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Preliminary results for the inundation heights, current velocities, and deposits of the 2011 Tohoku tsunami

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The 11 March 2011 MW 9.0 Tohoku megathrust earthquake off the coast of Japan was one of the largest events in the history of Japan. The huge tsunami inundated a large area on the northeast coast of Japan, and resulted in widespread devastation. Remarkable feature of the Tohoku region is the abundance of available historical and geological records for the past earthquakes and tsunamis. Based on the 1200 years historical records and 2800 years geological records, tsunami disaster mitigation countermeasures were prepared to the Pacific coasts of the Tohoku region. Hence, the Tohoku region is one of the best prepared regions against the tsunami in the world. This event is a very important opportunity to test the validity of a previous methodology for the tsunami risk assessment using the historical and geological records. In addition, there are many video footages for the 2011 event and hence the sedimentation process can be linked to the flow characteristics (e.g., inundation height and current velocity) of the tsunami. In order to study the inundation heights, current velocities, and their relationships to the erosion and sedimentation by the tsunami, we organized an international team of scientists and undertook a post-tsunami survey in May 2011 that focused on the area close to the Sendai megacity and the Sendai airport near the Natori to Iwanuma cities.

The field observation was conducted along transects established on a grid extending few kilometers inland near the north of Sendai airport. We conducted high resolution sampling at each pit to study the vertical and horizontal variation of the grain size for understanding the sedimentary process and for performing the inversion modeling. Geochemical analyses are also performed for the environmental assessments. We also studied the paleo-tsunami deposits such as the 869 Jogan tsunami in order to compare the sedimentary characteristics to the 2011 tsunami deposits. We also used video footages at the Natori city and at the Sendai Airport and estimated the current velocity of the tsunami. Our preliminary analysis revealed that the wave front of the run-up wave of the tsunami was moved about 3 m/s on land, whereas it was about 6.5 m/s in the Natori River.

In our presentation, tsunami inundation heights and current velocity will be linked to the sedimentary process of the tsunami deposits by using the forward and inversion modeling results.