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Recent Surface Deformation in western Himalaya: Uttarakhand state of India

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The Himalaya and its adjoining Ganga plain are traversed by a number of neotectonically active longitudinal and transverse faults. However, the pattern and extent of surface or crustal deformation induced by those active faults are not yet well known, especially in Uttarakhand state of India. Understanding the activity of these faults and their surrounding area is a key for both unraveling the mechanism of Himalayan growth and preparing the major earthquake disasters. The latter issue became much more important after the April 25th 2015 Nepal earthquake (also known as the Gorkha earthquake), which killed more than 8,800 people and injured more than 23,000. This earthquake is a dramatic manifestation of the ongoing convergence between the Indo-Australian and Asian tectonic plates that has progressively built the Himalayas over the last 50 million years. Despite its importance, only a few preliminary studies have focused on the frontal part of the western Himalaya. We herein present the preliminary results of our investigation directed in this direction. Surface deformations induced by active faults during a period of seven years from 2003 to 2010 in the south western Himalaya and adjoining proximal part of the Ganga Plain in Uttarakhand state of India have been firstly monitored. Multidate ENVISAT and ALOS radar images of the area have been analyzed by applying the latest radar remote sensing technique of Persistent Scatterers Interferometric Synthetic Aperture Radar (PSI). Since PSI can extracts surface information even on vegetated or mountainous regions as well. The study reveals some conspicuous surface deformation patterns, which may be related directly to the active movements along some of the major fault /thrust in the area. For example the Himalaya Frontal Thrust and the transverse Garampani-Kathgodam Fault. A campaign GPS network of 20 stations has also been installed in 2013 in our study area. This network also provided us important ground data to proof and adjust our PSI measurement and can help us better understanding the present deformation behavior of this area.