

Holocene environmental variability evidenced in lake Hestvatn, South Iceland

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Sediment cores from lake Hestvatn have provided valuable insight into Holocene environmental variability in South Iceland. In 2003 cores were retrieved from both the south and the north basin of the lake, which are easily correlated by lithology, tephra layers and magnetic susceptibility. A total of 150 tephra layers have been identified in the Holocene record of the Hestvatn cores (Jóhannsdóttir unpubl. data), and provide important chronological control. The lake becomes isolated from the sea around 10.6 cal. kyr BP, and the first 600 years the lake is impounded by repeated jökulhlaups, presumably originating in former ice-dammed lakes on Kjölur. Soon after the meltwater inflow halts primary productivity increases gradually, recorded in BSi (biogenic silica), TOC (total organic carbon), and reaches maximum Holocene values around 7.5-8.0 cal. kyr BP. Pollen analysis from the north core records highest pollen concentration around 8.0 cal kyr BP (Caseldine unpubl. data). This interval presumably relates to a period denoted as the “Holocene Thermal Maximum”. Around 4.5 cal. kyr BP the sedimentation rate of the north core more than doubles, concurrent with a change to gray clayey sediments, decreasing TOC and BSi values, and a jump in the MS record (indicative of more minerogenic sediments); colder conditions with consequent erosion, possibly recording a neoglacial cooling. Slight increase in the BSi and TOC data is recorded from 3.0 cal. kyr BP, with concurrently decreasing MS values. Before settlement the sediment accumulation rate of the north core is on average double that of the south core, whereas post-settlement the sediment accumulation rate is almost equal for the two basins. The environmental change observed at the time of settlement is profound, and entails the most dramatic changes in sediment delivery into the lake during the Holocene (excluding the jökulhlaup period). The TOC and BSi records of the north core which have a correlation of 0.9 pre-settlement, diverge at the onset of settlement, and revert to a correlation of -0.21. Post-settlement the TOC data presumably reflects the washed and blown in soil from the watershed, instead of being a recorder of primary productivity.