Liverpool Bay is a shallow corner of the semi-enclosed Irish Sea. The UK National Oceanography Centre has maintained a Coastal Observatory in Liverpool Bay since August 2002. The Observatory includes, but is not limited to, near-monthly CTD area surveys, long-term HF radar derived surface currents, two long-term current profile moorings, and a high resolution numerical simulations of the Bay. Liverpool Bay has complex dynamics; it has one of the largest tidal ranges in the world and is also strongly influenced by freshwater estuarine outflow such that lateral density gradients dominate vertical gradients.

The residual circulation, representing the time average flow, is important for transporting freshwater, contaminants, sediments and nutrient loads in the region. While fixed moorings can directly measure the long term average flow they are costly to maintain and, in a region of such strong lateral gradients, are limited in their spatial relevance. We exploit the spatial coverage of the surface radar data in conjunction with CTD derived density climatology to make estimates of the depth varying residual circulation for the whole Bay. This dynamically useful product is achieved by conditioning a modified version of the classic Heaps residual circulation solution with data from the mooring profiles. These indirect observations of the residual circulation are tested against the high resolution simulation data.