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Assessment of the tsunami in the Pacific Ocean caused by the explosion of the Hunga Tonga–Hunga Ha'apai volcano on January 15, 2022, using the express method of operational forecasting

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Abstract. The aim of the study was to confirm the possibility of forecasting tsunamis of non-seismic (volcanic) origin using the express method of operational forecasting. The surface wave formed as a result of the explosive volcanic eruption on January 15, 2022 was a superposition of forced (baric) waves caused by an atmospheric pressure wave and free (gravity) waves generated by the disintergration of the disturbance in the source. The express method of operational tsunami forecasting was used to compute the gravitational component of the surface wave. The method allows one to compute the tsunami waveform at any point in the ocean and near the coast in real time based on the data from the sea level measurement stations. The computation of the tsunami on 15.01.2022, its gravitational component, at the DART stations remote from the source was performed based on the data from the DART stations 51425 and 52406 closest to the volcano. For an adequate forecast, the information on the tsunami of the DART stations closest to the source with the duration of a quarter of the first period is sufficient, which is especially important in the operational mode. The result satisfies the definition of the concept of "tsunami forecast" formulated by the Intergovernmental Oceanographic Commission of UNESCO. It has been confirmed that the express method can provide a tsunami forecast regardless of the mechanism of its excitation. It remains unclear how adequate the assessment of the amplitude of surface waves is based on the bottom pressure data is.

Keywords:
tsunami, operational tsunami forecast, tsunami warning services, Pacific Ocean, sea level measurements, Lamb waves, forced waves, free waves

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