

Glacigenic deposits at Happisburgh, NE Norfolk, record the earliest known expansion of glaciers into lowland eastern England during the Quaternary. The sequence comprises two regionally extensive till units, the Happisburgh Till and Corton Diamicton members of the Happisburgh Glacigenic Formation, deposited during separate ice advances, and intervening glacialacustrine and outwash deposits laid down during ice-marginal retreat. During 2012, a new diamicton unit was discovered within the intervening sorted sediments and its significance is outlined here. Sedimentological and structural evidence suggests, tentatively, that the diamicton forms a small debris fan generated subaerially by a series of water-saturated hyperconcentrated or debris flows. The precise trigger mechanism for these flow deposits remains unclear, but may relate to seasonal melting of surface or buried ice followed by mass-movement, or to more abrupt geological events including periods of intense rainfall, moraine dam failure or a glacier outburst flood. Middle Pleistocene glacigenic sequences in NE Norfolk offer a detailed insight into the dynamics of lowland glaciation in eastern England, with evidence for multiple ice advances (Bowen et al. 1986; Banham 1988; Hart & Boulton 1991; Lunkka 1994; Lee et al. 2004a; Pawley et al. 2004; Pawley 2006). Traditionally, these ice advances have been attributed to glaciation of the region by coeval British (Pennine) and Fennoscandian ice sheets (Perrin et al. 1979; Bowen et al. 1986; Ehlers & Gibbard 1991). However, recent provenancing of apparent Scandinavian till units instead suggest derivation from bedrock strata in eastern England and southern Scotland, indicating a British (North Sea) ice source (Lee et al. 2002, 2004a; Hoare & Connell 2005). Further debate also surrounds the number and ages of glaciations represented by the sequence in NE Norfolk (Banham et al. 2001; Lee et al. 2004b; Hamblin et al. 2005; Preece et al. 2009; Rose 2009; Preece & Parfitt 2012).