Comparable Analysis of the Distribution Functions of Runup Heights of the 1896, 1933 and 2011 Japanese Tsunamis in the Sanriku Area

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Data from a field survey of the 2011 tsunami in the Sanriku area of Japan is presented and used to plot the distribution function of runup heights along the coast. It is shown that the distribution function can be approximated using a theoretical log-normal curve [Choi et al, 2002]. The characteristics of the distribution functions derived from the runup-heights data obtained during the 2011 event are compared with data from two previous gigantic tsunamis (1896 and 1933) that occurred in almost the same region. The number of observations during the last tsunami is very large (more than 5,247), which provides an opportunity to revise the conception of the distribution of tsunami wave heights and the relationship between statistical characteristics and number of observations suggested by Kajiura [1983]. The distribution function of the 2011 event demonstrates the sensitivity to the number of observation points (many of them cannot be considered independent measurements) and can be used to determine the characteristic scale of the coast, which corresponds to the statistical independence of observed wave heights.