What is a meteotsunami?

A simple definition:
- Looks like an earthquake tsunami, but it’s not!
- Elevated wave activity caused by amplification of the inverted barometer effect.

Identifying a wave event as a ‘meteotsunami’ is difficult as around 99% of energy within the tsunami frequency band (2 mins – 2 hours) is related to meteorological forcing. Literature suggests events with a wave height exceeding 4σ can be classified as meteotsunamis.

To overcome these difficulties, this research sought to identify events by the occurrence of amplifying mechanisms.

Some mechanisms involved

Typical amplifying mechanisms for a meteotsunami are:
- Proudman Resonance: where a pressure system moves at a similar speed and direction to the free wave it propagates
- Greenspan Resonance: where a pressure system moves at a similar speed and direction to a coastally trapped wave
- Topographic effects: e.g. harbour seiching, topographic funneling, shoaling, continental shelf resonance

Developing a method to identify meteotsunamis

A method for identifying meteotsunami events is developed for occurrences at Sydney in 2013.

Fourier Analysis Methodology
Occurrence of East Coast Lows creates difficulty in identifying NSW meteotsunamis using a 4σ wave height threshold. Fourier analysis is used to detect dates with elevated energy within the meteotsunami wave bands.

Exploring theoretical methodologies
Understanding theoretical resonance conditions could allow causative barometric conditions to be detected and possibly forecast.

Proudman Resonance Conditions
\[ c = \sqrt{gh} \]

Greenspan Resonance Conditions
\[ c_{gps} = g \frac{\tan(\frac{1}{2}n)}{n} \]

Conclusions
- High spatial and temporal resolution bathymetry data would extend modelling and predictive capabilities.
- High resolution water level recording within NSW lakes and estuaries would improve monitoring, modelling, and predictive capabilities by allowing detection of shorter period wave energy.