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Rethinking and updating lahar detection at Mount Rainier, Washington, USA

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In 1998 the USGS and Pierce County, Washington USA collaboratively installed an automated lahar-detection and warning system on the Carbon and Puyallup rivers which drain the western flank of Mt. Rainier, a 14,410 feet-high (4393m) ice-clad volcano. That system, operated by Pierce County for 18 years now, employs the Acoustic Flow Monitors (AFMs) to sense strong ground vibration caused by mass flows and – by means of a tripwires – flow depth as a proxy for the extent of the area at risk. Custom software evaluates data from the AFM networks with algorithms to detect lahars large enough to threaten the town of Orting 25km downstream from the AFM arrays. The lahar detection system is part of a larger lahar warning system operated by Pierce County and the State of Washington. The AFM-based lahar detection system still functions, but will be augmented with and eventually replaced by a network of broadband seismometers, webcams and other devices that will allow a more sophisticated analysis of physical flow characteristics (e.g., mass, momentum, velocity) in near real-time. In 2016, we are installing monitoring sites with this new equipment, and investigating new software tools for lahar detection using the new data. As a first step, we will duplicate the function of the current AFM-based lahar detection software with new SCADA/SCALA software tools. Later, we hope to develop and implement more powerful seismic analysis techniques, increasing the time available for evacuations of Orting by several minutes, from the current estimate of 40 minutes after detection of the lahar. Fundamental difficulties remain in developing methods for timely estimation of flow magnitude and thus the area at risk from a lahar already in progress and time available for evacuation of that area.