Geophysical Research Abstracts
Vol. 20, EGU2018-7754, 2018
EGU General Assembly 2018

The Olutor (Kamchatka, Russia) 20 April 2006 earthquake: New insight from SAR interferometry and seismology data

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We used SAR interferometry to resolve disagreement between seismology and field geology data for the Olutor MW=7.6 (Kamchatka, Russia) April 20, 2006 earthquake and two main aftershocks both of magnitude 6.6 at April 29 and May 22, 2006. The intriguing feature of these earthquakes is that surface ruptures of 140 km long showed mostly right-lateral slip when CMT solution showed predominantly thrust movement. Besides the surface ruptures dip to the SE while aftershocks occurred in the area to the NW from the surface rupture extending up to 75 km in the direction of the regional Vyvenka-Vatynskya tectonic suture.

We analyzed 35 ERS-2 and 6 ENVISAT images covering the area and time interval of the earthquake and revealed two reliable interferograms. The first one covers the main seismic event and April 29 aftershock. The second shows displacements caused by the aftershock of May 22. The LOS displacement field also display movement to the satellite (“uplift”) in the aftershock area to the NW from the ruptures at the surface.

To explain the SAR displacement field we proposed a model of the coseismic rupture with main rupture plane extending to the NW from the surface rupture. This rupture is not exposed at the surface and its movement is almost pure thrust. This model agrees with hypothesis of Lander and Pinegina [2009] considering the main rupture surface being blind thrust to the NW from the surface right-lateral ruptures.

Hence, SAR interferometry provides a new insight into geodynamics of the Northern Kamchatka seismogenic zone. This study was supported by the grant of Ministry of Education and Science contract №14.W03.31.0033.