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Field Survey of the 17 June 2017 Landslide generated Tsunami in Karrat Fjord, Greenland

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On 17 June 2017 a massive landslide generated tsunami impacted Karrat Fjord and the Uummannaq fjord system located some 280 km north of Ilulissat in western Greenland. The eastern of two easily recognized landslides detached completely and fell approximately 1 km to sea level, before plunging into the Karrat Fjord and generating a tsunami within the fjord system. The landslide generated tsunami washed 4 victims and several houses into the fjord at Nuugaatsiaq, about 30 km west of the landslide. Eyewitnesses at Nuugaatsiaq and Illorsuit recorded the tsunami inundation on videos. The active western landslide features a back scarp and large cracks, and therefore remains a threat in Karrat Fjord. The Geotechnical Extreme Events Reconnaissance (GEER) survey team deployed to Greenland from July 6 to 9, 2017. The reconnaissance on July 8 involved approximately 800 km of helicopter flight and landings in several key locations. The survey focused on the landslides and coastlines within 30 km of the landslide in either fjord direction. The aerial reconnaissance collected high quality oblique aerial photogrammetry (OAP) of the landslide, scarp, and debris avalanche track. The 3D model of the landslide provides the ability to study the morphology of the slope on July 8, it provides a baseline model for future surveys, and it can be used to compare to earlier imagery to estimate what happened on June 17. Change detection using prior satellite imagery indicates an approximate 58 million m3 total landslide volume of which 45 million m3 plunged into the fjord from elevations up to 1200 m above the water surface (Gauthier et al., 2017). The ground based tsunami survey documented flow depths, runup heights, inundation distances, sediment deposition, damage patterns at various scales, performance of the man-made infrastructure, and impact on the natural and glacial environment. Perishable high-water marks include changes in vegetation and damage to roots, deposits and scour of soil and rock, stranded icebergs, as well as damage to homes and infrastructure. The tsunami runup heights exceeded 90 m laterally to the west of the landslide and 50 m across the 6 km wide fjord. The Greenland landslide generated tsunami highlights coastal hazards to communities not commonly exposed to earthquake generated tsunamis.