

Revisit of the 2010 Darfield, New Zealand, Earthquake

Manabu Hashimoto^{1*}

¹DPRI, Kyoto University

The Japanese Advanced Land Observation Satellite (ALOS) observed many earthquakes and volcanic eruptions and gave us invaluable information during 2006 to 2011. We detected deformations associated with these events using PALSAR onboard ALOS.

On September 3, 2010, a Mw 7.0 earthquake hit south Island of New Zealand. The epicenter is located in the Canterbury plain west of Christchurch. Fortunately, there were no report of serious damages. Though no active faults were had not been identified in the GNS's map before the occurrence of this event, clear surface trending in the E-W direction ruptures appeared.

Urgent observations of PALSAR were conducted and LOS changes exceeding 1m was detected. We recognized complicated pattern of fringes along the surface rupture, implying complex configuration of the source fault. Low coherence is recognized consistent with the distribution of surface rupture. The zone of low coherence has a large bend in its middle. Aftershock distribution is also complex there. We assume 7 segments of fault along the low coherence zone, fit observed fringes and estimated about 5 m slip at maximum.

In order to examine preseismic deformations, we apply time series analysis with StaMPS to the PALSAR images acquired during 2007 to right before the event. The result shows LOS increase in the zone of low coherence in the interferogram encompassing the main shock. Especially, a shape of zone of LOS increase is similar to that of low coherence. However there are LOS increase in other areas, we reserve the conclusion that LOS increase is related to the source fault. There are some reports of correlation between LOS changes in the alluvial plains and base structure, there remains a possibility that faults which formed base structure might be responsible for the earthquake.

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