Geophysical Research Abstracts
Vol. 21, EGU2019-11514, 2019
EGU General Assembly 2019

High Resolution InSAR Investigation of Increased Landslide Motion and Non-steady-state Glacier Flow on Mount Meager, BC, Canada

Farnoush Hosseini (1), Anna Gribbon (2), Bernhard Rabus (1), and Gwenn Flowers (2)

(1) Engineering Sciences, Simon Fraser University, Burnaby, B.C., Canada, (2) Earth Sciences, Simon Fraser University, Burnaby, B.C., Canada

Mount Meager is a large dormant glacier-clad stratovolcano in British Columbia, Canada that last erupted in 2360 Cal yr BP. Several large catastrophic landslides have occurred on different flanks of Mount Meager, including the 2010 failure of its south flank, which is the largest recorded landslide in Canadian history [1]. Further, there have been observations of increased fumarole activity on Job Glacier, on Mount Meager's north side. Above Job Glacier, a very large deep seated mass movement has been observed covering a significant portion of the Mount Plinth side summit (Plinth Slope instability). This movement is a potential pre-cursor to a further catastrophic slide that would threaten power installations, and similar to the 2010 event, indirectly through valley damming and subsequent flooding also the town of Pemberton 65 km away. Links between increased mass movement and hydrothermal activity, have been connected previously with thawing permafrost and ongoing deglaciation on Mount Meager[2].
In the present study we put the Plinth Slope instability in context with observations of non-equilibrium dynamics of Job Glacier. Measured ice flow field vectors suggest non-steady state compatible with asymmetric deglaciation and corroborating a narrative of feedback between deglaciation and hydrothermal activity and the increased landslide activity. Spatio-temporal InSAR analysis including state-of-the art correction of atmospheric effects and topographic phase error, of data from multiple viewing geometries of the TerraSAR-X sensor is used to generate high accuracy motion maps of the Plinth Slope instability, showing unprecedented spatial detail and delineation of the landslide. Further, using both InSAR and speckle tracking methods on the same data we reveal pronounced non-steady state glacier flow at two locations on Job Glacier. The first location near the head of the Glacier shows strong temporal acceleration (potentially recurring seasonally) compatible with short-lived events of anomalous local melt water production. The second location of suspected non-steady state ice flow is the ablation area of the Job Glacier just down-stream of the fumaroles, and directly underneath Plinth summit. Here, our analysis suggests ice motion vectors that veer out of the fall-line with an unusually large component towards the valley wall with the Plinth Slope instability. We discuss this feature of the ice motion field in the context of possible asymmetric deglaciation rates or subglacial meltwater production, potentially of hydrothermal origin, producing ice surface lowering and a transverse gradient of the surface slope or sliding rate, respectively towards the Plinth side of the Job Glacier valley. Asymmetric deglaciation would provide an explanation for the rapid activity increase of the Plinth Slope instability.

References:
1. Roberti, G. Mount meager, a glaciated volcano in a changing cryosphere: Hazard and risk challenges. Simon Fraser University, Fall 2018.
2. Roberti, G.; Ward, B.; van Wyk de Vries, B.; Falorni, G.; Menounos, B.; Friele, P.; Williams-Jones, G.; Clague, J.; Perotti, G.; Giardino, M. Landslides and glacier retreat at mt. Meager volcano: Hazard and risk challenges. In Geohazards 7, Canmore, Alberta, Canada, 2018.