Interseismic crustal deformation along the Xianshuihe Fault System, Western China, detected by ALOS-2 ScanSAR interferometry

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The Xiansuihe fault system (XFS) is a large-scale strike slip fault running eastern part of the Tibetan plateau. Its western part lies high altitude and dry area, while eastern part runs mountainous area partly covered by vegetation. Although we know XSF hosts many historical earthquakes, it is difficult to grasp its current activity mainly because it is too large and too remote to be equally covered by ground based observations like GNSS. Therefore, Interferometric Synthetic Aperture Radar (InSAR) is suitable technique to make a detailed map of current fault activities. Wang et al. (2009) reported strain concentration at the western part of XSF using C-band satellites (ERS-1/2 and Envisat), which suffered from low coherence. Also, their study area is very limited (> 100 km). Zhang et al. (2019) also reported interseismic strain localization along XSF using Sentinel-1 interferograms. But their results include strong oscillation probably affected by tropospheric disturbances.
In this study, we use ALOS-2 ScanSAR images to grasp overall interseismic crustal deformation along XFS. All the interferograms are processed by GAMMA software suite (Wegmüller and Werner, 1997). The SAR images we used are acquired from descending orbit, which is more sensitive to the XSF motion than those taken from ascending orbit. We processed three interferometric pairs with temporal baseline ranging from 3 to 4 years. The coherence of those interferograms are high in summer along all the fault traces, while it decreases in winter only in eastern section. Almost all the interferograms are covered by strong long wave-length noise, possibly resulting from ionospheric and tropospheric perturbations. Assuming that GNSS data are correct, we estimated the InSAR error at each GNSS station, and interpolated the errors into all the pixels to remove the long-wavelength noise (Fukushima and Hooper, 2011; Takada et al., 2018). The GNSS velocity field used for correction has been estimated by Liang et al., (2013). The interferograms thus corrected indicate strain rate concentration along the whole trace of XSF, which is much wider than previous studies. We are currently applying the time-series analysis and the split spectrum method (Gomba et al., 2015; Furuya et al., 2017) to remove ionospheric effects before the GNSS correction.

Keywords: ALOS-2, ScanSAR, GNSS

