Poster #1-9

Characterization of Snow Distribution at Teller and Kougarok Sites of Seward Peninsula

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Snow cover plays an important role in the climate, hydrology and ecological systems of the Arctic due to its influence on the water balance, thermal regimes, vegetation and carbon flux. Thus, snow depth and coverage have been key components in all the earth system models but are often poorly represented for arctic regions, where fine scale snow distribution data is sparse. Through the DOE Office of Science Next Generation Ecosystem Experiment, NGEE-Arctic, high resolution snow distribution data is being developed and applied in catchment scale models to improve representation of snow and its interactions with other model components in the earth system models. To improve these models, it is important to identify key factors that control snow distribution and quantify the impacts of those factors on snow distribution. Intensive snow surveys were conducted at two sites in Seward Peninsula: Teller site (in 2016, 2017, and 2018) and Kougarok site (in 2018). We built linear mixed models to explore the relationship between snow water equivalent (SWE) and different underlying controlling components including topographic factors (elevation, slope, curvature, aspect) at different spatial scales, vegetation factors (NDVI and land cover types). The results show that those factors explained 42% of the variation in snow distribution at Teller and 67% at Kougarok. For both sites, vegetation had the largest impact on the snow distribution, with more snow accumulating in the areas where the NDVI was higher and there were shrubs. In addition, snow distribution at Teller site was also largely impacted by elevation, while the snow distribution at Kougarok was also largely impacted by aspect and slope. There was strong spatial autocorrelation in the residual SWE for both sites, the snow distribution was autocorrelated at two distinct scales at Teller, 16.7m and 159.2m, while it was autocorrelated at a single scale, 44.1 m at Kougarok, reflecting the impacts of the processes and factors not explicitly considered in the linear mixed model, i.e. the local wind impact (wind drift) caused by interaction between global wind and topography and vegetation. Finally, we used our models and the spatial autocorrelation to interpolate SWE for the whole study area based on Universal Kriging method. We expect that the characterized SWE spatial distribution patterns, the statistical relationships developed between SWE and its impacting factors can be used for the development and validation of snow distribution models and to improve understanding of hydrology, vegetation and nutrient dynamics at catchment scales.