Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

HTT09-P01 Room:Convention Hall Time:May 20 18:15-19:30

Classification of shallow-water bottom features by using DEM obtained by airborne LiDAR bathymetry

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The distribution of sea grass habitats is an important and basic piece of information for understanding shallow sea environments. Supervised and unsupervised classification of aerial photographs and satellite imagery is an effective method to assess the state of shallow-water bottom features. For accurate classification, it is important to measure the topography of the seabed extensively and at high resolution, because each band brightness should be corrected by depth. This is difficult, as the depth of the water restricts the movements of survey vessels.

In this study, we generated a Digital Surface Model (DSM) of shallow-water bottom features via airborne LiDAR bathymetry. We and then used the DSM and aerial photographs to classify the bottom features. Airborne LiDAR systems can measure the depth of shallow water of $<$ ˜30 m depth using 532 nm wavelength laser pulses. As part of the research project ”Evaluation of multiple geological risk for giant earthquakes and tsunamis, - comprehensive geological approaches for the Great East Japan Earthquake” conducted by the National Institute of Advanced Industrial Science and Technology (AIST), we conducted simultaneous bathymetry and aerial photography of several bays in the east coast of Tohoku, Japan. We used a Fugro LADS Mk III system for bathymetry and a Redlake image sensor for aerial photography. A 5 m grid (max. 2.5 m) DSM and 0.4 m resolution orthophotograph can be obtained (Matsunaga et al., this meeting) with these instruments.

We classified the Redlake imagery, satellite imagery, and other aerial photograph after absorption corrections at each band by using topographic data. The M7000 series 1 m interval isobath data compiled by the Japan Coast Guard were also used for the topographic analysis.

Keywords: Airborne LiDAR, supervised classification, shallow-water bottom features, absorption correction