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# A new astronomical solution and the calibration of geologic time

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Astronomical computations are key to understanding the dynamical evolution of the solar system, including its chaoticity, and represent the backbone of cyclostratigraphy and astrochronology to understand Earth's paleoclimate. Development of an absolute astronomically calibrated time scale has hitherto been unattainable beyond ∼50 Ma, an apparently firm limit for astronomical solutions, which disagree before that age. Geologic records are now required to constrain astronomical solutions and advance the field. In this presentation, we show how analyses of geologic records and astronomical computations can complement each other. On the one hand, we present a new astronomical solution that shows exceptional agreement with geologic records across key time intervals and can hence be selected over other solutions that fit the geologic data less well. On the other hand, we show how our new astronomical solution can be used to extend an astronomically calibrated time scale back in time. In other words, we use geology to constrain astronomy, and, conversely, use astronomy to provide key applications widely used in geology. We show that our astronomical solution requires a chaotic resonance transition in the solar system's fundamental frequencies g4-g3 across a critical time interval. Notably, we also found that parameters required for long-term integrations compatible with geologic observations of the past are not fully compatible with our best knowledge of the current solar system. Finally, we present results to accurately determine boundary ages of major epochs and dates of major climate events, the latter of which reshape our current thinking about their chronology.