
Mid-oceanic sea-level drop at the two Permian extinctions: evidence from accreted paleo-atoll carbonate complexes

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Abstract

Pre-Jurassic mid-oceanic sedimentary records were rarely preserved, as those had been mostly subducted/disappeared along convergent margins due to non-stoppable plate tectonics since the Archean. Almost nil, however, a few of them could survive in the form of exotic blocks within accretionary complexes, i.e., deep-sea chert and paleo-atoll carbonates. Mid-oceanic reefy carbonates from the top of ancient seamounts archive sensitive sea-level changes through time, according to their near sea-surface facies and total absence in tectonic disturbances at trench and/or mid-oceanic ridge. The Middle-Upper Permian and Triassic carbonates in SW Japan (Akasaka, Kamura and other sections) represent accreted fragments from ancient seamount-top reef complexes, in which drastic facies changes at two extinction-related horizons are preserved, i.e., the Guadalupian/Lopingian (Middle-Upper Permian) and Lopingian/Induan (Permian/Triassic) boundaries. Sharp lithofacies changes are eye-catching at the two horizons in multiple sections. At the G-L boundary, the uppermost Guadalupian organic-rich dark gray limestone of shallowing upward sequence is abruptly truncated with an unconformity by the overlying Lopingian light gray limestone. At the P-T boundary, Lopingian white dolomite is truncated with a hiatus by the black Induan organic-rich limestone. The sharpness in facies change and evident erosional features indicate that sharp sea-level drops occurred for both timings in mid-oceanic setting regardless of local tectonism. These apparent sea-level drops in atoll carbonates likely recorded the appearance of cool climate on a global scale, further suggesting a promising trigger for global environmental changes relevant to the major Permian extinctions of marine organisms.

Keywords: atoll carbonate, sea, level drop, extinction, Guadalupian, Lopingian, Triassic

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