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## Run-up height distribution of tsunami caused by the 2011 Mw 9.0 Off Pacific Coast of Tohoku earthquake and its seismic i

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On 11 March 2011, at 02:46:23 PM local time 2011, a moment magnitude 9.0 earthquake (called 2011 Off Pacific Coast of Tohoku Earthquake) occurred in the off shore of the northeast Japan, resulting in extensive damage throughout east-northeast Japan, including more than 14,100 deaths and 13,500 missing and ~5,000 injured.

The epicenter is located on the on the off shore near the plate boundary between the Pacific plate and the North American plate, 130 km east of Sendai City, Miyagi Prefecture, northeast Japan. Seismic inversion analyses reveal that a maximum thrust slip of >20 m occurred on a 500-km-long fault plane (USGS, 2011; Yagi and Nishimura, 2011). Such large thrusting slip along the plate boundary between the Pacific plate and the North American plate resulted in an enormous tsunami that caused great damage along the north-south striking coast parallel to the plate boundary.

It is reported that the tsunami-induced inundation areas are distributed in a wide corridor along the coast with the tsunami wave height of >35 m, resulting in serious secondary damage after the main shock, however, the tsunami run-up height distribution and its relations with coseismic slips remain unclear. In the present study, we report the analytical results of tsunami run-up height using high-resolution remote sensing imagery data, including ALOS and Google images and aerial photographs, acquired before and after the 2011 earthquake and digital elevation data, and calculated coseismic slips on the fault plane. Based on the analytical results, we conducted fieldworks in the early April to validate the interpretations and compared the run-up heights with the GPS observations and calculated seismic slips on the fault plane.

Analytical results and field investigations reveal that the run-up heights are up to >20-30m in Ishinomaki-Miyako areas and decreases south- and northward gradually. The distribution pattern of run-up heights is consistent with that of ground displacements indicated by GPS observations and calculated coseismic slips on the fault plane along the plate boundary. The findings indicate that the run-up height is closely related to the coseismic slip on the source fault along the plate boundary between the Pacific plate and the North American plate.

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Keywords: Off Pacific Coast of Tohoku earthquake, tsunami, run-up height, seismic slip, plate boundary, ALOS image