

# Triggered Surface Faults Associated with Large Earthquakes Detected by L-band SAR Interferometry

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Interferograms of L-band SAR satellite for large earthquakes generally show elastic deformation caused by the main earthquake as well as numerous complex surface displacements that cannot be explained by the motion of seismic source faults. We have identified linear surface displacements in the interferograms considered to be triggered surface faults for several large earthquakes. These linear surface displacements include shallow extensions of the seismic source faults, however, most of them are located away from the hypocenter and are considered to be triggered surface faults which are not directly connected to the seismic source faults. Since these triggered surface faults have not found evidence of generating large seismic motions, many are unlikely to cause major earthquakes in the future.

However, we found a new example of an active fault that had caused a moment magnitude of 7 class earthquake in the past became a triggered surface fault associated with another moment magnitude of 6 class earthquake of 2018 Northern Osaka.

The emergence of these triggered surface faults associated with large earthquakes is likely a common phenomenon, however, their causes vary and are diverse. For example, in 2016 Kumamoto earthquake sequence, the strain created by the main shock and the motion of the triggered surface fault coincided in a specific area, and it was thought that the main shock directly created the triggered surface faults. Conversely, in another area the movements of the two did not match, and the main shock was just a trigger, and there were also triggered surface faults that have released strain accumulated over a long period from the past.

From these, the following hypothesis is considered. Regardless of the causes, a large earthquake tends to induce the movement of triggered surface faults. Then, the triggered surface faults release the strain by causing fault motions and form linear surface displacements. Once such faulting occurs, they remain as weak fault planes that are easy to move, and will repeatedly move again at the same locations in the future.

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# Triggered surface faults (TSF) associated with large earthquakes

L-band SAR detected large number of TSFs.

Similar TSFs appear to form groups.

Even though they have similar shapes, the causes of different group of TSFs are diverse.

