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Toward a continuous 405-kyr-calibrated Astronomical Time Scale for the Mesozoic Era

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Mesozoic cyclostratigraphy is being assembled into a continuous Astronomical Time Scale (ATS) tied to the Earth's cyclic orbital parameters. Recognition of a nearly ubiquitous, dominant ∼400-kyr cycling in formations throughout the era has been particularly striking. Composite formations spanning contiguous intervals up to 50 myr clearly express these long-eccentricity cycles, and in some cases, this cycling is defined by third- or fourth-order sea-level sequences. This frequency is associated with the 405-kyr orbital eccentricity cycle, which provides a basic metronome and enables the extension of the well-defined Cenozoic ATS to scale the majority of the Mesozoic Era. This astronomical calibration has a resolution comparable to the 1% to 0.1% precision for radioisotope dating of Mesozoic ash beds, but with the added benefit of providing continuous stratigraphic coverage between dated beds. Extended portions of the Mesozoic ATS provide solutions to long-standing geologic problems of tectonics, eustasy, paleoclimate change, and rates of seafloor spreading.