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EVALUATION OF THE USE OF THE SUB-PIXEL OFFSET TRACKING METHOD WITH CONVENTIONAL DINSAR TECHNIQUES TO MONITOR LANDSLIDES IN DENSELY VEGETATED TERRAIN IN THE THREE GORGES REGION, CHINA

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ABSTRACT:

Sub-pixel Offset Tracking (sPOT) has previously been applied to monitor glacier and volcanic activities and co-seismic tears resulting from earthquakes to address the limitations of dInSAR techniques, particularly the impact of dense vegetation and the limitations due to the maximum detectable displacement (MMD) for very fast slope movements. As an alternative to conventional dInSAR, sPOT has recently been employed to derive centimetre-level landslide rates in the Three Gorges Region using metre-resolution space-borne SAR imagery. A previous study indicated that reliable deformation magnitudes can be measured from artificial corner reflectors. However, there is controversy concerning the interpretation of results on whether this method is able to accurately measure the "bare earth" landslide rates in densely vegetated terrain.

In this study, continuous landslide activity in the Shuping area was measured using the sPOT method applied using TerraSAR-X (TSX) 1m Spotlight data acquired from February 2009 – April 2010 and February 2012 – February 2013. The landslide rates show a consistent seasonal pattern with a dramatic increase of landslip from May to August in both 2009-2010 and 2012-2013, coinciding with substantial drawdowns of the reservoir water level at the Three Gorges dam during the upstream flooding season. These results suggest a strong connection between the formation of landslides and the operation of the Dam coupled with seasonal rainfall. In addition, a statistical analysis shows that sPOT methods are still able to correctly measure ground deformation range in densely vegetated terrain with lower coherence. This implies such sPOT methods can be applied to the vast majority of regions for which no corner reflectors are available.

In a second study region, with the availability of much higher resolution 20cm TSX Staring Spotlight data, the use of dInSAR and sPOT techniques in the densely vegetated terrain will be evaluated in terms of temporal de-correlation effects, accuracy and associated limitations.