

Research on Repeated Excavation Rules Based on Multibaseline SAR Interferometry with Cross-platform SAR data

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ABSTRACT:

The ESA EnvisAT and JAXA ALOS have acquired large amounts of SAR data during its normal operation, which has been proved successful in various fields, such as large-scale man-made linear features deformation monitoring, polar iceberg monitoring, surface subsidence caused by underground water withdrawal and volcano eruption and earthquake. For the complex non-linear deformation taking place in area with sophisticated topography, however, these data demonstrated some limitation mainly due to spatial-temporal decorrelation, the maximum detectable deformation gradient and time sampling with varied degree. Thus single platform SAR interferometry is more likely to fail to reveal the rules of surface deformation, which usually lasts a long time. Currently the archived SAR data still place an important role for InSAR application and could be jointly utilized to explore an efficient method for InSAR technology, especially in tough circumstances to fulfil the potential of remote sensing in terms of quick speed, large extents and saving labor forces. In this article we select a coal mining area in Shanxi province and exploit 13 SAR data (5 ALOS PALSAR and 8 EnvisAT ASAR) during 2008 to 2010 with the Coherent Pixel Target (CPT) method to reveal the law of deformation caused by repeated excavation. We distinguish the area directly above stopingface from the whole. Generally, the critical perpendicular baseline and maximum detectable deformation gradient increase with the wavelength. When low coherent region and/or big displacement are encountered (the area directly above the mining face), the L band SAR data processing results are used and are more likely to produce robust ground subsidence result, according to the terrestrial survey products; the shorter wave length data (C-band EnvisAT ASAR) are preferred for coherent area where only small deformation taking place (area 150m or more away from the stopingface and area above the abandoned mine goaf), to retrieve the exact extent of mining-affected area and the duration of deformation more accurately.