EGU24-4815, updated on 23 Jan 2025
https://doi.org/10.5194/egusphere-egu24-4815
EGU General Assembly 2024

Propagation Process of Long Ocean Wave from the Yellow Sea to the Korea Strait in Spring 2019

Kyungman Kwon[1], Sung-Gwan Myoung[2], Byoung-Ju Choi[3], and Kwang-Young Jeong[4]
[1]Tropical & Subtropical Research Center, Korea Institute of Science & Technology, Jeju, Korea, Republic of (kkwon@kiost.ac.kr)
[2]Tropical & Subtropical Research Center, Korea Institute of Science & Technology, Jeju, Korea, Republic of (msg@kiost.ac.kr)
[3]Department of Oceanography, Chonnam National University, Gwangju, Korea, Republic of (bchoi@jnu.ac.kr)
[4]Ocean Research Division, Korea Hydrographic and Oceanographic Agency, Busan, Korera, Republic of (kwangyoung@korea.kr)

Meteotsunami, which cause fluctuations on the sea surface, occur due to atmospheric pressure jumps and atmospheric gravity waves. This is a long ocean wave with almost the same spatio-temporal scale as regular tsunamis, causing significant damage to coastal areas. To understand the relationship between meteotsunami and climate change in Korea, research on the genesis and development processes of meteotsunami is necessary. This study examines the generation and propagation process of a meteotsunami that occurred in the Korea Strait on April 7, 2019, using observational data and numerical models. Coastal tidal observation stations detected a meteotsunami in the Korea Strait, characterized by oceanic long waves with heights ranging from 0.2 to 0.9 meters and a period of about 60 minutes. Atmospheric pressure jumps, starting in the Yellow Sea and moving into the Korea Strait, propagated in succession, observed to range from 2 to 4 jumps with magnitudes of 1.5 to 3.9 hPa. Analysis of meteorological data showed that the isobars of the atmospheric pressure jumps were oriented eastward in a counterclockwise direction at angles of 75 to 83 degrees, moving at speeds of 26.5 to 31.0 m/s. The Regional Ocean Model System (ROMS) was used to reproduce this meteotsunami's generation and propagation process. Numerical model results indicated that long ocean waves were amplified in the southwestern part of the Yellow Sea with depths greater than 75 m due to Proudman resonance. This long ocean wave refracts towards the coast in shallow areas north of the Korea Strait, with refraction and reflection by offshore islands influencing the wave heights at the coast. In particular, the high maximum amplitude of long ocean wave in Masan Bay is mainly due to refraction and reflection by nearby islands, increasing the amplitude by approximately 72.7%. Sensitivity experiments were conducted to examine the relationship between the height changes of long ocean wave on the coast and the speed and angle of the atmospheric pressure jumps moving from west to east across the Korea Strait. In the numerical model experiments, atmospheric pressure jumps moving at angles of 80 to 118 degrees and speeds of 27 to 30 m/s significantly increased the amplitude of the ocean long waves. Regionally, Seogwipo and Goheung showed increased amplitudes at speeds of 24 to 30 m/s and were relatively less affected by the angle. In Masan, the maximum amplitude of sea surface oscillation occurred when the

atmospheric pressure jump moved at angles of 85 to 100 degrees at a speed of 30 m/s.