

THE UPS AND DOWNS OF DETERMINING ANCIENT SEA LEVEL CHANGE

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Global (eustatic) sea level is a fundamental divide. Change of its position dramatically affects the balance between nearshore retention versus deep-sea delivery of sediments and nutrients, thereby influencing coastline ecosystems, hydrocarbon and mineral wealth, and the distribution of people. The magnitude, rate, and cause of eustatic change is well known in some time intervals, and poorly known in others. Tide gauges show an average rise of about 1 ft over the last century, due to melting ice caps. Corals record an irregular rise of ~100 m since 20 ka, and provide hints of similar ups and downs over the preceding 106 years due to thaw/freeze cycles at the Earth's poles. On timescales of 10⁷ years, oscillations in global ice volume modulated by a change in the spreading rate of mid-ocean ridges caused variations of similar scale. We're challenged, however, to find a cause for eustatic change that occurred over timescales of 10⁸ years, as recorded in the architecture of passive margin sediments. Isolating the imprint of eustatic change from that of crustal deformation, thermal subsidence, sediment supply and compaction is a challenging task, and one that DSDP/ODP has tried to determine in several drilling campaigns. Dr. Mountain has participated in 4 such expeditions since 1976, serving as Co-Chief Scientist on Leg 150.