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Cyclostratigraphy, Orbital Tuning and Unit-Stratotypes

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Cyclostratigraphy, the sub-discipline of stratigraphy that deals with the identification, characterization, correlation and interpretation of cyclic variations in the stratigraphic record, is rapidly growing to maturity. The expression of astronomical climate forcing is much more widespread than hitherto assumed. It is found on tectonic time scales and in sedimentary environments that were previously considered unsuitable. The former points to the expression of long-period (million year) orbital cycle components, providing a potential mechanism to explain 1) the inferred global correlatibility of many 3^{rd} order sequences in sequence stratigraphy and 2) the occurrence of abrupt events by passing threshold values through the combination with long-term linear trends.

Astronomic tuning of deep-marine continuous successions combined with integrated high-resolution stratigraphy underlies the - age calibration of the - new standard geological time scale for the Neogene and the tuning is now being extended into the Mesozoicum. These recent developments, including the intercalibration with $^{40}Ar/^{39}Ar$ time, invalidate arguments against the designation of unit-stratotypes for global stages, the basic building blocks of the standard Global Chronostratigraphic Scale (GCS). The added value of a unit-stratotype lies in the integrated high-resolution stratigraphy and astronomical tuning which combined provides an excellent age control with an unprecedented resolution, precision and accuracy *within* the entire stage. In this way a stage, including its time scope, is defined by its *content* and not only by its boundaries. Our unit-stratotype approach further strengthens the importance of time-rock units by favouring the introduction of astronomically defined chronozones as formal chronostratigraphic units and arguing against the elimination of the dual classification of chronostratigraphy and geochronology. Extending the approach to older time intervals will inevitable lead to the use of multiple hole (I)ODP sites in extending the

astronomical tuned geological time scale and defining (remaining) stages and stage boundaries in at least the Cenozoic and Cretaceous and possibly the entire Mesozoic.