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High resolution rapid revisit InSAR monitoring of surface deformation

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Monitoring surface deformation on strategic energy and transportation corridors requires high resolution spatial and temporal InSAR images for mitigation and safety purposes. High resolution air photos, lidar and other satellite images are very useful in areas where the landslides can be fatal. Recently, radar interferometry (InSAR) techniques using more rapid revisit images from several radar satellites are increasingly being used in active deformation monitoring. The Canadian RADARSAT Constellation (RCM) is a three-satellite mission that will provide rapid revisits of four days interferometric (InSAR) capabilities that will be very useful for complex deformation monitoring. For instance, the monitoring of surface deformation due to permafrost activity, complex rock slide motion and steam assisted oil extraction will benefit from this new rapid revisit capability. This paper provide examples of how the high resolution (1-3 m) rapid revisit InSAR capabilities will improve our monitoring of surface deformation and provide insights in understanding triggering mechanisms.

We analysed over a hundred high resolution InSAR images over a two year period on geologically different sites with various configurations of topography, geomorphology, and geology conditions. The high resolution InSAR images are effective in characterizing differential motion within these low velocity landslides. Our results show that rapid revisit InSAR acquisitions are required during the combined wet spring and storm events for coastal landslides. Highly fractured slow moving asymmetrical wedge failures on an active rockslide along a railway corridor require InSAR acquisitions throughout the year. Permafrost triggered landslides affecting pipeline corridors require acquisitions during the peak summer thaw season. Deformation triggered by steam injection over the oil sands requires high resolution constant rapid revisit monitoring during the steaming and extraction periods.

