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High-Resolution Observations of a Meteo-Tsunami

Jelle Assink (1), Läslo Evers (1), Madelon Smink (1), and Arnoud Apituley (2)

(1) KNMI, R&D Seismology & Acoustics, De Bilt, Netherlands (assink@knmi.nl), (2) KNMI, R&D Observations and Data Technology, De Bilt, Netherlands

In the early morning of 29 May 2017, unusually large waves of over 2 m height hit the west coast of the Netherlands, leading to some property damage. The waves were due to a meteo-tsunami, which is a tsunami of meteorological origin, unlike seismogenic tsunamis. This particular event was caused by a rapidly moving cold front which featured a sharp squall line that moved towards the coast. Associated was a large perturbation in air pressure of 5 hPa which, along with Proudman resonance effects and the upsloping seabottom lead to the tidal surge. While the meteorological conditions leading up to such an event are relatively common, the more extreme events appear to happen under specific conditions only.

As a result of the meteo-tsunami, gravity waves were observed over the Netherlands with a variety of meteorological instruments, including weather radar, ceilometers and a network of micro-barometers that are typically used for the detection of infrasound. The high resolution gravity wave observations show characteristic waveforms that provide enhanced insight in the storm processes and that may be missed when averaged meteorological quantities are considered. The observations are found to be in good agreement with forecasts obtained from the non-hydrostatic HARMONIE model.