

Crustal deformation and fault motion of the 2008 Wenchuan Earthquake, China, detected by ALOS/PALSAR

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We generated ALOS/PALSAR-based interferograms over 6 ascending satellite tracks around the rupture zones of the 2008 Wenchuan earthquake near Longmen Shan fault zone (LMFZ), and found that significant ground displacements took place. While those interferograms basically show excellent coherence over broad areas, it turns out to be difficult to quantify the actual ground displacements near surface ruptures. This is because the magnitude of displacements was so large that we could not accurately unwrap derived deformation fringes.

It is important to quantify where and how much the largest ground displacements were taking place, so that we can understand the rupture processes of the earthquake. To this end, applying a SAR offset-tracking method to the earthquake, we have revealed detailed ground displacements in the proximity of the LMFZ. Technically, we confirmed that an elevation dependent coregistration was indispensable to achieve sub-meter accuracy. A sharp displacement discontinuity with a relative motion of ~1-2 m appears over a length of 200 km along the LMFZ, from which it is demonstrated that the main rupture has proceeded on the Beichuan fault (BF) among several active faults composing the LMFZ, and an active fault is newly detected on the northeastward extension of the BF. The faulting on the BF is characterized by right-lateral motion in the northeast, while in the southwest an oblique right-lateral thrust slip is suggested. In contrast to the northeast where a major faulting proceeds at the BF only, in the southwest multiple thrust faultings have occurred in the southeastern foot of the Pengguan massif.