

Holocene Climatic-induced Morphodynamics and Settlements in the Coastal Region of the Nile Delta

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The Nile Delta is primarily the result of depositional processes associated with the discharge of Nile floods. The timing, amount, and characteristics of the sediment load of Nile water depends on the relative contributions from the distant Equatorial and Blue Nile tributaries. These contributions are related, to a great extent, to the movement of the Inter-tropical Convergence Zone (ITCZ). Considerable variability in Nile flood discharge has already been inferred from our studies in the Faiyum and Saqqara regions. We use this data in combination with estimates of sea-level rise during the Holocene and rates of subsidence to develop a model of the morphodynamic processes that influence human occupation in the Delta. During the last glacial maximum, the older sands and gravel of the braided streams that traversed the Delta were deeply incised. An initial depositional phase from 14.5 to 13 kyr was in turn followed by degradational processes during the Younger Dryas (13-11.5 kyr). In the subsequent period from 11.5 to 8.2 kyr, which witnessed higher influx from the Nile tributaries under increasing wetter and warmer conditions, aggradational processes prevailed. The 8.2 kyr abrupt, cold, dry event marked a change toward unstable climatic conditions that became especially pronounced from 7.5 to 6.8 kyr. By 4.2 kyr, Nile discharge was declining and following a severe, drop in Nile flood discharge at that time, Nile aggradation continued under a hydrographic regime dominated by contributions from the Ethiopian tributaries. Sea level rise during the early Holocene between ca. 11.5 and 7 kyr was a limiting factor in the progradation of the Delta, but with the deceleration of sea level rise Delta progradation led to the shift of near seashore depositional conditions to its current position by ca. 3 kyr. Throughout the Holocene subsidence of the Delta modulated the relative impact of climatic-induced morphogenetic processes. However, the impact of subsidence was not spatially coherent, with marked differences between East and West Delta. Human occupation of the Delta was responsive to the distribution of arable lands and wetlands. It was also tuned to the numerous Nile branches that were influenced both by change in Nile flood discharge and subsidence.

