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Integrated corner reflector InSAR, SI and GPS characterization of complex earth slide deformations, Little Smoky River, Alberta, Canada

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Since the construction of the highway across the Little Smoky River in 1957, slope movements on both valley walls have lead to significant ongoing maintenance for both the highway and the bridge crossing. As the river has changed courses over it's period of incision, numerous landslides of different ages and orientations impact on the road infrastructure. In addition, downcutting into the thick infill of glacial sediments has lead to large, compound earth slides moving in both translational and rotational components.

Previous studies associated with road maintenance and repair has relied on conventional point source geotechnical instrumentation, slope inclinometers, at discrete locations. As the landslides impacting on the road are on the scale of many kilometers in width and length the point source readings adjacent to the highway have not allowed for proper characterization of deformation rates on other portions of the valley walls. As options are currently being considered for re-alignment of the highway, data on the relative state of stability of other portions of the valley walls are critical.

In order to provide a better global view of the state of stability of the valley walls of the Little Smoky River a series of 18 corner reflectors were installed at strategic locations along the valley walls. This included locations where reflectors were co-located with conventional geotechnical instrumentation and areas where no monitoring had been previously attempted. Each reflector was aimed for optimal orientation for readings with Radarsat F2N ascending beam mode on a 24 day return cycle.

During the initial installation period in October 2006, GPS readings were taken on all reflectors with second epoch of readings conducted in August 2008. As well, during this time period bi-annual slope inclinometer readings were collected to provide indications of the horizontal component of the displacements. These two set of ground data were compared, along with observations of slope morphology in order to interpret the InSAR line-of-sight observations and provide a more complete picture of deformations on the valley walls.