What are meteotsunamis?

Meteotsunamis are a relatively unknown or misidentified phenomenon. As the name suggests, these are waves that are similar to the more commonly referenced seismic tsunami waves, which are caused by earthquakes along the ocean floor. However, meteo-tsunami waves are created by significant changes in wind and air pressure that often accompany convective thunderstorms instead of seismic activity, hence they are meteorologically-driven and thus the name meteotsunami for short. Like the more familiar seismic tsunami waves, meteotsunamis are rapid changes in water level over a short period of time from a few minutes up to an hour.

These are unusually fast changes in water level than can catch people off guard and inundate the coast, damage waterfront property, disrupt maritime activities, and create strong currents. Although an unfamiliar name to most, meteotsunamis make up about 20 percent of the tsunamis in the world, and occur all around the globe, from ocean coasts to the Great Lakes. For most of the historical record, these waves have been misidentified as either freak waves, tidal waves, or a seiche. In recent years significant research has led to a better understanding of what causes these waves and the impact they have on the coasts. Recently, we've been investigating historical cases in order to determine exactly what conditions cause meteotsunamis, particularly in the Great Lakes, and how this understanding may lead to the ability to forecast such events and protect life and property.

What is the research community doing to advance our understanding of meteotsunamis?

Scientists have been investigating historical cases in order to determine exactly what conditions cause meteotsunamis, particularly in the Great Lakes, and how this understanding may lead to the ability to forecast such events and protect life and property.

The aim of our current research, and the focus of our 2017 meteotsunami session at the Ocean Science Meeting, is to highlight the climate conditions of meteotsunamis around the world, understand commonalities and differences between different regions, in order to develop meteotsunami warning and forecast capability. During the meeting, we presented research on new meteotsunami cases from Lake Superior, Lake Michigan, and Lake Huron, as well as a long-term database of frequency, intensity, hot-spots of meteotsunamis in the Great Lakes), and NOAA's work to develop a forecast model for meteotsunamis.

We represent a collaborative team of international researchers from NOAA and universities around the world, which aims to further our understanding of meteotsunamis for this global phenomenon. We are organizing the 1st World Conference on Meteotsunamis, to be held in Split, Croatia in May 2019.

Additional resources:

- Meteotsunami fact sheet, National Tsunami Hazard Mitigation Program, National Weather Service
- Meteotsunamis in the Laurentian Great Lakes: Bechle, A., C.H. Wu, D.A.R. Kristovich, E.J. ANDERSON, D.J. Schwab, and A.B. Rabinovich. Meteotsunamis in the Laurentian Great Lakes. Scientific Reports (DOI:10.1038/srep37832) (2016).ANDERSON, E.J.,
- Reconstruction of a meteotsunami in Lake Erie on 27 May 2012: Roles of atmospheric conditions on hydrodynamic response in enclosed basins. Bechle A. J., Wu, C.H., Schwab, D.J. Mann, G.E. and Lombardy, K.A. Reconstruction of a meteotsunami in Lake Erie on 27 May 2012: Roles of atmospheric conditions on hydrodynamic response in enclosed basins. Journal of Geophysical Research: Oceans (DOI:10.1002/2015JC010883) (2015).
- Summit: Meteotsunami Forecasting and Warning System for the Laurentian Great Lakes: New Paradigm for Big data Challenges and Analytics

- Ocean Sciences Press Conference Recording (Video)
- Two meteotsunamis, large waves caused by storm systems, came across Lake Michigan on April 13, 2018. (Animation)

Contact:

Media Inquiries
Margaret Lansing
NOAA GLERL
4840 S. State Rd.
Ann Arbor, MI 48108-9719
margaret.lansing@noaa.gov
734-741-2210

Research
Eric Anderson
NOAAGLERL
4840 S. State Rd.
Ann Arbor, MI 48108-9719
eric.j.anderson@noaa.gov
734-741-2293