Here we analyse observations from a measurement array constructed on landfast sea ice in McMurdo Sound, Antarctica during a two-week period from late November to early December 2010. The aim of this work is to quantify centimetre-scale horizontal and vertical displacements in the sea ice referenced to a local datum. The array comprised two survey-grade Global Navigation Satellite System (GNSS) receivers, a robotic Total Station (an instrument that precisely measures distances and horizontal and vertical angles), and thirteen optical prisms placed on fibreglass rods mounted into the sea ice. The GNSS receivers were positioned ~200 m apart, oriented to the long axis (approximately north-south) of the Sound, and logged observations at 1 Hz. The receiver post-processed kinematic positions were derived using the permanent GNSS receivers at Scott Base (SCTB) and the McMurdo Station (MCM4). The Total Station was positioned at the centre of the array and observed the prisms at 15-minute intervals. Prisms were positioned in three lines radiating out from the central site: a north-south line, an east-west line and a line spanning the interface between first-year and multi-year ice, and were placed generally at distances of 200 and 750 m from the array centre. Preliminary results indicate vertical oscillations due to tidal forcing are well resolved by the GNSS receivers, as well as horizontal displacements on the order of 30 mm day$^{-1}$. Total Station measurements indicate relative horizontal displacements of up to ~30 mm day$^{-1}$, potentially indicating local deformation of the landfast sea ice.