

Re-examination of seismic quiescence prior to the 2011 Tohoku earthquake

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We have presented the seismic quiescence to be detected prior to the 2011 Tohoku earthquake in the last SSJ meeting (Yoshikawa,2011). We examined two cases of the periods, considering the difference of the detectability of seismic activity. According to this, the seismic quiescence appeared since 2001 around the San-Riku coastal area, the major length of three to four hundred km, in the period from October 1997 to February 2011 with the threshold of M3.0 (Case-A). And it appeared since 1996 in the wider area than the above case with the major length 500 km, in the period from January 1984 to February 2011 with the threshold of M4.0 (Case-B). Against this result, it was pointed out that the appearance should be influenced by de-clustering and the seismic activity in the reference period. And as stated above, the difference of the quiescence area and the period between the two cases suggests dependences of the parameters used for the analysis of the quiescence. In this study we present the results of re-examination, considering the problems.

As a method for detection of seismic quiescence we chose the method developed by Aketagawa and Ito (2008) and Hayashimoto and Aketagawa (2010) in order to find the areas of activation and quiescence of seismicity (hereafter, it may be called 'e-Map'). We can obtain the seismicity map depending on the seismic density of each region by this method. We investigated the influences of the threshold of magnitude, the radius of the test circle in survey area, the reference period, the survey period, etc. and found that the appearance form of quiescence area can be remarkably changed by choice of the above parameters, although a scaling law between the quiescence area and the magnitude of the earthquakes accompanied by seismic quiescence was clear.

As the results of the study, we did not find large differences both in the area and commencement of quiescence prior to the 2011 Tohoku earthquake caused by de-clustering. And we found that since the seismic activity in the coastal area of the San-Riku became high from 1989 to 1995, it makes the appearance of quiescence earlier, if the reference period includes that active period. Then as we set the reference period in the period from 1984 to 1988 for Case-B, the appearance of quiescence delayed to 2001, as in Case-A.

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