Deformation across the Altyn Tagh Fault from InSAR – improved estimates using a new tropospheric correction method

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Abstract

The 1600 km-long Altyn Tagh Fault (ATF) is a major intra-continental strike-slip fault in northern Tibet, and accurate determination of its slip rate has significant implications for the interpretation of tectonic processes across the Tibetan Plateau region. However, as the fault is located at the border between the low Tarim Basin and the high Tibetan Plateau, the long wavelength deformation signals are strongly masked by the tropospheric delays resulting from the 6000 m topographic relief across it.

To improve our retrieval of the tectonic signal, we have developed a new approach that combines the use of both external weather model data and the interferometric phase. We use vertical refractivity profiles calculated from a high resolution weather model to define the form of the relationship between tropospheric delay and height, and estimate a magnitude correction by scaling the original delays to best match the interferometric phase.

We applied our algorithm to the central portion of the ATF, and the results show that our method can better reduce the tropospheric effects and lead to clearer long wavelength deformation signals. We found slip rate of 10.5 ± 1.0 mm/yr for the central portion of the ATF based on the InSAR measurements, which is consistent with independent GNSS measurements around this region.

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