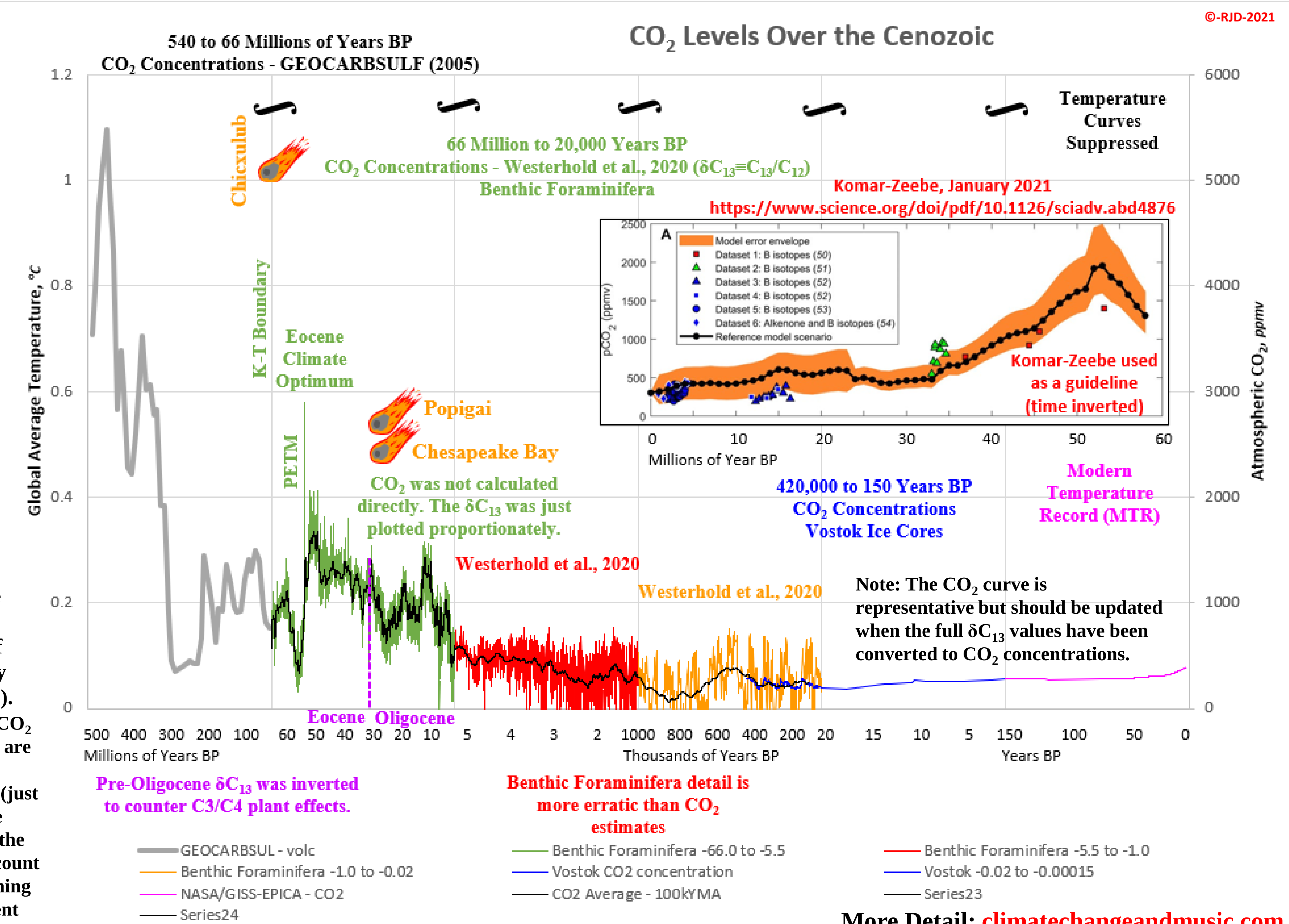
Phanerozoic Progressive Detail

CO_2

The carbon isotope ratios (over the Cenozoic) are representative of atmospheric CO_2 concentrations. Pre-Oligocene, the δC_{13} needs to be inverted (a consequence of C3 Plant domination throughout the much warmer Eocene and earlier periods). C4 Plants dominated once temperatures dropped suddenly at the Eocene/Oligocene boundary and Antarctica began its glaciation. CO_2 declined off the Eocene Climate Optimum as Temperatures dropped through a combination of major geological events (discussed in CSS-10) and the cosmic ray induced cooling as our solar system began traversing the Sagittarius-Carina arm of our Milky Way galaxy (CSS-12).

CO_2 Progressive Detail

The natural processes of weathering and CO_2 sequestration (carbonate rock deposition) are also actively reducing CO_2 levels and contributing to the temperature reduction (just not at a significant level). CO_2 Climate Sensitivity is roughly 1 °C, which means the drop from 1600 to 200 ppm would only account for 3 °C of the roughly 15 °C drop. Assuming the CCS is not less than one above current concentrations (CSS-7 – CO_2 – The FECKLESS GreenHouse Gas).



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CSS-15d

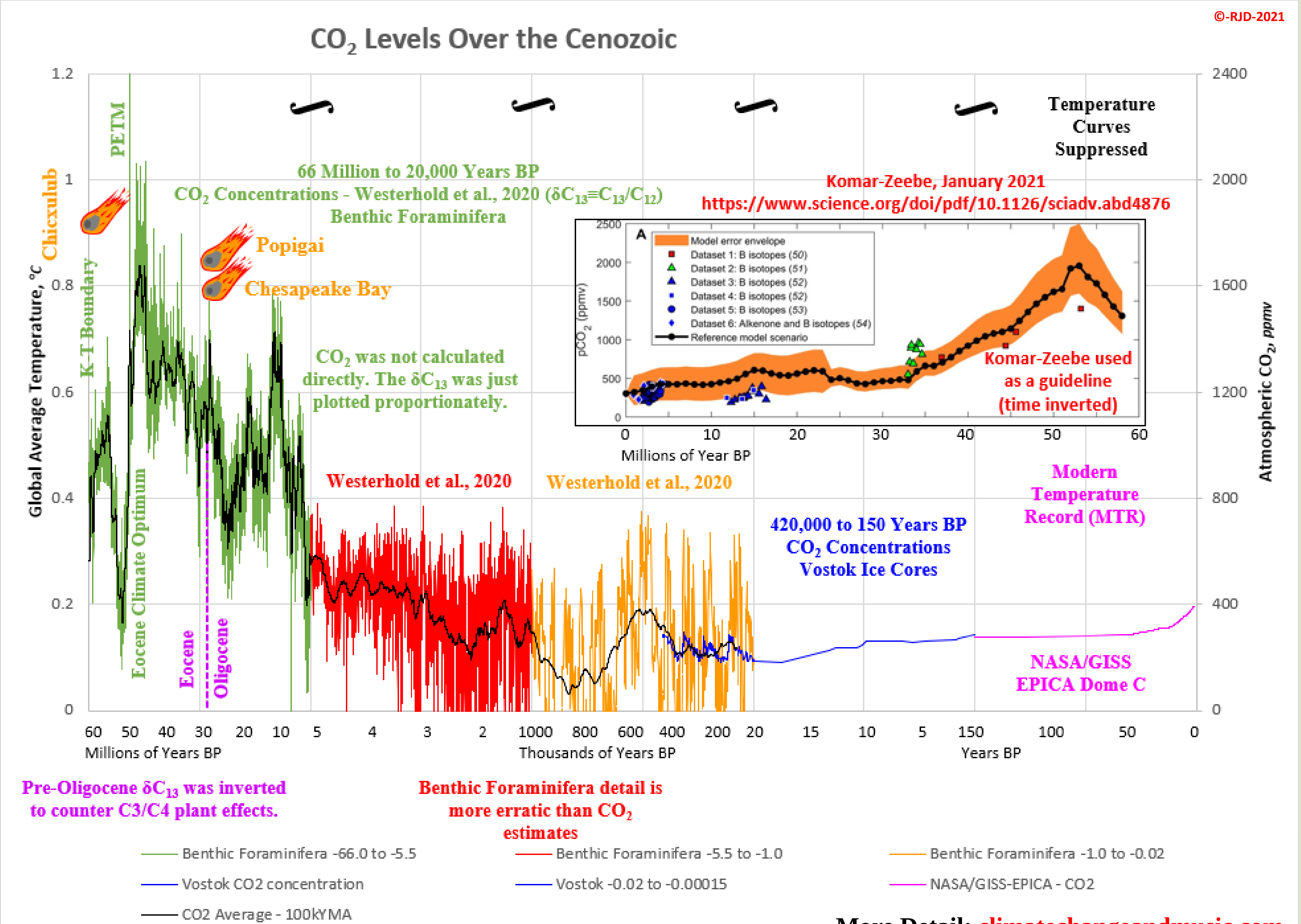
Cenozoic Progressive Detail

CO_2

This curve is the same data as the previous slide just focussed on the Cenozoic. The smaller scales provide a bit more detail. The Komar-Zeebe estimate of Cenozoic CO_2 was used as a guideline to scale the Benthic Foraminifera CO_2 estimates. The general trends are represented by the 100 kYear Moving Average. The fluctuations around that average would represent the Milankovitch Cycles (or their historical equivalents). As shown in CSS-10k, the Benthic Foraminifera and Ice Core data correlate quite well. Climate Change over the Cenozoic (as previously mentioned)

Cenozoic Progressive Detail

was strongly influenced by the major geological and celestial events that played out over millions of years. Those events were the transition periods between the stable temperature (variable CO2 concentration) platforms highlighted in my CSS-10 – A Ride Through the Cenozoic post. The averages are more representative than the fluctuations which are over exaggerated.



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CSS-15e

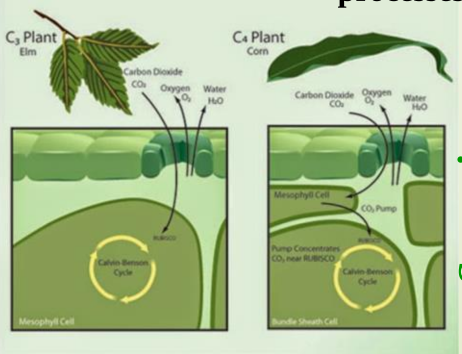
Cenozoic

Carbon Isotopes

This slide is provided to give a graphical representation of the δC_{13} (carbon isotope ratio) data as measured and as inverted (pre-Oligocene). The two plant types process the carbon isotopes in CO_2 differently. As shown in the measured data, the δC_{13} PETM response is a strong decrease when C3 plants dominate. The CO_2 response was a corresponding strong increase. When C4 plants dominate (i.e.: the much colder post-Eocene Period), the δC_{13} and CO_2 responses move in the same direction. The C4 plants are better adapted to handle the generally cooler temperatures associated with the periods of Antarctic glaciation.

Cenozoic Carbon Isotopes

The schematic below shows the different photosynthesis processes.



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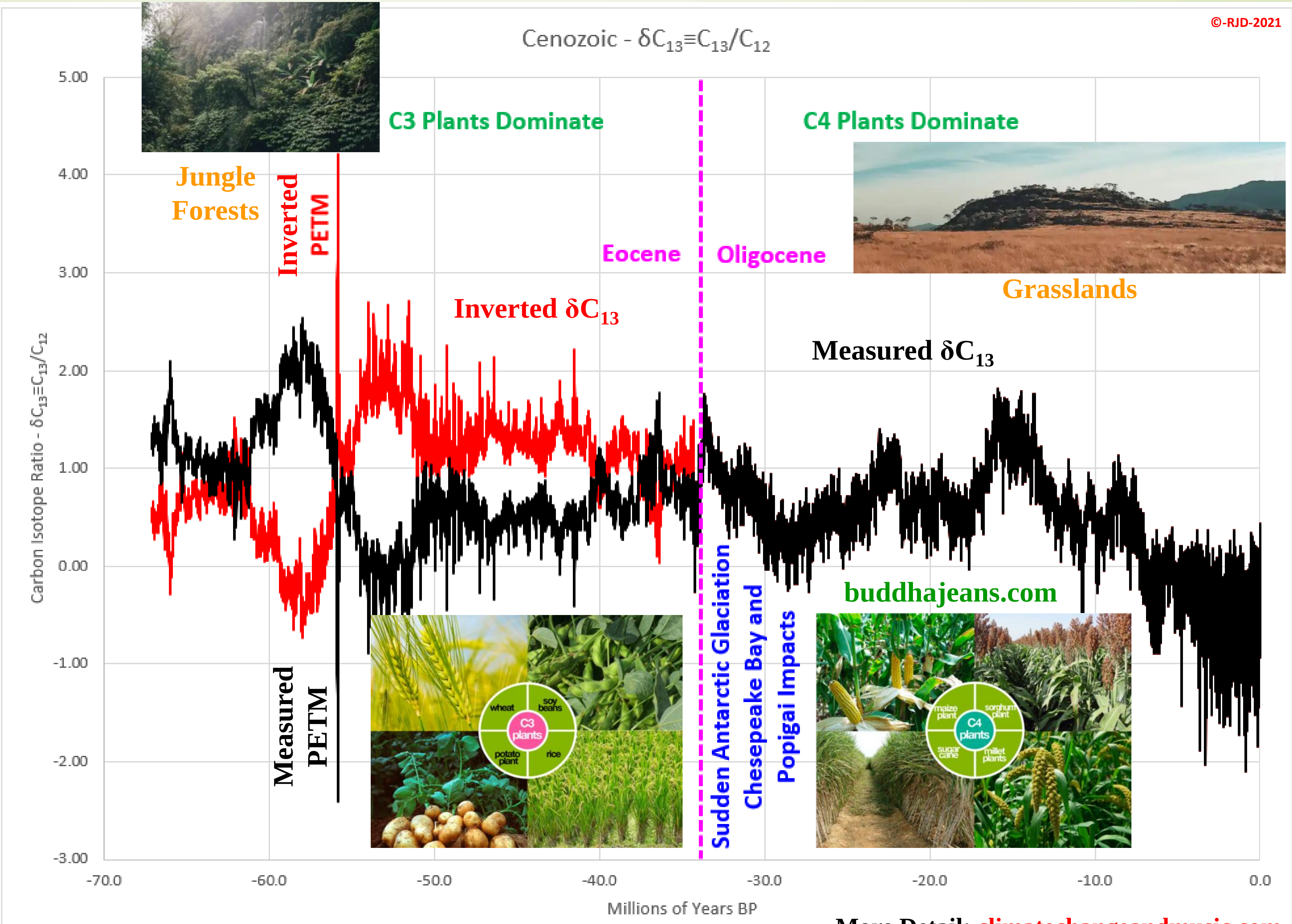

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