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Surface deformation of alpine terrain derived by PS-InSAR technique on the Siachen Glacier

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The Karakoram is situated at the western end of the trans-Himalaya and is one of the largest glaciated areas outsides the polar regions, of which over 37% is covered by glacierscopland2009.The aggregate amount of glaciers was investigated $16.6 \times 10^3 km^2$ approximately. This study focuses on the upper part of Siachen Glacier(35.6°N 77.3°E), the eastern part of Karakoram range, it includes Teram Shehr Glacier, Lolofond Glacier and several other tributaries. Despite, the Siachen Glacier is about 74 km long, and width varying from 1 to 8 km approximately, as the longest glacier in the Karakoram and second longest in the world's non-polar areas. Accumulation gain is essential for mass balance of valley glaciers in the Karakoram Himalayas. The higher elevation of this area received snowfall(>1000 $cm \cdot yr^{-1}$) annually, while the snowfall occupies 95% of total precipitation (75-150 $cm \cdot yr^{-1}$). Meanwhile, the air temperature ranging from -20 to -40 °C, during December-February, is also very suitable for accumulation of glacier mass. Including all tributary glaciers, the Sianchen glacier system covers 700 km^2. Therefore, the observation of its glaciological process is limited by high attitude, remote and sophisticated meteorological conditions.

Given these complex restraints, SAR data is an efficient source of this type glacier flow velocity estimation in general. The interferometric phase is as noted sensitive to both surface topography and coherent displacement of scatters along the radar look direction in the time between the acquisitions of the interferometric image pairs. For glacier surface, the coherence is affected by both meteorological conditions and glacier flow velocity and generally decreases rapidly with increasing time between the acquisitions of two SAR images. Meteorological causes of decorrelation involve ice and snow melting, snowfall and wind redistribution of snow and ice. Moderate snowfall on the glaciated surface, extremely reduce temperatures and intense wind conditions give to harsh weather and climatic conditions over this region.

We choose ALOS/PALSAR L-band data from April, 2007, to September, 2009, in the Siachen glacier to generate the interferograms and calculate their displacements spatially and temporally. In this study, the surface deformation of upper part of the Siachen glacier located in central Karakoram is estimated by using PS-InSAR technique. Here, we implement the PS method, which uses spatial correlation of interferogram phase to find pixels with low-phase variance in the terrain. Prior knowledge of temporal variations in the deformation rate is not required for their identification. Through times series analysis of the interferograms we were able to reduce the impact of digital elevation model errors and extract the real surface change signal.