Circumpolar Albedo of Northern Lands from Landsat-8 and Sentinel-2

Crystal Schaaf **PI**, Arthur Elmes, Angela Erb, Charlotte Levy (UMassBoston)

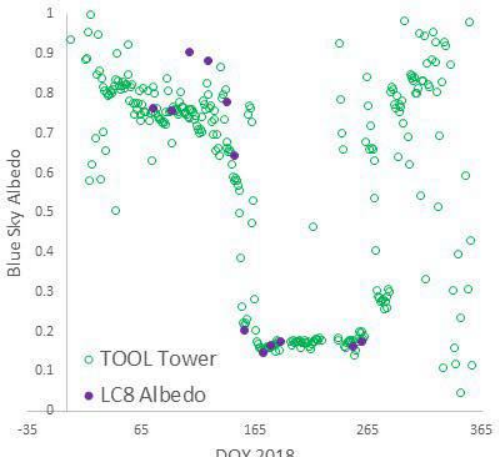
CoIs: Dorothy Hall (ESSIC/UMD), Sean Healey (USFS), Brendan Rogers (WCRC)

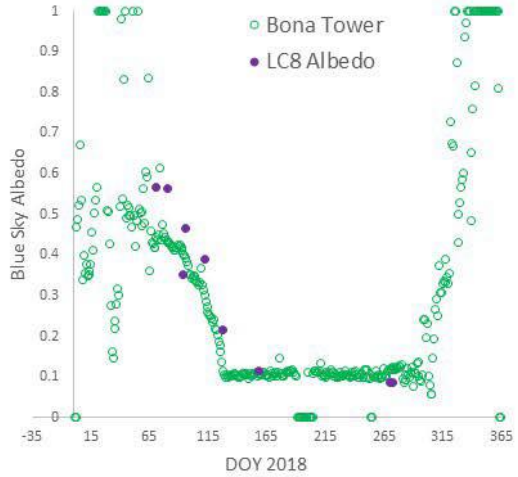
Collaborators: Zhuosen Wang (ESSIC/UMD), Feng Gao (USDA/ARM), Mark Chopping (Montclair), Mathias Disney (UCL), Gabriela Schaepmen (UZurich), Terhikki Manninen and Aku Riihelä (FMI)

Goals:

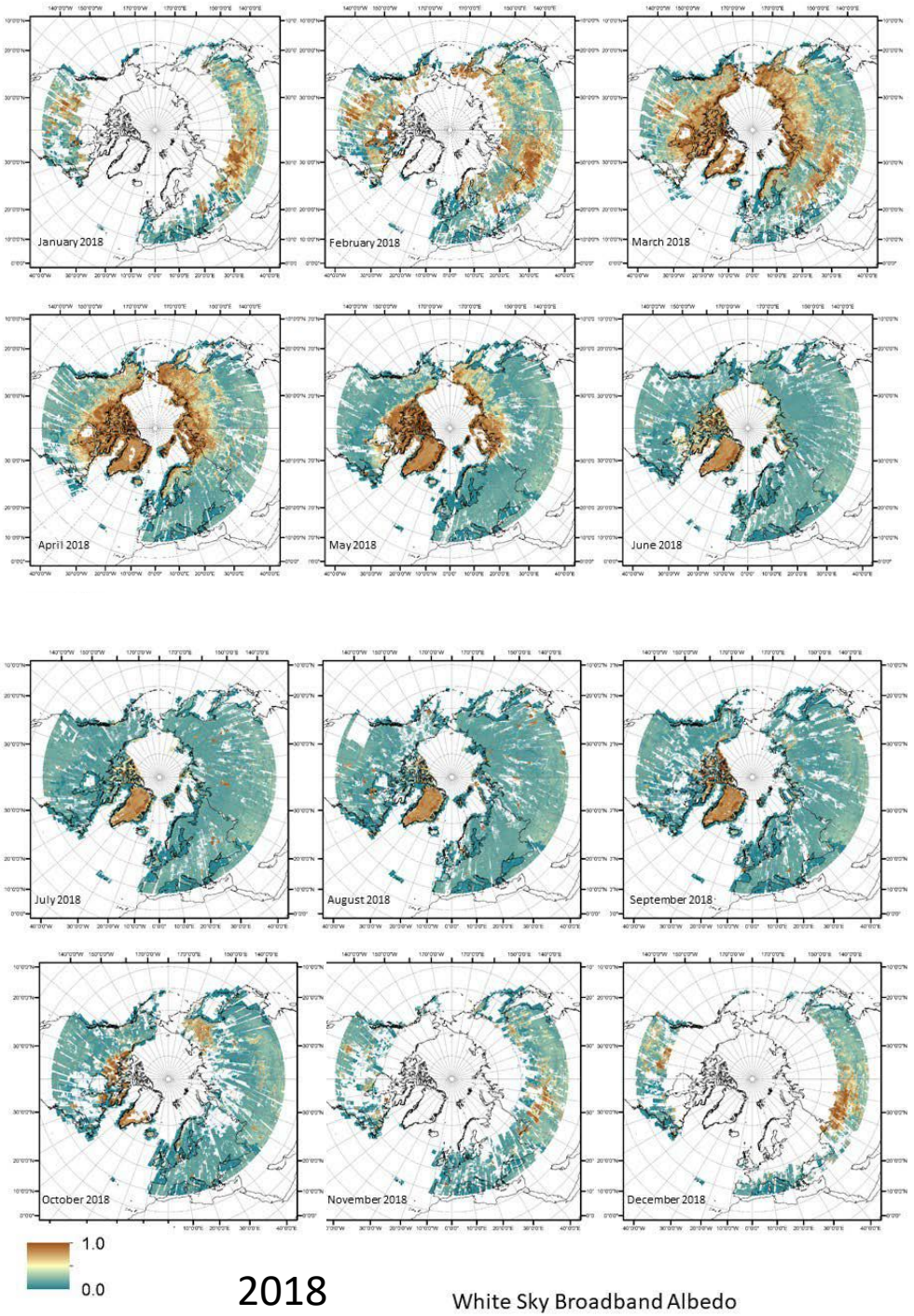
- *Adapt North American Landsat-8 Land Surface Albedo methodology into Landsat-8, Sentinel-2, and HLS Land Surface Albedo products of circumpolar northern lands (*40°N to 84°N*) for snow-free and snow-covered conditions (using either MODIS or VIIRS BRDFs)*
- *Investigate the temporal and spatial variation of albedo in the higher latitudes due to land use change, vegetation species shift, and forest disturbance from fire and insect infestation. Explore impacts on surface energy budgets, and radiative forcing.*

Circumpolar Landsat-8 Albedo

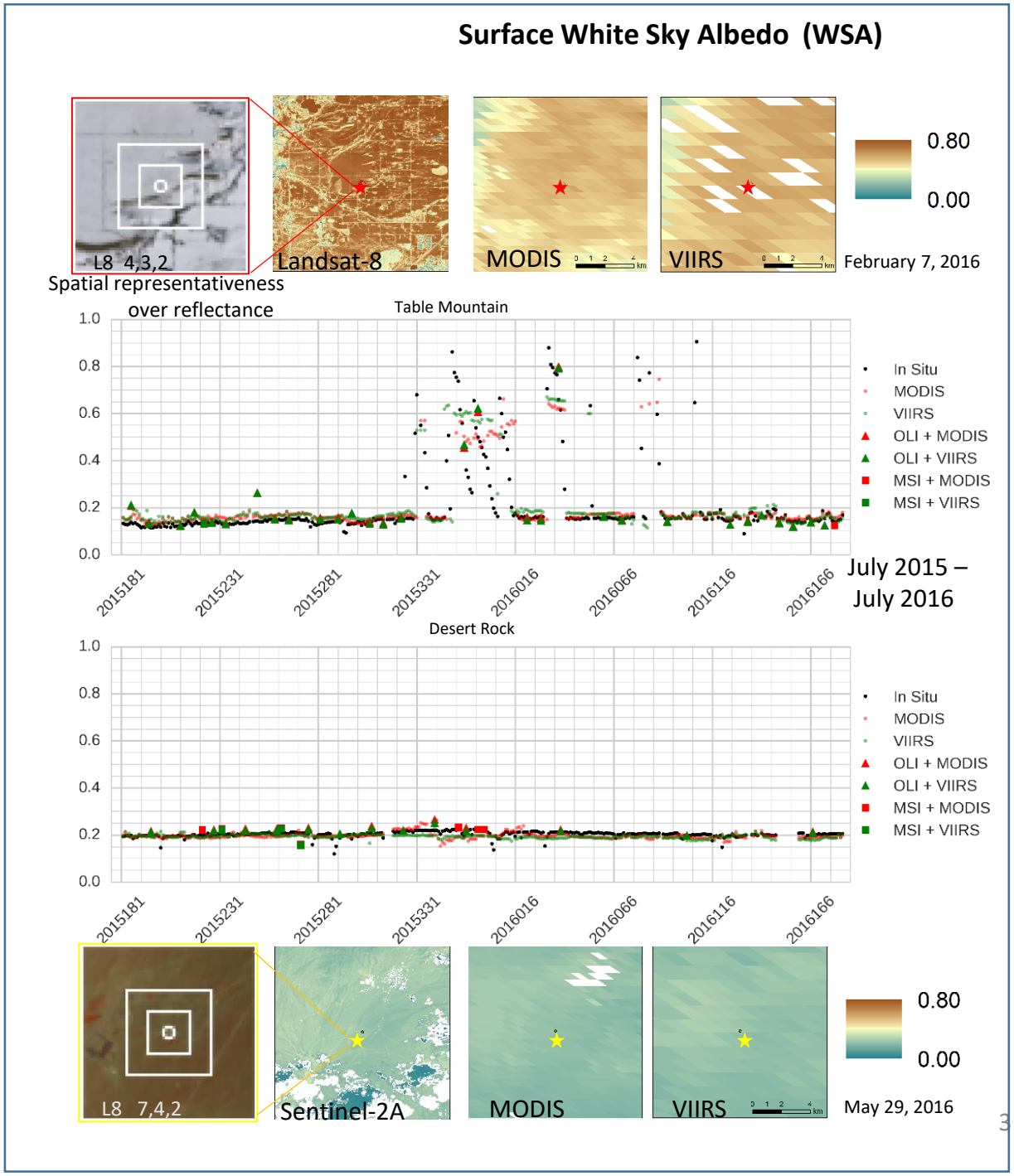




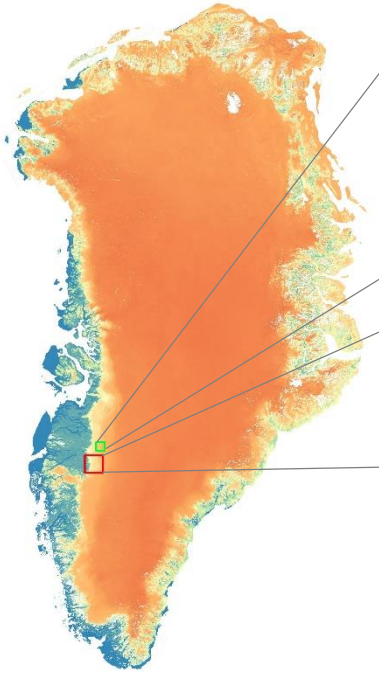
Tower sites: Toolik (TOOL) tundra and Caribou-Poker Creeks Research Watershed (BONA) taiga and Blue Skye Broadband Albedos



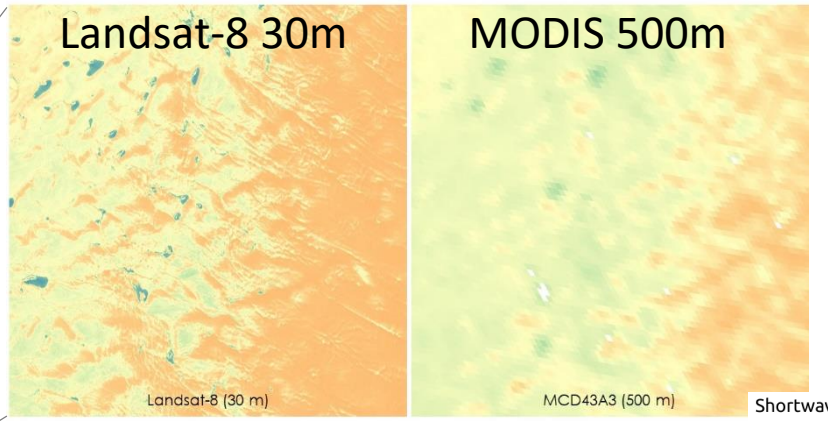
Broadband Blue Sky Albedo evaluation at Table Mtn and Desert Rock BSRN/SURFRAD sites

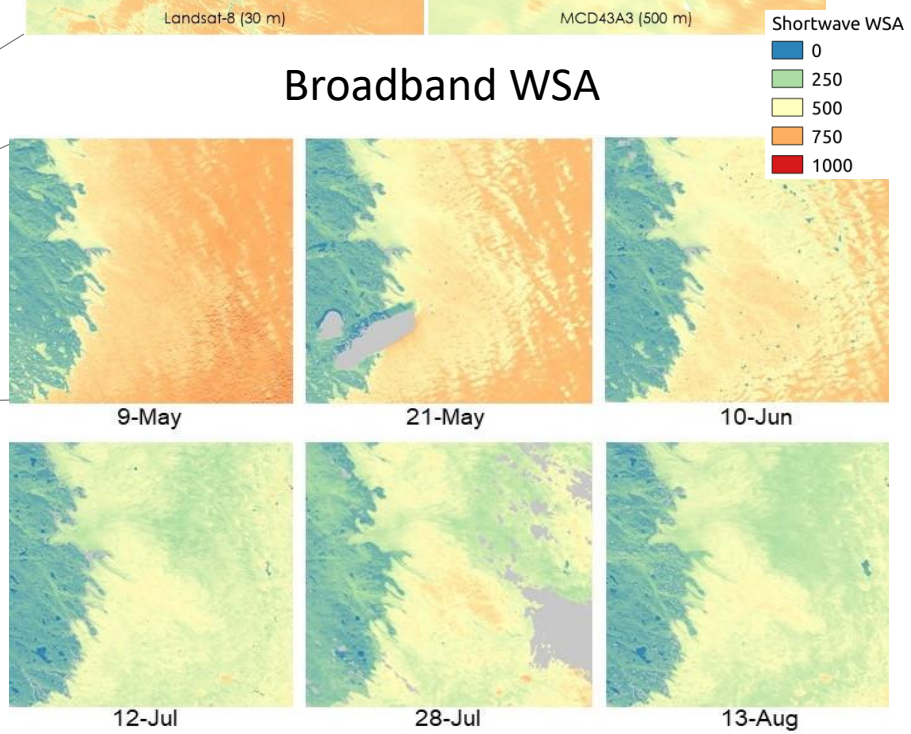


Greenland Broadband White Skye Albedo Heterogeneity 2019 Melt Event (southwest ice sheet)



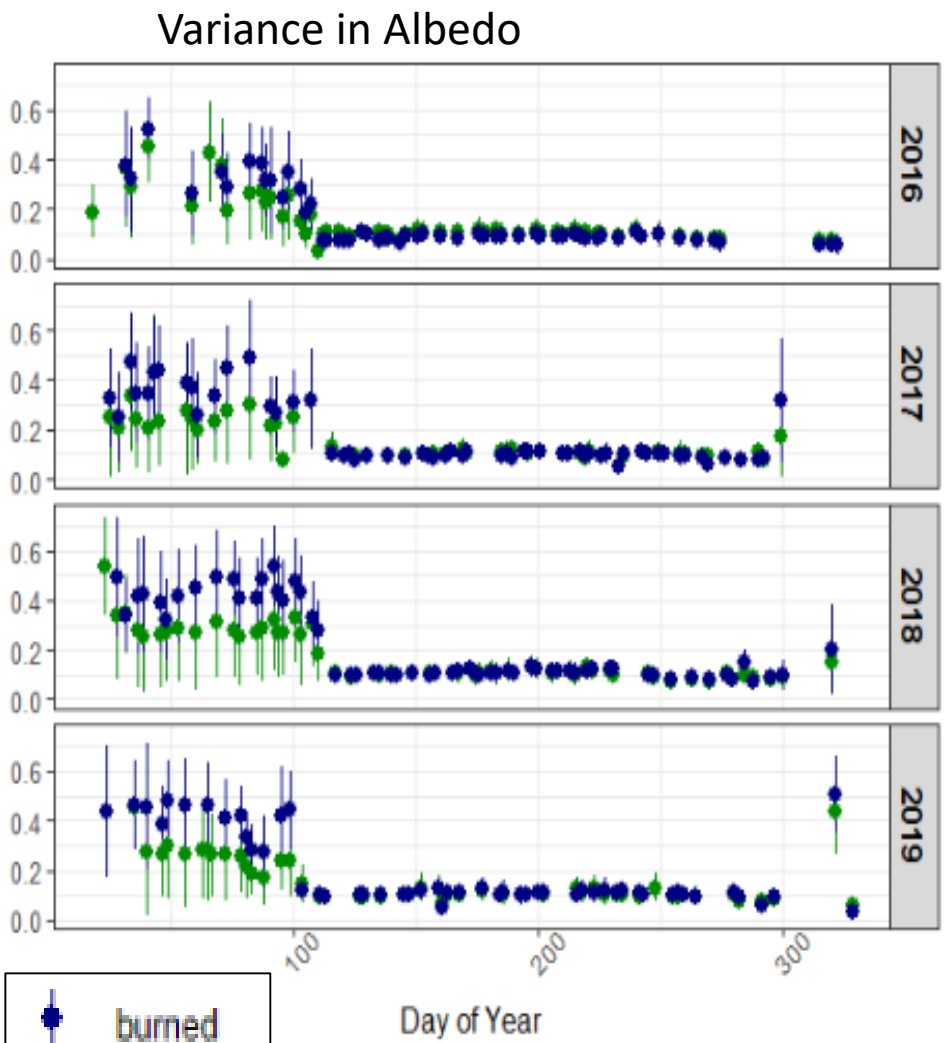
Comparison of the albedo pattern as measured by Landsat-8 (left, 30 m resolution) and MODIS (right, 500 m resolution) on 2019-06-10. Although the overall pattern is consistent between the two sensors, the increased spatial variability afforded by Landsat-8 provides considerably more detail.

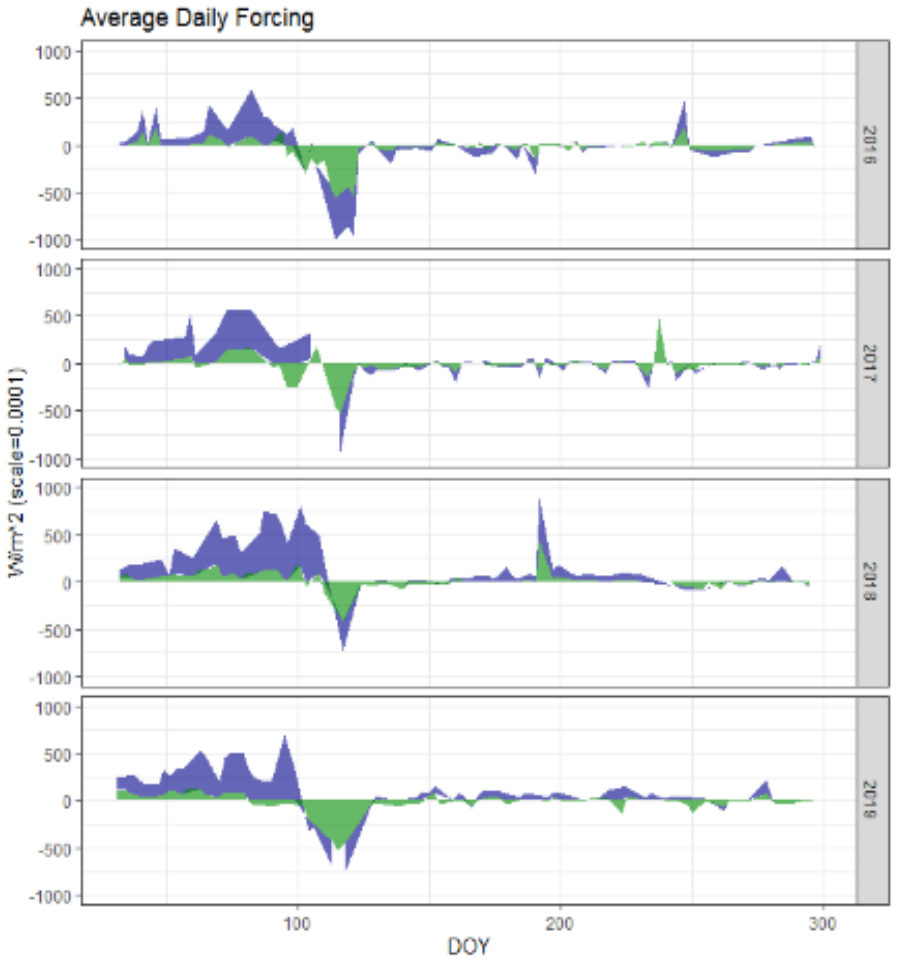




Detailed albedo pattern observed by Landsat-8. This series illustrates the 2019 melt episode for the location indicated in Figure 1.

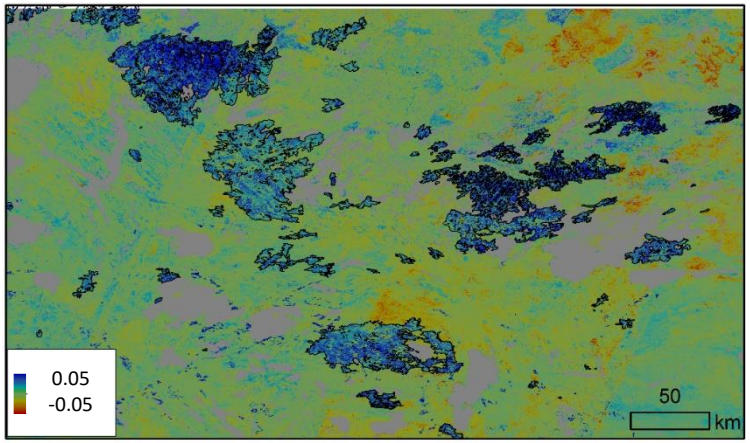
Elmes, A., C. Levy, A. Erb, D. Hall, T. Scambos, N. Digirolamo, and C. Schaaf, 2020, Consequences of the 2019 Greenland Ice Sheet Melt Episode on Albedo, (submitted).





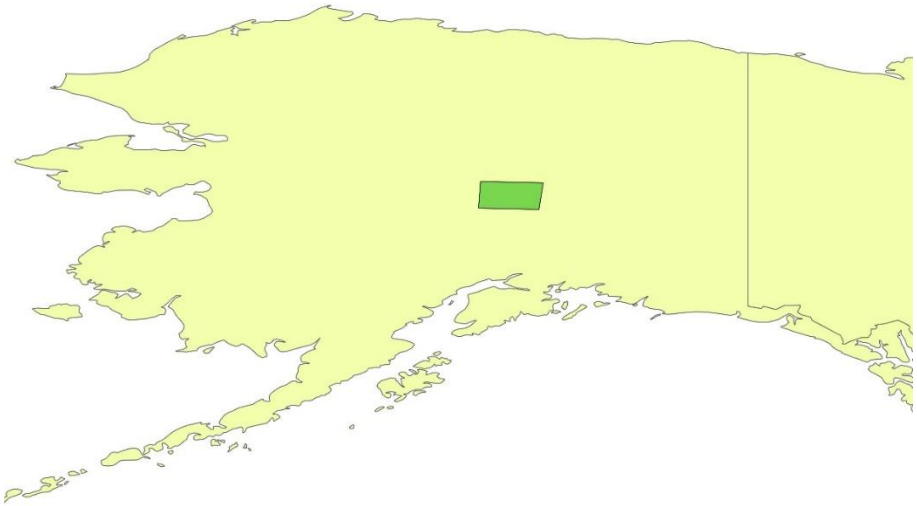
Saskatchewan Fires

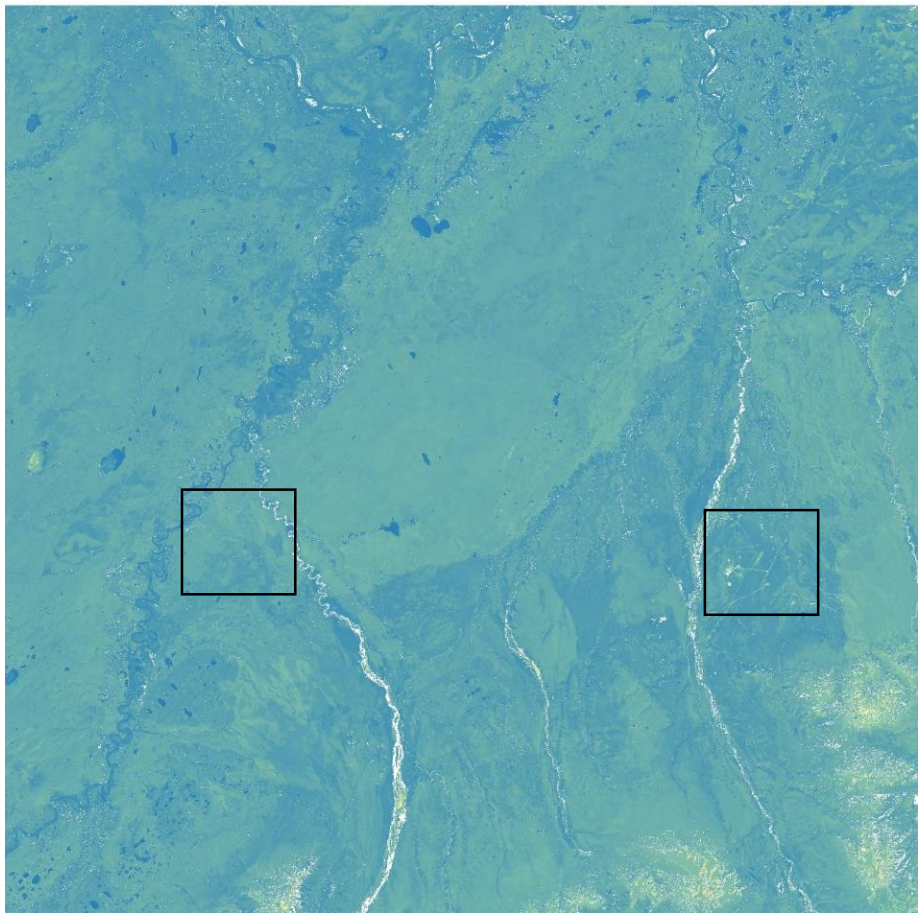
Spring Surface Shortwave Forcing
post-fire (2019-DOY30-120)



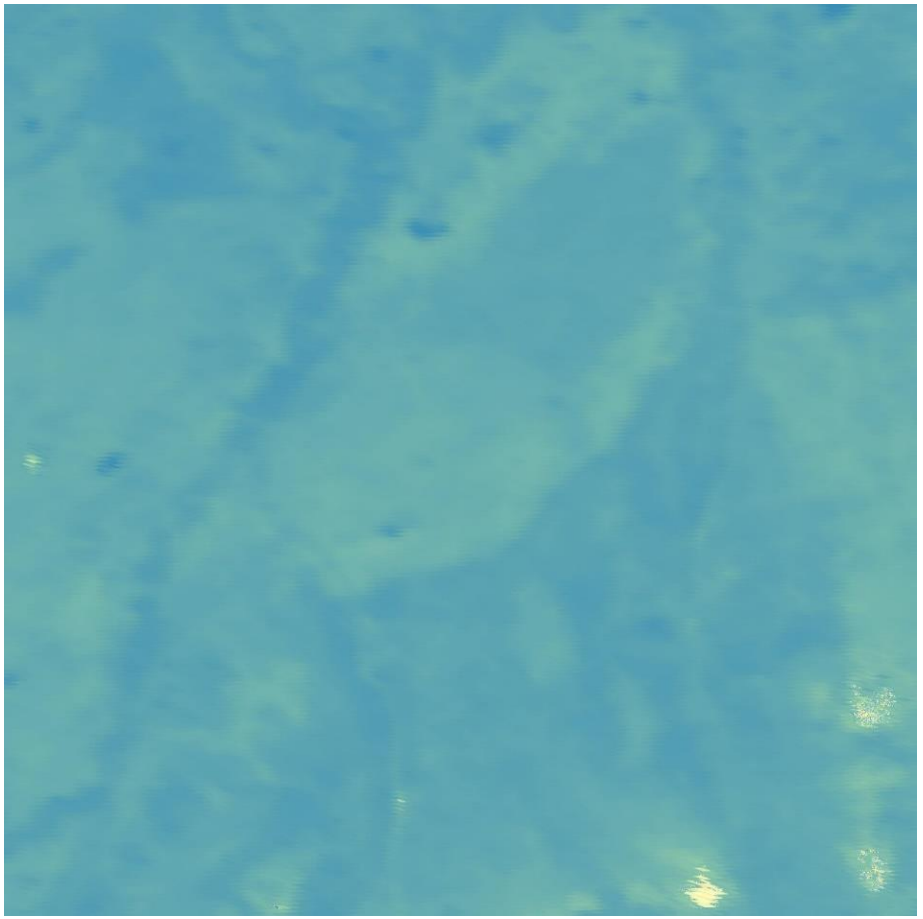
Angela Erb, and collaboration with Brendan Rogers, Woodwell Climate Research Center

Location of MGRS Tile 05WPM





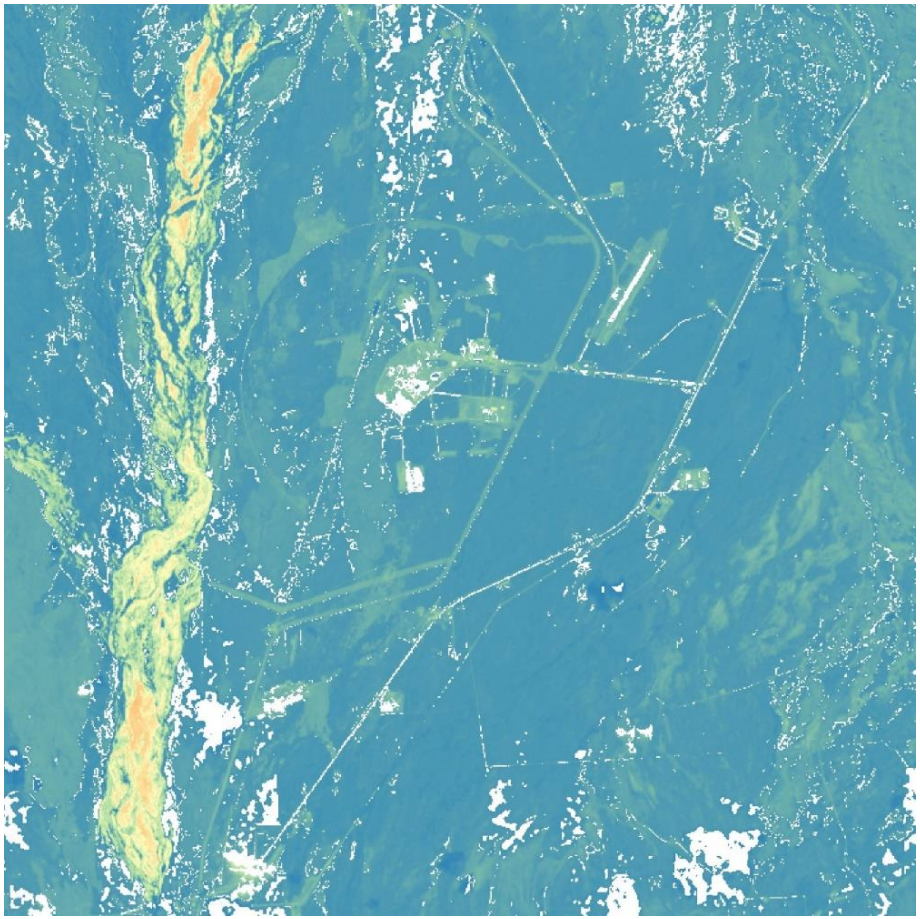
HLS v1.5 S30 Shortwave Albedo



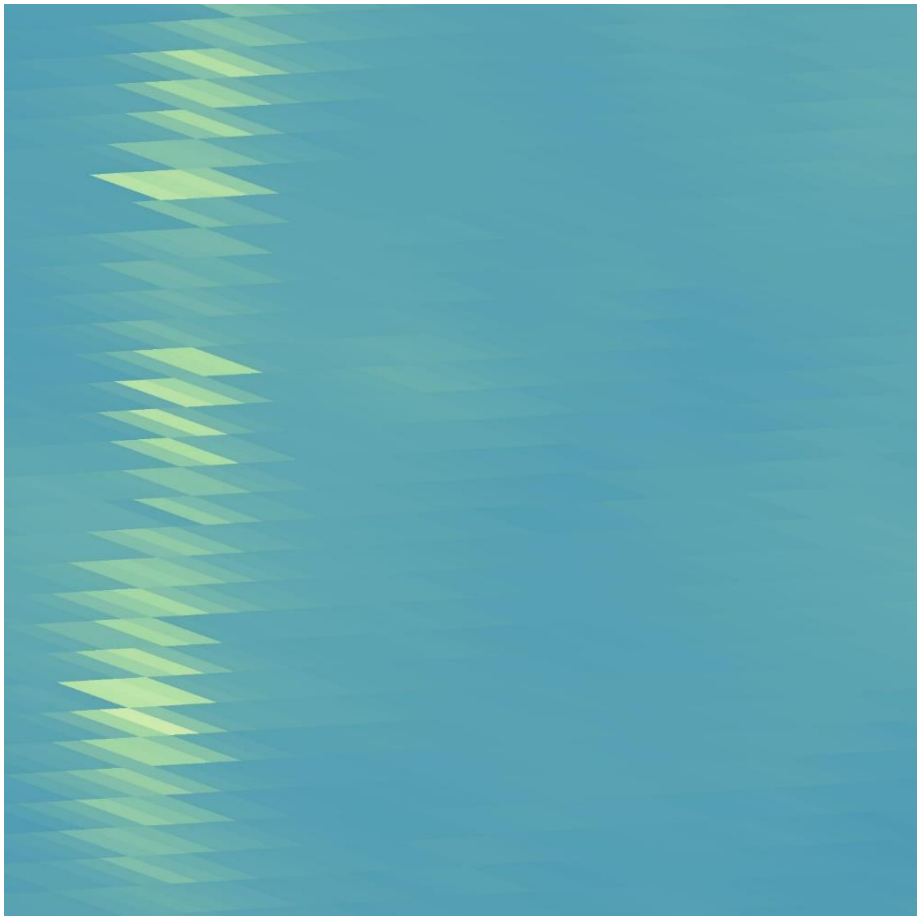
MCD43A3 Shortwave Albedo

HLS v1.5 S30 Shortwave Albedo

MCD43A3 Shortwave Albedo



HLS v1.5 S30 Shortwave Albedo



MCD43A3 Shortwave Albedo

Circumpolar Albedo Processing

- L-8, S-2, and HLS v1.5 are now being processed both locally and on Amazon Web Services (AWS)
- Further evaluation underway at spatially representative tower sites
- Several manuscripts are currently in progress demonstrating advantages of higher resolution albedo products from L-8, S-2, HLS.