

Cullen Scholarship: Recovering legacy tidal records to elucidate trends in sea level rise in Ireland

(PhD Award)

Background

A necessary first step for understanding coastal risks associated with rising sea levels is the availability of high-quality observations over the longest period possible. To achieve this, when scientific records do not currently exist, it is possible to rescue and quality control historical observations of sea level, typically made by port authorities, that have not previously been used for scientific purposes.

The island of Ireland has few long-term records of mean sea level, and these records are confined to the north east of the country (Dublin from 1922, Belfast from 1910, Malin Head from 1958) and, with the exception of Belfast are not at sufficiently high frequency to study tidal and storm surge changes.

The pattern of glacial isostatic adjustment in Ireland is such that the northeast of the country is slowly rising and south west is subsiding. Therefore, the current set of long sea level records inherently underestimate relative sea-level rise in Ireland. Many sectoral and local authority climate adaptation plans in Ireland place a strong emphasis on threats related to changes in sea level in the coming years. This proposal seeks to augment our understanding of sea level change in Ireland through a targeted PhD scholarship.

Proposal

We propose a **structured four-year PhD project** on a full-time basis to address:

- How does a long, southern record of sea level revise estimates of relative sea level rise around Ireland?
- How have tides and storm surge characteristics changed around the Irish coast since the 1930s?
- What information can this new record provide in the context of regional sea level change in the northeast Atlantic relative to global patterns?

To achieve these goals, accurate data archaeology of sea level records will be necessary. Sea level records exist since the 1930s and are typically stored in paper marigram format. Once digitised, mean sea level, tidal parameters, and storm surge characteristics will be calculated. Mean sea level records will be compared with existing long records of mean sea level in Dublin, Belfast, and Malin Head. They will also be compared with observations from the National Tide Gauge Network including two newly-installed GLOSS standard tide gauges at Union Hall, Co. Cork and Howth, Co. Dublin.

Outcome

The expected outcomes from the project will be:

- Revised estimates of sea level change for various locations around the Irish coast.
- Assessment in the context of global projections of sea level change for the NE Atlantic.
- Targeted advice to policy makers in Government departments and local authorities in Ireland to guide their climate adaptation planning.
- Scientific publications to disseminate the research findings to the scientific community.
- Preparatory work to enable the production of revised sea level harmonics and a tidal atlas for the Irish coast.
- Building the data pipeline to ensure the long term availability of Irish sea level records at the Permanent Service for Mean Sea Level (PSMSL) and at the major aggregators of European marine data e.g. EMODnet, Copernicus and SeaDataNet.
- Significant capacity in sea level analysis will be enabled through this fellowship. The fellow will have the opportunity to train with international experts in the field.

Links to MI Strategy

This proposal falls principally under Strategic Focus Area 3 - Research & Innovation. This constitutes fundamental research of sea level around the Irish coast. The research has wide potential application in information climate adaptation decisions by government departments and local authorities. The proposal also links to Strategic Focus Area 2 – Forecasting Ocean and Climate Change as the revised sea level estimates (based on digitisation of historic observations) will improve forecasting models for tides and surges around the Irish coast in an operational context. The research will also contextualise observations of sea level over the last 150 years with respect to longer term climate change e.g. ice and ocean sediment cores and tree ring analysis. This research also has the potential to improve the scientific advice provided by Marine Institute to sea level stakeholders in Ireland and in an international context (Strategic Focus Area 1 – Scientific Advice and Services).

Specific Requirements

The scholar should have a primary degree in maths, science or engineering. Experience in the collection and analysis of marine data sets would be an advantage.

Financial Details

Scholarships will be up to €27,500 per annum (maximum funding of €110,000 over four years). This amount comprises a maintenance award of €18,500 (Irish Research Council rate effective 1-Jan-21) to the student as well as payment of fees to the host higher education institution (HEI). The maximum fees payable to the HEI will be €6,000 per annum. The scholarship award also includes a budget of up to €3,000 per annum for eligible research costs (travel & subsistence, publication costs, consumables and other costs e.g. laptop) for the sole use of the student, and are payable on a reimbursement basis direct to the host institution where the postgraduate student (scholar) is registered. There are no overheads payable on the scholarship. Publication costs are intended to cover publications on which the scholar is listed as first author and are published under Open Access.

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