Foreshocks and earthquake hazard assessment in Japan mainland.

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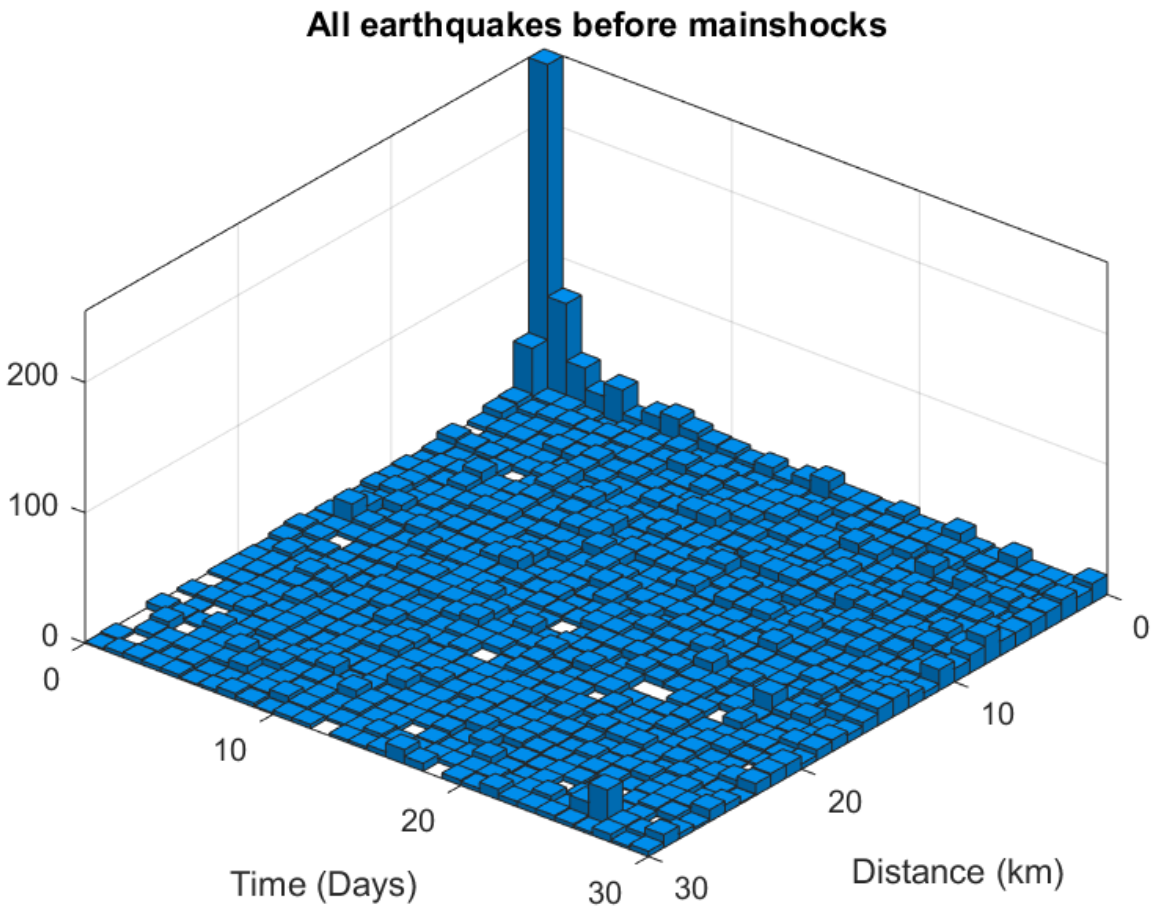
In the past, studies of foreshocks have estimated the rate of foreshock occurrence before moderate and large earthquakes in high seismicity areas such as California. Those studies also show that it is possible to calculate the significant probability that a larger earthquake follow a specific event. In our study, we use the earthquakes recorded on land in the Japan Meteorological Agency catalogue from 2004 to 2019 to study foreshock. We looked at the temporal and spatial distributions of pairs of earthquakes where a smaller earthquake is followed by a larger earthquake. There is a clear peak for pairs of events that are located with 5 days and 2 km of each other. Therefore our definition of a foreshock is an event that is followed by a larger event within 5 days and located within 2 km. In this analysis, we removed aftershocks and sequences of earthquake swarms.

According to our results, about 40% of mainshocks (M >= 3.0) have foreshocks. This is consistent with previous studies that foreshocks could be a useful tool for the short-term earthquake hazard assessment. Also, wwe also estimated that the average probability that an earthquake will be followed by an earthquake of large magnitude is ~10%.


All earthquakes before mainshocks
200
100
0
0
10
20
30
Time (Days)
0
10
20
30
Distance (km)