

Sanders, J. E.; Merguerian, Charles; and Okulewicz, S. C., 1995a, Glacio-tectonic evidence for SE-directed glacial flow in displaced slab of Upper Cretaceous sediments exposed in the Harbor Hill Moraine, Princes Bay, Staten Island, New York.

The eroding coastal bluff in the Harbor Hill Moraine at Princes Bay exposes a slab of Upper Cretaceous sediments (consisting of interbedded white charcoal-bearing clay layers, cross-bedded sands, and hematite-cemented sandstone/conglomerate) that is enclosed within typical reddish-brown Quaternary sediments (tills and outwashes). The Cretaceous is here overlain by channelized Pleistocene pebbly outwash and till. Nearby, these Pleistocene sediments are capped by a buff-colored paleosol and a layer of loess. The Cretaceous exposed here, formerly thought to be in situ and nondisturbed, displays a recumbent shear fold plunging roughly 17° into S60°W with an axial surface oriented N4°E, 20°NW. At least four low-angle imbricate ice-thrust surfaces are present within and below the Cretaceous sequence. A hematite-cemented layer has been brecciated in situ and possibly has been duplicated. The orientation of the recumbent fold and ice-thrust surfaces is consistent with other evidence for SE-directed glacial flow (indicator stones from the NW including anthracitic coal, Silurian Green Pond Conglomerate, Proterozoic gneiss boulders, and omnipresent Palisades dolerite). This evidence for ice flow to the SE associated with the Harbor Hill Moraine supports a pre-Woodfordian age, as previously found in Queens County by J. B. Woodworth (1901).

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