3.6 Surface and Sub-surface Currents

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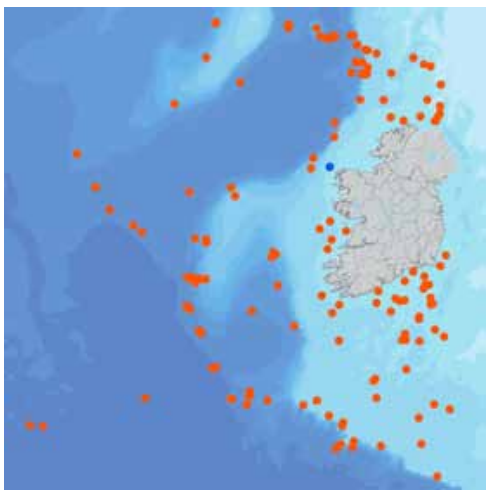
Ocean currents transport heat, freshwater and carbon from one part of the ocean to another and play a key role in determining climate conditions. The North Atlantic Current (NAC), an extension of the Gulf Stream draws relatively warm and saline subtropical waters northeastward across the Atlantic Ocean, helping to maintain the temperate climate conditions in northwestern Europe. Although multi-annual and decadal changes in the strength of the NAC have been recorded, there is no coherent evidence for a long-term trend.

Photo: ©Triona McGrath



Map 3.6. Location of current meters deployed in recent years.

'Although multi-annual and decadal changes in the strength of the North Atlantic Current have been recorded, there is no coherent evidence for a long-term trend.'

Measurements

There are no permanently maintained current meter arrays in the ocean area adjacent to Ireland. There are a number of historical current meter and Acoustic Doppler Current Profiler (ADCP)[17]

17 An ADCP transmits sound waves which are reflected from particles moving in the water. It uses the Doppler effect to calculate the velocity of these particles and hence the currents.

records, which have been collected for research purposes. The map shows the location (red) of current meters deployed by a number of organisations in recent years. Near Belmullet, Co. Mayo (blue) current measurements have been made by the Marine Institute since 2010 in support of the evolving national ocean energy programme.

Recent research has shown that sea-surface height data from satellite altimeters and wind data from scatterometers can be combined to provide information on ocean surface currents. This work requires validation that can only be provided by *in situ* current meters.

Time-series and Trends

Figure 3.13 shows important current pathways in Irish waters.[18] Coastal currents (red) are associated with the boundaries between shallow areas where waters remain vertically mixed throughout the year and deeper regions where stratification occurs.

The Shelf Edge Current (green) is an important pathway for eggs and larvae of commercial fish species. Its strength and continuity fluctuates over seasonal and annual time scales in response to changes in the large-scale ocean atmospheric forcing.

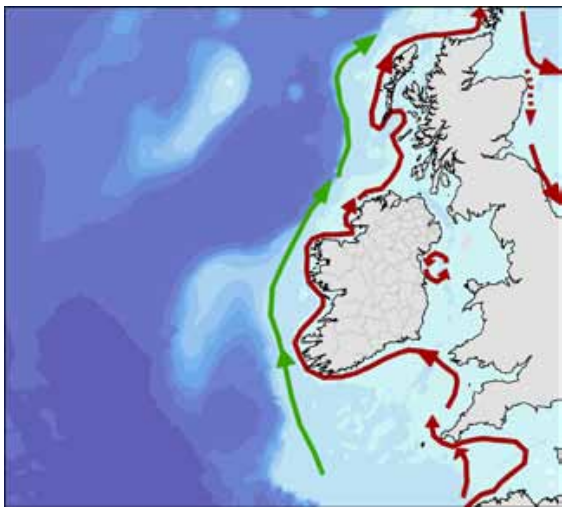


Figure 3.13. Main ocean current pathways around Ireland.

18 Adapted from Hill et al. (2008).

'The lack of a long-term current monitoring system in Irish waters represents a significant gap in the northeast Atlantic.'

Maintaining Observations

There is no long-term current monitoring system in place. Such a system would fill a significant gap in the northeast Atlantic and would be particularly useful in the Shelf Edge Current to monitor variability in a major source of Atlantic water input to the Nordic Seas. However, there are no plans or funding to advance this activity at present.

Further Information and Data Sources

Cannaby, H. and Nolan, G. (2009) Physical oceanography. *Irish Ocean Climate and Ecosystem Status Report 2009.* Nolan, G., Gillooly, M. and Whelan, K. (eds.) Marine Institute, Galway, Ireland, pp. 100.

Hill, A.E., Brown, J., Fernand, L., Holt, J., Horsburgh, K. J., Proctor, R., Raine, R. and Turrell, W.R. (2008) Thermohaline circulation of shallow tidal seas, *Geophysical Research Letters*, Vol. 35, L11605, doi:10.1029/2008GL033459.

Current meter data are archived and can be requested from the Marine Institute: http://www.marine.ie/home/publicationsdata/RequestForData.htm

Current meter data are archived and can be requested from the National University of Ireland, Galway's School of Earth and Ocean Science: http://www.nuigalway.ie/eos/

Current meter data are archived and can be requested from the British Oceanographic Data Centre: http://www.bodc.ac.uk/

Near-real time global ocean surface currents derived from satellite altimeter and scatterometer data: http://www.oscar.noaa.gov/