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Observations and modelling of a meteotsunami across the English Channel on 23rd June 2016

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Meteotsunami are shallow water waves in the tsunami frequency band, which are generated by sub-mesoscale pressure and wind velocity fluctuations. Whilst documented meteotsunami on the north-western European shelf have not been hazardous, around the world they have caused fatalities and significant economic losses. Previous observational studies suggest that across Western Europe strongly convective storms are meteotsunami-generating. We give evidence for a meteotsunami on 23rd June 2016 along the northern coastline of France, following strongly convective storms. This includes 1-minute temporal resolution tide gauge data, in situ pressure and wind velocities, and infrared satellite images. With an estimated wave height of 0.8 m at Boulogne, this meteotsunami is particularly large compared to previous observations in Western Europe. The tsunami travel times have been estimated using the wavefront method, showing that a single, instantaneous source for the waves is highly unlikely. Using the ocean model Telemac2D, idealised models of pressure and wind have been used to simulate the meteotsunami. The model supports that across the English Channel thunderstorms with north-easterly tracks, moving at the shallow water wave speed, can generate wave amplification through Proudman resonance. The Weather Research and Forecasting (WRF) model has been used to produce numerically simulated thunderstorms, which have been used to force the Telemac2D ocean model with idealised bathymetries. The WRF-Telemac2D model results also support meteotsunami generation by thunderstorms. To the author's knowledge this is the first time a thunderstorm simulation has been used to produce a meteotsunami-like wave, and indicates that non-hydrostatic, convective atmospheric processes are important for meteotsunami generation. This suggests that with combined high resolution observations and modelling, a meteotsunami forecasting system may become possible in Western Europe.