

Seismicity shadows and stress shadows in aftershock activity

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This paper examines the space-time distribution of aftershocks to forecast the probable location of a large aftershock that triggers a significantly large number of secondary aftershocks. For performing this analysis, the time elapsed since the main shock is transformed using the standard aftershock decay rate in the entire aftershock area. Here, it is assumed that, for the period until such a large aftershock, the occurrence rates in all aftershock subregions obey the same Omori-Utsu function except for the parameter K that depends only on the location. In the normal aftershock activity, each location has a constant occurrence rate with respect to the transformed time. In other cases, there are space-time zones where the events are distributed more frequently or less frequently than those in the preceding period. The more frequent anomaly includes secondary aftershock activity or triggered swarms. The less frequent anomaly, called the seismicity shadow in this paper, indicates the region and period of quiescence relative to the normal decay rate in the subregion. A number of recent aftershock sequences in and around Japan are investigated. The seismicity shadow of the considered aftershock activity is explained based on the stress shadow caused by possible aseismic slips in and near the aftershock volume. According to the case studies presented, they are not only preseismic slips of a large aftershock but also postseismic slips of the main shock or a large aftershock.

References

Ogata, Y. (2008). Seismicity shadows and stress shadows in aftershock activity, revised version, in preparation.