Wave Measurements at Sendai Port – Fieldwork (August 8 – 9, 2016)

Theme：Coastal erosion, seawall, typhoon waves, numerical modeling.
Location: Sendai Port, Miyagi, Japan

Associate Prof. Jeremy D. Bricker and Assistant Prof. Volker Roeber (International Research Institute of Disaster Science (IRIDeS), Tohoku University) have teamed up with Associate Prof. Hiroshi Takagi (Tokyo Institute of Technology) and Project Associate Prof. Miguel Esteban (University of Tokyo) to investigate the wave regime near Sendai Port during Typhoon 5 (Omais).

The Port of Sendai is not only the economically most important port in Tohoku (both by volume and value of cargo); it is also the only one that can handle 40' containers. Consequently, a new container storage facility was constructed at the southern part of the port in 2010. Shortly after its completion, the 2011 Great Tohoku Tsunami struck the area and caused substantial damage to the main offshore breakwater (foundation failure), cargo processing facilities, and administrative buildings. Since then, the coast near Sendai Port has been experiencing strong erosion and failure of defense structures. A seawall construction is underway to protect critical parts of container storage areas.

The IRIDeS researchers, Volker Roeber and Jeremy D. Bricker, are investigating the cause of the sudden increase of coastal erosion near Sendai Port to better understand its fundamental mechanisms and to suggest efficient counter-measures. One important step of this research effort is gathering data of the wave regime during large swell events. Wave measurements usually require expensive equipment and complex deployment operations; however, the team found a simple, yet efficient way to measure wave heights in the runup zone along the beach.

A survey rod with a pressure sensor mounted deployed in the wave runup zone and stabilized by a tripod. A total station then determined the horizontal and vertical position during the deployment by focusing on a prism attached to the top of the rods. The survey utilized two pressure sensors simultaneously to compare the wave regimes and water levels at different locations along the beach. Post-processing of the data then showed wave spectra as well as gradients in the mean water level during energetic swell events that help explain local current patterns and that serve for validation of numerical models.

Typhoon swell near Sendai Port

Wave measurements using
pressure sensor and total station

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