

## Simulating rapid water level decrease of Lake Biwa due to Typhoon Jebi (2018)

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A powerful typhoon Jebi brought heavy rains and winds of up to 50 meters per second to the western part of Japan in September 2018. The strong winds caused a serious damage in the region. Notably, the water level in the south lake of Lake Biwa decreased by 1 m within a few hours. This amplitude is more than an order of magnitude bigger than the typical variations in a normal condition. This water level decrease dried up a part of the coastal lake. The sudden water level change has a potential hazard of flooding, although it did not happen in this particular event of Jebi (2018).

To understand the mechanism of the rapid water level change due to the strong typhoon, we performed a high-resolution simulation of Lake Biwa using a regional ocean model known as ROMS at 50-m-mesh resolution forced by the atmosphere from a regional atmospheric model SCALE at 1-km-mesh resolution. A river model (Kotsuki et al. 2012) was also used to calculate river inflows into the lake. For outflows through a water gate at the southern end of the lake, the operational station record was used except for the time when the typhoon was approaching the lake. During this time, the gate was kept open to the full extent, so that the outflow rate was fixed at the maximum value of the gate specification.

ROMS reproduced well the rapid decrease of water level near the western coast of the south lake: 80 cm decrease within 2 hours. The model data showed that rains increased the water level, but strong southwesterly winds along the long axis of Lake Biwa moved a large amount of water from the south lake to the north lake. The northward water current became maximum at 0730 UTC, when the typhoon already departed from Lake Biwa, but the southwesterly wind speed was the maximum. The water level decrease had a delayed response, and its peak appeared at 0820 UTC. After that, the water level rapidly recovered to the normal level within 2 hours. This was similar to the actual observation data.

Keywords: Lake Biwa, Typhoon, Water Level Change, Numerical Simulation