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Direct dating of marine sediments using optically stimulated luminescence techniques: Insights from ODP cores 658B and 659A.

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Chronologies for marine sediments are usually constructed by tuning marine proxies for global ice volume ($\delta^{18}O$) to the well understood variations in the Earth's orbit, by the identification of event horizons (e.g. tephra or biostratigraphic markers) and/or by radiocarbon dating. However, these techniques are not universally applicable. Optically stimulated luminescence dating (OSL) is potentially widely applicable to marine cores and may offer significant advantages over more conventional chronometric techniques. However, methodological considerations regarding the application of OSL techniques have yet to be systematically explored. Using material from Ocean Drilling Program (ODP) cores 658B and 659A, we assess the applicability of OSL dating to deep ocean sediments. For these cores, severe uranium-series disequilibrium is found, but the cause and character of this disequilibrium is spatially and temporally variable. Uranium-series disequilibrium causes the environmental dose rate to vary over time, and an iterative dose rate calculation is required to generate accurate ages. For the last glacial-interglacial cycle, these calculations yield OSL ages which are in good agreement with independent age estimates, suggesting that the application of luminescence dating techniques to deep-sea sediments merits further investigation.