

# Estimation of water velocity fields induced by the Nihonkai Chubu Tsunami by analysing aerial photos in Akita and Noshiro harbors

# Takashi Yanuma[1]

[1] PASCO Corporation

Aerial photos of water surface were taken in Noshiro and Akita harbors in the time of hitting of the tsunami of the 1983 Nihonkai Chubu Earthquake. By using these photos, I estimated the water velocity by two different methods, and compared it with the numerically calculated velocity field.

The first method is as follows; Aerial photos are taken overlapping their extents. So, if some materials such as drifting logs on the sea surface, are taken at the different positions. Getting data of the time interval of the two shots and the height of the airplane, I can estimate the velocity of the water flow. The second method is as follows; when we see two photos stereoscopically, floating materials are seen as if they rise up or sink down from the water surface due to the movement by the water flow. I estimated the water velocity from this parallax.

In Akita harbor, I obtained the velocity field in a straight canal. The velocity was about 80cm/sec near the log pond in the direction towards the harbor mouth. At the point one kilometer from the harbor mouth, the velocity was almost zero, and the flow turned to the opposite direction from the point to the harbor mouth. The wave length was estimated about 2 km. In Noshiro harbor, two eddies with the radius of 600m were seen and the eddy outer side of the harbor was clockwise and the other on the inner side of the harbor was counterclockwise. The maximum velocities of water particles in the outer and the inner sides of the eddy were about 170cm/sec, and about 90cm/sec for the inner one, respectively.

On the other hand, the velocity fields were calculated numerically. For Akita harbor, I assumed the water level change of 0.625 times of the water level change observed on the tide gauge station in the harbor. For Noshiro harbor, I set the calculation region covering the source area of the 1983 Japan Sea and calculated the velocity by assuming the sea floor elevation of the 1983 Nihonkai Chubu Earthquake proposed by Aida(1984).

In Akita harbor, I could reproduce the water flow pattern. It is clarified that the numerically calculated velocity was about 0.6 times of that of the observed one. This may be due to that the numerical simulation could not reproduce the local strong velocity. In Noshiro harbor, I could reproduce the two eddies, but the outer eddy was calculated at the southerly. By analyzing the numerical simulation, it was found that the outer eddy was caused by the flow along the wharf at the harbor mouth and the inner eddy was caused by the flow from the bottom of the harbor. The calculated maximum velocities were about 0.8 times and 1.8 times of that of the observed one.