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STATE AND FATE OF MID-ATLANTIC SEA LEVELS: GEOLOGIC EVIDENCE FROM CHESAPEAKE BAY

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Rising sea levels present an ongoing threat to communities and resources around the Chesapeake Bay, east coast, USA, where relative sea-level rise is approximately twice the rate of average global eustatic rise. Such rapid sea-level rise is due to the subsidence of the land surface, as the region continues to adjust to forebulge collapse following the Last Glacial Maximum (LGM). Dated shorelines in the region indicate that related glacial isostacy altered the timing of previous relative sea-level high stands in the Chesapeake Bay region relative to areas farther afield from the glacial margin. However, dated shoreline deposits are largely restricted to the Holocene and to marine isotope stage (MIS) 5, so the timescales over which these processes operate remain unknown.

To better understand relative sea level processes in the Chesapeake Bay, we study a broad, low-elevation (<2 m) surface on the east-central shore that is cut into preexisting MIS 5 deposits. Light detection and ranging (LiDAR) and borehole (n=70) data help characterize the geomorphology and lithology of landforms, and optically stimulated luminescence (OSL) dating provides age control. LiDAR imagery indicates a prominent scarp that trends WNW-ESE across the field area, with a field of long (>2km), sub-parallel, curvilinear ridges below the scarp. Facies within the scarp and ridges include burrowed, silty fine sand; horizontally bedded, alternating sand and silt; and massive fine to medium sand. OSL ages (n=24) from these landforms range 69-26 ka. The morphology, lithology, and ages of landforms are interpreted to indicate estuarine deposition during MIS 3, when sea level proxies indicate eustatic sea levels ~40-80 m below present.

The presence of shallow-water estuarine MIS 3 deposits near modern sea level in central Chesapeake Bay implies >80 ky of subsidence following the MIS 6 glaciation, with renewed glacioisostatic uplift during the LGM. Considering retreat of LGM ice sheets and forebulge collapse did not commence until ~20 ka, continued subsidence is expected for many millennia at Chesapeake Bay latitudes. This will add to the effect of continued global-warming-induced sea level rise and exacerbate the impacts of large storm events. Continued subsidence should be considered in risk assessments and climate change adaptation plans for the region.

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Back to: Paleoclimatology/Paleooceanography

<< Previous Abstract | Next Abstract >>