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Satellite thermal mapping of the lowest surface temperatures in Greenland

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Inspired by a recent paper on the lowest observed air temperature in the northern hemisphere (AWS observation near Summit Station; Weidner et al., 2021), we will composite Aqua MODIS Land Surface Temperatures (LST, data set MYD11_I2 ver061) over the Greenland Ice Sheet spanning 2003-2023. Our preliminary analysis shows LST below 200°K with just part of the data processed. or colder than -100°F. Using the record-setting AWS station data, we estimate the temperature inversion between the ~2 meter air temperature and the snow surface to adjust the LST satellite measurements. Greenland shows a similar gradient in temperature between LST 'skin' temperature and air temperatures as seen in Antarctica from our earlier research (Scambos et al., 2018). Lowest temperatures occur on clear-sky polar nights under calm or nearly calm winds, in general just to the west and northwest of the ice divide. Maps of LST show small scale geographic variations that are closely associated with local lows in topography. We infer that this is a result of cold air pooling and further chilling of the surface under conditions that maximize radiative heat loss.