An Attempt to Tie the Laskar Insolation Curve to a Core from the Monterey Formation

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Abstract

Recent studies describe orbital influence in the Monterey Formation. Laskar (2011) published data on eccentricity, obliquity, and precession and wrote Program Insola to calculate insolation variations. I rewrote Insola as an Excel spreadsheet, accessible at www.github.com/jdunham76/monterey22. 40 years previous, the Leroy 51-18 core recovered thin dolostone beds separated by thicker phosphatic mudstone layers, followed by an increase in total organic carbon in phosphatic mudstone, culminating in a phosphatic hard ground interpreted as a condensed sequence. Above this are the first biogenic silica beds of porcelanite and opal-CT chert. Using age control from a regional study by Blake (2022), I attempted to match these widely recognized lithologic events to absolute-age points on Laskar orbital-cycle curves. The model interprets that mudstone intervals represent phases of high orbital eccentricity with a frequency of about 400 kyr, while dolostone beds denote a favorable coincidence of eccentricity and obliquity cycles. Eccentricity peaks and troughs may also explain high silica and lower silica periods. More precise age control from the core is needed to validate the match. Thin tuff layers might help. While insolation cycles may explain a portion of sediment variation, other factors, including slumping, mass-transport events, and tectonic deformation, could scramble the insolation signal. If future researchers can isolate Laskar cycles, it might be possible to assign absolute ages to individual beds.