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## Field surveys of tsunami heights and inundation area in Ibaraki and Chiba, generated with the 2011 Tohoku earthquake

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We conducted field surveys of tsunami heights and inundation area in Ibaraki and Chiba prefectures, just after the 2011 off the Pacific coast of Tohoku earthquake. In the surveys, we tried to find evidences which indicate the tsunami heights, for examples, watermarks on walls and debris on the ground. Witness accounts about the tsunami heights were also obtained. Then, tsunami inundation heights (above the sea level), run-up heights (the height of inundation limit above the sea level), and flow depth (above the ground) were measured based on the evidences by using a total station (electronic/optical instrument). Along the Kujukuri beach, Chiba prefecture, inundation area was intensively surveyed. Locations of the most-inland debris and/or locations which inhabitants pointed out as the inundation limit were measured by using GPS receivers.

The results were briefly shown as follows. The tsunami inundation heights were measured to be 3.3-3.6 m (above the sea level at 17:20 on 14 March, 2011) in Hitachi-naka city, Ibaraki prefecture, 4.4-4.8 m (above the sea level at 15:29 on 14 March) in Oarai town, more than 7.5 m in Kamisu City, 3.8 m (above the sea level at 15:18 on 13 March)in Kujukuri town, Chiba prefecture. The flow depths were also measured to be more than 3.5 m just behind the most-seaward beach ridge in Sanmu city. The estimated inundation area indicates that the tsunami basically inundated up to several hundred meters inland from the coast line. Around ditches, some places were inundated about 1.5 km from the coast line. In the south part from Katagai village of Kujukuri town, the tsunami barely inundated over the Kujukuri toll road, which runs parallel to the coast line. That means that the toll road might behave as breakwaters.

Keywords: the 2011 off the Pacific coast of Tohoku earthquake, tsunami height, tsunami inundation area, field survey, Ibaraki prefecture, Chiba prefecture