

An Observing System Simulation Experiment for Lake Biwa, Japan; Test on Cyclone Man-Yi in 2013.

*John Wells¹, Guillaume Auger¹

1.Dept. Civil Eng., Ritsumeikan University

Fourteen million people drink water supplied from Lake Biwa, in the Osaka-Kyoto region of Japan. Sewage treatment plants surround the lake, atomic power stations lie within 40 km on the Japan Sea, and tropical cyclones hit the region every year. Thus there is significant risk of pollution triggered by earthquakes and/or typhoons.

The North Basin's dimensions of roughly 20x40 km, and maximal depth of 104 m, facilitate geostrophic gyres during the stratified season. If continuously available nowcasts were available for the three-dimensional circulation of the lake, and associated pollutant or nutrient motion, they could support management of water quality both during emergencies, and in normal times. Accordingly, our group is developing a nowcasting system to track the fields of flow, temperature, etc in Lake Biwa. Simulations are performed by the unstructured-mesh ocean model SUNTANS. The Local Ensemble Transform Kalman Filter (LETKF) scheme assimilates available data streams. The forecast system integrates an ensemble of seven state vectors: one unperturbed state plus six perturbed states generated using bred vectors.

We will present the assessment of performance of the nowcasting during typhoon Man-Yi, which struck our region in September 2013. We chose this event due to the strong wind and sediment discharge associated with record rainfall.

To quantify the forecast skill, we first performed a "Nature Run", i.e. a fine-scale simulation of the Lake Biwa's circulation. The consistency of the simulation was confirmed by in-situ temperature data at six depth levels for the vertical consistency, and space borne satellite estimates of SST. We also used near-infrared satellite data to analyse the propagation of turbidity after the typhoon.

After confirming in this way that the original simulation was consistent with observations, we performed an Observing System Simulation Experiment (OSSE), in which artificial data streams from the simulation are assimilated into a virtual nowcasting system. We will show the results of the reanalysis of the typhoon ManYi using the nowcasting system. We will also discuss instabilities identified during and after the typhoon by the bred vectors.

Keywords: Lake Biwa, Typhoon, Nowcasting, Data Assimilation