

# DEEPENING-UPWARD SUBTIDAL CYCLES, MURRAY BASIN, SOUTH AUSTRALIA

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**ABSTRACT:** Decimeter-scale, deepening-upward cycles are the basic depositional motif of Oligocene--Miocene Murray Supergroup limestones in the Murray Basin, southeastern Australia. Cycles formed in this large intracratonic basin on a centripetal, temperate-water epeiric ramp. They reflect generation by trophic resource-influenced carbonate production under mostly transgressive conditions. Listed from the base up, each cycle is ideally composed of five parts: Part A---biotically depauperate carbonates reflecting relatively shallow-water, restricted, variably stressed highly mesotrophic environments; Part B---increasingly biotically diverse limestones recording progressively more physical energy and less mesotrophic conditions upward; OM<sub>1</sub>---a conspicuous hardground to firmground surface formed during late transgression to stillstand during which wave sweeping and reworking contributed to omission and lithification; Part C---relatively biotically diverse, epifauna-dominant sediments that were highly abraded during periods of condensed sedimentation under marginally oligotrophic conditions; and OM<sub>2</sub> (cycle boundary)---a rarely conspicuous surface representing arrested sedimentation and variable cementation as trophic resources increased and conditions for carbonate production deteriorated. Ten cycle types are grouped into four major styles; clay cycles, mollusc cycles, echinoid cycles, and bryozoan cycles. These are interpreted to form a lithological continuum from inner restricted terrigenous locales to outer, open marine, bryozoan-colonized environments. Deepening-upward cycles were profoundly sensitive to autogenic factors such as nutrient influx, terrigenous content and turbidity, hydrodynamic energy, water temperature, salinity, and water depth manifested in this intracratonic setting. Although these cycles share a similar sedimentological motif and hydrodynamic energy-based cycle-capping process with open shelf, epicratonic, shallowing-upward subtidal cycles of Tertiary age, they formed in a very different way reflecting the distinctive intracratonic environment in which they formed. Murray Basin cycles preserve a record of relative sea-level rise whereas open shelf cycles accumulated mostly during relative sea-level fall.