Characteristics of damages from three earthquakes in the northern Miyagi Prefecture since 1900

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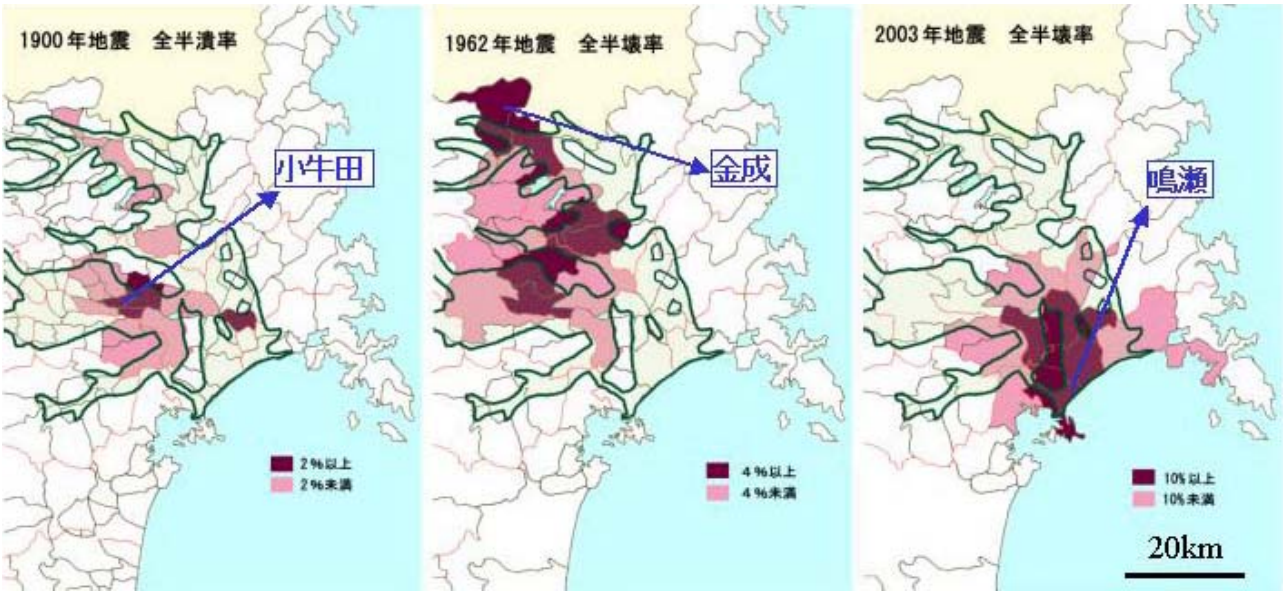
Three damage earthquakes occurred in the northern part of Miyagi Prefecture at 1900, 1962, and 2003. Magnitude and location of source were specified for the 1962 and 2003 events. But they were not clearly determined for the 1900 event while some historical earthquake catalogs indicate that the epicenter of the 1900 event was almost the same place of the 1962 event and magnitude M was about 7.0 which was larger than the others. M's of the 1962 event and of the 2003 event are 6.5 and 6.4, respectively. We re-examined damage data for each event to obtain the distributions of damage rates for comparison of magnitudes and the locations of sources for the three events. It was found that the heavy damage region for each event coincides with the distribution of alluvial plain. When the northern Miyagi Prefecture is divided into three regions, that is north, center, and south, the 1962 event had two heavily damage area in the northern region and the central region, while the 1900 event has one area in the central region. The source region of the 1962 event was specified with the distribution of aftershocks in the north region. The other damage region may be due to the accumulated alluvial soil in the central region. On the other hand, one heavily damage area by the 1900 event strongly suggested that the source region of this event was in the central region. Judging from the area of the damage region of the 1900 event, it was concluded that the magnitude of this event was overestimated and was similar to those of the 1962 and 2003 events. This conclusion was supported by an empirical relation between earthquake magnitude and Utsu's damage rank for the inland shallow earthquakes since 1885 in Japan. The statistics of the earthquake damages for the three events with almost the same magnitude are useful to measure the development of the seismic performance of Japanese houses. However, a big obstacle exists. The basis of judging the degree of damages has significantly changed.


1900年地震　全半潰率
小牛田
2%以上
2%未満
1962年地震　全半壊率
金成
4%以上
4%未満
2003年地震　全半壊率
鳴瀬
10%以上
10%未満
20km