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Field observations of Infragravity waves along the Belgian coast

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Infragravity waves have been identified as driving force behind various nearshore processes including beach and dune erosion, the development of seiches in harbors, and wave-driven coastal inundation when not accounted for in the design calculations. These waves have been observed to cause extreme water levels and resulting damage in various locations around the world.

Field observations and measurements are essential for understanding the behavior and impacts of infragravity waves, which are long surface waves with low and with significantly longer periods than the peak frequency of the incident wave spectrum. The period is typically between 30 and 300 seconds (0.03 – 0.003 Hz), the amplitude ranges from a few millimeters to tens of centimeters and has a wavelength scale of kilometers.

In this study, we first revisit field observations, instrumentation, and sampling techniques that have been used to study this phenomenon. The advantages and limitations of different approaches are discussed, as well as the challenges and best practices for collecting high-quality data in the field are addressed.

Field observations were conducted using multipurpose mooring frames equipped with both ADCP-based acoustic surface tracking and high-accuracy quartz pressure sensors. Data were collected continuously for 3 months, covering storm and moderate wave conditions. The measurements from ADCP and pressure sensor were combined and the infragravity wave characteristics were determined. Algorithms to calculate the wave characteristics were developed and combined with data from tide gauges and wave buoys to calibrate the sensors and cross-validate the results.

The observations showed that infragravity waves can be effectively monitored using ADCP and high-accuracy quartz pressure sensors, providing useful information regarding impacts on the coastal environment. The results showed the relevance and occurrence of these waves along the Belgian coast and valuable insights into their generation and propagation and the interaction with Sea-swell waves, including with relation to their spatio-temporal variability.