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A 700-year history of climate change and human impact on the southern Cape coast inferred from lake sediments of Eilandvlei, Wilderness Embayment, South Africa

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The environment of the southern Cape coast, South Africa, is sensitive to climate fluctuations as it is influenced by different atmospheric and oceanic circulation systems. Paleoecological evidence of Holocene climate variations in this region is presently limited, due to climatic conditions not supporting the accumulation and preservation of suitable sedimentary deposits. Here, we present a lake sediment record spanning approximately the last 670 years from Eilandvlei, a brackish coastal lake situated mid-way between Cape Town and Port Elizabeth. The results from geochemical and sedimentological analyses point to an increase of minerogenic sediment input from the catchment starting ∼AD 1400. Changes in the seasonal distribution of rainfall during the Little Ice Age (LIA) may have altered hydrological conditions and possibly caused a recession of afrotemperate forest vegetation, increased erosion rates and fluvial sediment transport. A rising mean lake level, possibly associated with relative sea level rise, may offer an additional explanation for the deposition of finer sediments at the coring site. After AD 1450, reduced burial flux of organic carbon, nitrogen, phosphorous and other elements associated with autochthonous sediment formation may have resulted from ecological changes in Eilandvlei whereby submerged macrophytes were potentially constrained to shallower waters. Enhanced sedimentation rates, increasing carbon, nitrogen, phosphorous and biogenic silica concentrations as well as high concentrations of indicators for allochthonous sediment input (e.g., aluminium, titanium, zirconium) point to increasing sediment and nutrient flux into Eilandvlei from the late 19th century onwards. The most likely factor involved in these recent changes would appear to be land-use change and other forms of human impact.