Poster #1-13

Topographic and Climatic Controls on Peri-Glacial Hillslope Sediment Transport: A Regional Study of Solifluction

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Solifluction lobes, the downslope transport of soil in discrete lobes, are ubiquitous features of periglacial and alpine landscapes throughout the world. In Alaska and across the Arctic, the creep of soil driven by freezing and thawing cycles creates patterned roughness elements that dominant entire hill-slopes. The impact of solifluction on the microtopography of hillslopes can result in feedbacks between vegetation, snow-cover, and hillslope erosion. Solifluction lobes also act to redistribute carbon on hillslopes by continually burying vegetation, altering flow pathways, and transporting organic rich mats of sediment towards colluvial hollows and valley bottoms. However, the occurrence of solifluction is highly sporadic due to the strong dependencies on local climate, geology, and hydrology conditions. A large body of literature investigates the structure and rate of solifluction lobes at the scale of a single lobe or hillslope. Few studies investigate solifluction at a regional scale and those that do typically implement probability models to capture where solifluction might occur with no information related to the morphology of lobes. In this study we incorporate a suite of new datasets for the country of Norway as the availability of topographic data at a sufficient resolution to resolve solifluction lobes is highly limited in the arctic, including Alaska. We incorporate three primary datasets in this analysis: 1) high resolution (1m) LiDAR derived digital terrain models, 2) Gridded (1km2) temperature data on daily and hourly intervals and 3) displacement estimates derived from InSAR processing techniques. Given the wide coverage of all three datasets, we identify more than 50 hill-slopes exhibiting significant solifluction allowing us to delineate over 300 individual solifluction lobes using automated and manual methods. The North-South orientation of Norway results in hill- slopes covering a wide range of latitudes including permafrost and non-permafrost landscapes. With this dataset we will be able to identify the controls on the occurrence and morphology of solifluction lobes at a range of spatial scales and as a function of hill-slope steepness, aspect, and elevation as well as annual fluctuations in surface air temperature. Based on this study, we will be able to map likely distributions and characteristics of hillslope microtopography in regions, such as Alaska, lacking extensive high-resolution topographic datasets.