EGU2020-11395
https://doi.org/10.5194/egusphere-egu2020-11395
EGU General Assembly 2020

Using InSAR to asses rock glacier movement in the Uinta Mountains, Utah

George Brencher[1], Alexander Handwerger[2], and Jeffrey Munroe[3]
[1]Geology Department, Middlebury College, USA (gbrencher@middlebury.edu)
[2]. Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles, USA, 2. Jet Propulsion Laboratory, California Institute of Technology, USA (alexander.handwerger@jpl.nasa.gov)
[3]Geology Department, Middlebury College, USA (jmunroe@middlebury.edu)

Rock glaciers are perennially frozen bodies of ice and rock debris that move downslope primarily due to deformation of internal ice. These features play an important role in alpine hydrology and landscape evolution, and constitute a significant water resource in arid regions. In the Uinta Mountains, Utah, nearly 400 rock glaciers have been identified on the basis of morphology, but the presence of ice has been investigated in only two. Here, I use satellite-based interferometric synthetic-aperture radar (InSAR) from the Copernicus Sentinel-1 satellites to identify and monitor active rock glaciers over a 10,000 km^2 area. I also compare the time-dependent motion of several individual rock glaciers over the summers of 2016-2019 to search for relationships with climatic drivers such as precipitation and temperature. Sentinel-1 data from the August-October of 2016-2019 are used to create 79 interferograms of the entire Uinta range and are processed with the NASA/JPL/Stanford InSAR Scientific Computing Environment (ISCE) software package. Temporal baselines of intrayear interferograms range from 6-72 days. We use average velocity maps to generate an active rock glacier inventory for the Uinta Mountains containing 196 active rock glaciers. Average rock glacier velocity is 3 cm/yr in the line-of-sight direction, but individual rock glaciers have velocities ranging from 0.3-15 cm/yr. Rock glacier speeds do have a seasonal component, and were fastest in August across all years. One rock glacier reached a speed of 40 cm/yr over a 12 day interval from August 5 to August 17 of 2017. Preliminary results suggest that active rock glaciers are found at altitudes 10 m higher on average than inactive and relic rock glaciers identified in the previous inventory. Rock glacier movement did not accelerate between 2016 and 2019, suggesting that rock glaciers in this part of the Rocky Mountains are not speeding up over time. Our results highlight the ability to use satellite InSAR to monitor rock glaciers over large areas and provide insight into the factors that control their kinematics.