Meteotsunamis: from local hazard to global relevance

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The presentation gives an overview of the state-of-the-art meteotsunami research. Meteotsunamis or meteorological tsunamis are atmospherically generated long ocean waves in the tsunami frequency band. This phenomenon is traditionally witnessed in harbours and bays. At some locations meteotsunamis have such a strong impact that they are remembered in legends or local toponyms. Meteotsunamis manifest as long period (period is 5-120 min) ocean waves occasionally exceeding several metres in heights. At some regions, like the Mediterranean, meteotsunami heights exceed both tide and storm surge heights several times and therefore generate substantial coastal flooding. In constrictions, channels and harbours, strong currents may break moorings of large vessels, sink yachts and smaller boats, and wipe out aquaculture farms, while substantially increasing erosion over coastlines. Meteotsunamis are generated by travelling air pressure or wind disturbances, which – when travelling over shallow waters for which the speeds of the atmospheric disturbance is close to the speed of long ocean waves (i.e., the Proudman resonance) – generate large waves that are further topographically amplified by coastal topography. Specific synoptic patterns are found to favour formation of meteotsunamigenic atmospheric disturbances, thus opening a possibility to quantify such a connection and use it for a meteotsunami forecast services and for creation meteotsunami hazard projections in future climates. Recently, substantial efforts have been directed towards research of a planetary meteotsunami generated by an explosive volcanic Hunga Tonga-Hunga Ha'apai eruption (15 January 2022) radiating acoustic-gravity Lamb waves over the globe. Finally, it seems that meteotsunamis – as other types of tsunamis – may radiate energy vertically in the atmosphere, generating substantial variations in the ionospheric total electron content. It seems that – despite a tremendous increase in knowledge on different aspects of meteotsunamis – there is a great number of open questions which are waiting to be answered in order to properly quantify the associated hazards and risks in the present and future climates, and to construct an efficient warning system for alerting local populations.