Comparison of DINSAR techniques for measuring interseismic deformation across the North Anatolian Fault

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Abstract

The challenge of measuring interseismic deformation across major active faults by DINSAR is to be able to measure small displacement rates at large spatial scale; typically, 1 cm/year or less distributed over 100 km or greater. Difficulties come mainly from water vapor signal, orbital error and limited temporal coherence as such deformations often occur in natural, and more or less mountainous landscapes. Using ERS data, and conventional DINSAR technique, Wright et al (2001) were able to measure slow ground deformation of about 1 cm/year (along the radar line of sight) over 100 km across the eastern end North Anatolian Fault (NAF), Turkey. This measurement is consistent with GPS data and an elastic model of interseismic strain accumulation. Nonetheless, it is affected by 2–sigma error as large as 0.3 cm/year, due to the small number of interferograms available that fulfil the selection criteria for such a conventional DINSAR analysis. Such error would have been too large on many other faults with smaller interseismic slip rate. Aiming to improve the accuracy of measurement of interseismic deformation, we test the Persistent Scatterer Interferometry (PSI) technique on the same site. Starting from 44 descending ERS SAR raw images, SLC images are focused with ROI_pac software. Subsequent interferometric and PSI processing is performed using TU Delft’s DORIS and DORIS–PS software. We will present comparison of the two methods applied on our test site and discuss the use of DINSAR techniques for measuring interseismic deformation.