

Greenland Ice Surface Temperature from Imager and Sounder



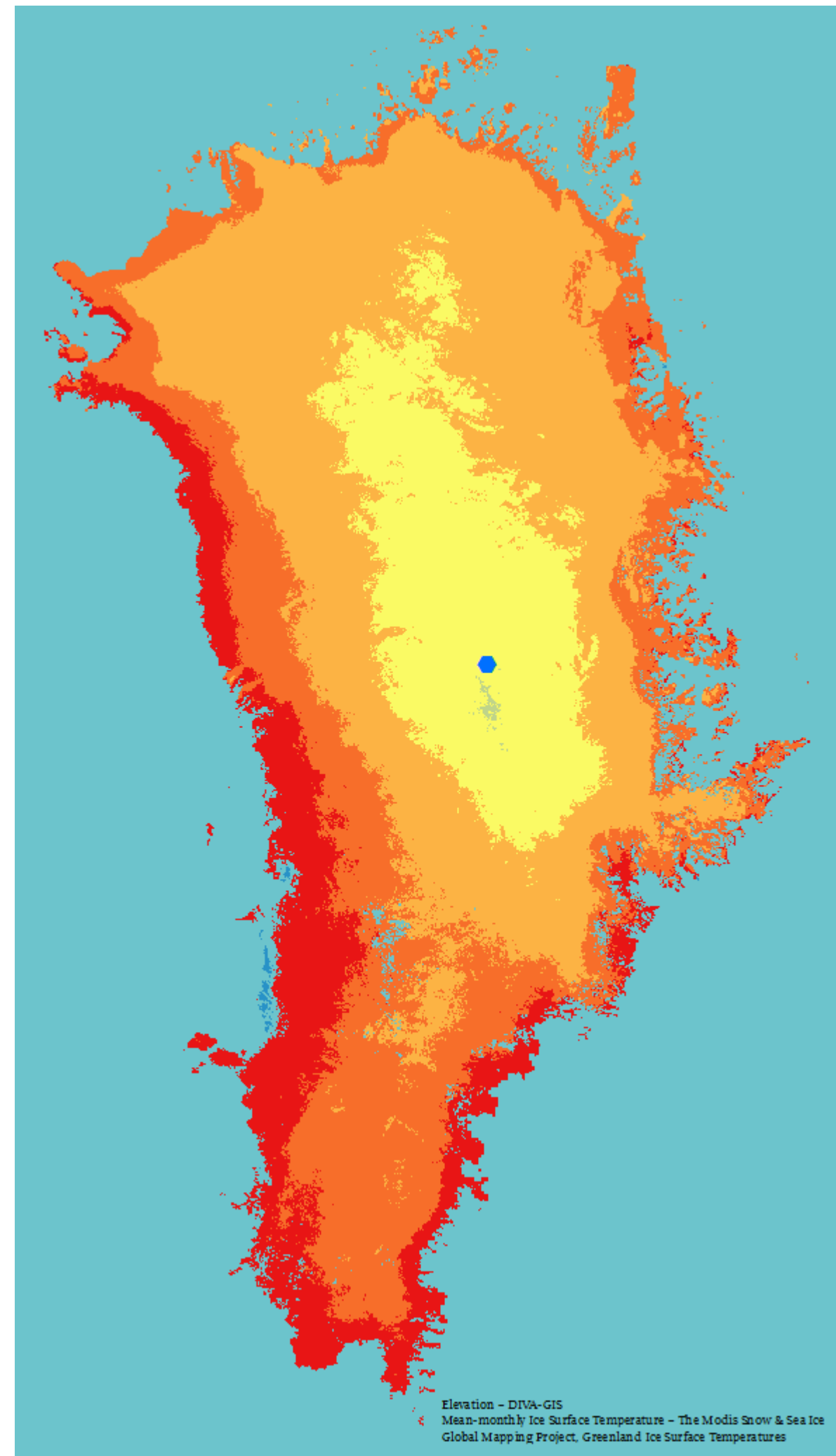
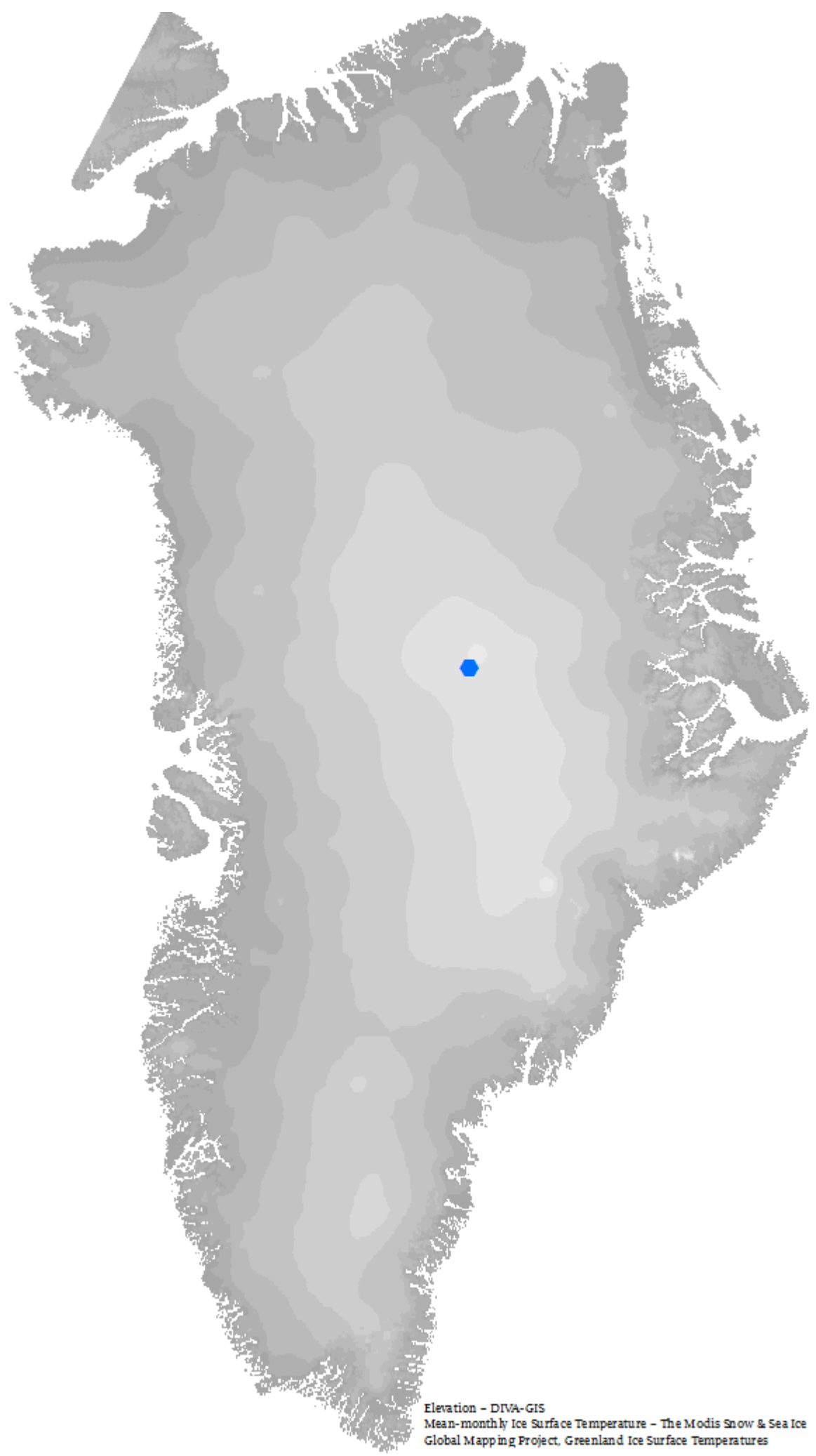
Robert Knuteson, Genevieve Burgess, Eva Borbas, Dave Tobin and Hank Revercomb



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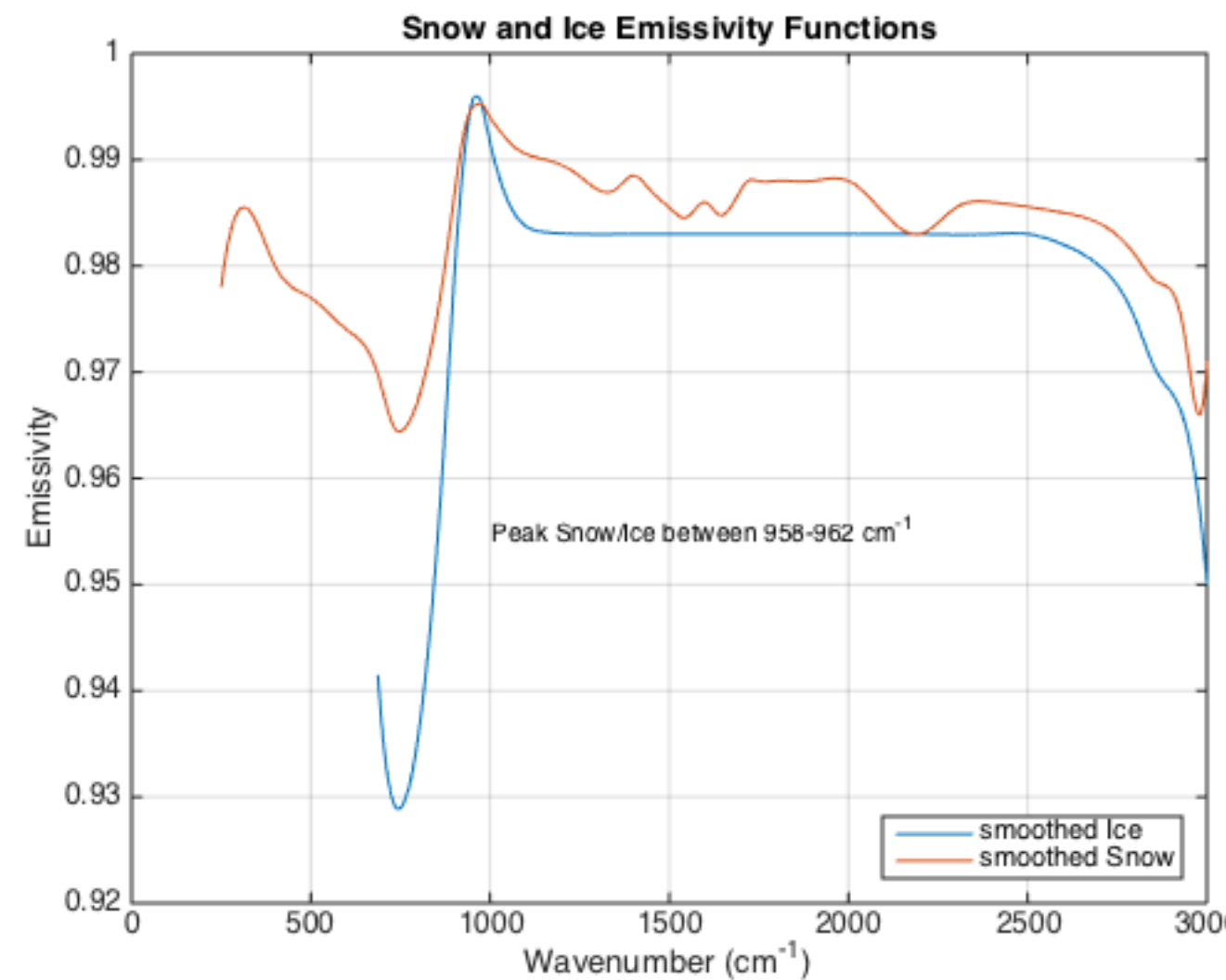
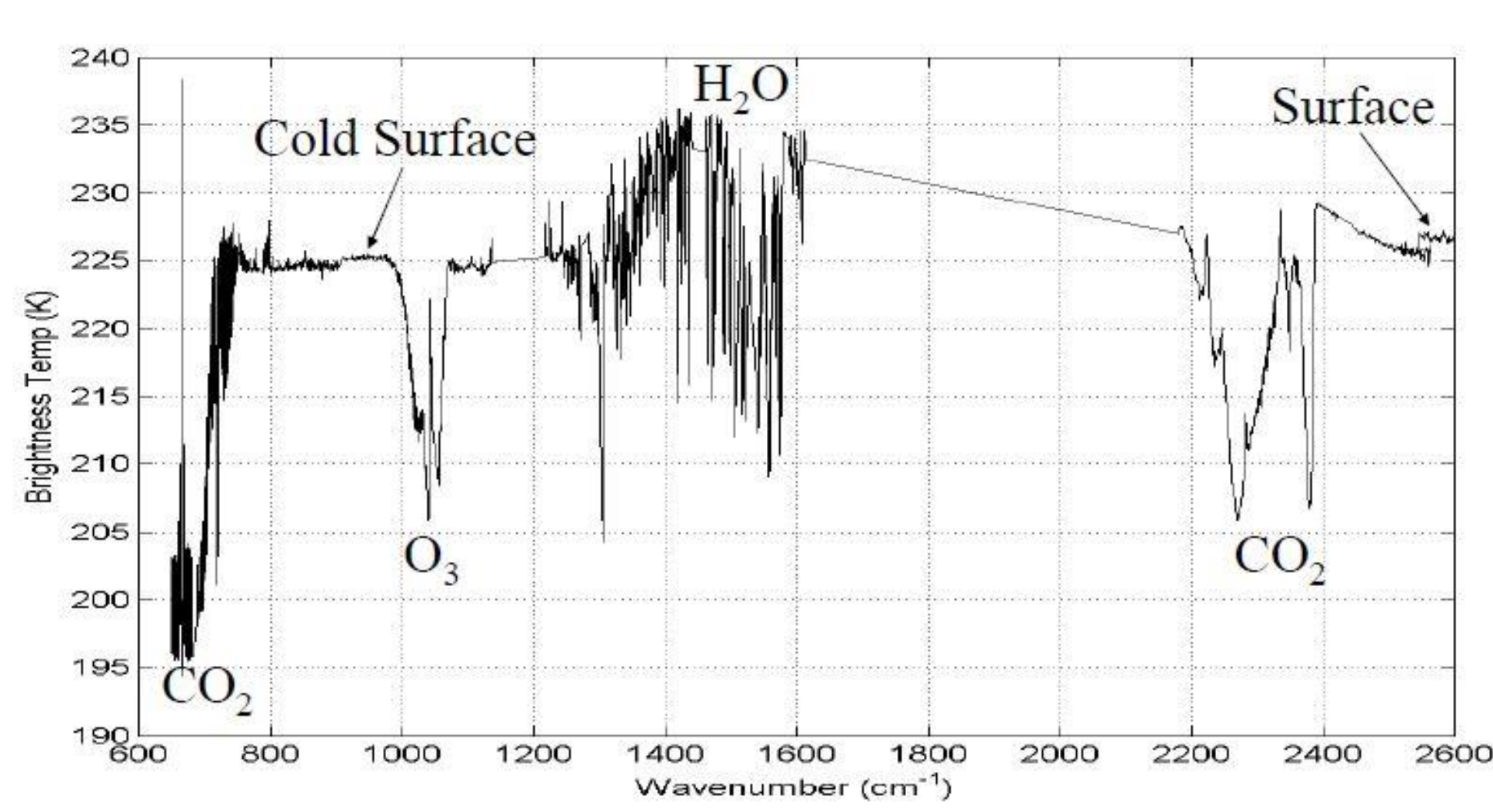
NASA MODIS Ice Surface Temperature Product

Hyperspectral Infrared Ice Surface Temperature



Monthly Ice Surface Temperature (IST) estimates of the Greenland plateau have been derived by NASA using the MODIS sensor for more than a decade. However, the accuracy of this product is difficult to verify due to the extremely harsh conditions, particularly in the winter months. Routine comparisons of Aqua MODIS brightness temperatures and collocated AIRS brightness temperature observations have been performed at UW-SSEC/CIMSS since 2003. Examples of the Aqua MODIS 11 μm brightness temperature averaged over the AIRS field of view compared with AIRS observations averaged over the MODIS spectral response functions are shown below for selected granules. During the very cold winter months the AIRS observations are about 0.4 K warmer than the MODIS observations for the 11 μm channel. This implies a systematic bias may exist in the NASA Greenland ICT record which could be corrected using coincident AIRS data.

An additional improvement in the AIRS ICT can be made through careful selection of the micro-windows selected to estimate the surface skin temperature. The snow/ice emissivity exhibits a narrow peak value at 962 cm^{-1} . Use of observations at this wavelength minimizes the error made in the assumed surface emissivity. The difference between AIRS BT at the peak (optimal) emissivity versus the AIRS BT averaged over the MODIS 11 μm channel is shown to be about 0.2 K. Thus the "error" in the MODIS 11 μm BT compared to the optimal AIRS BT is seen to be about 0.6 K in the mean.



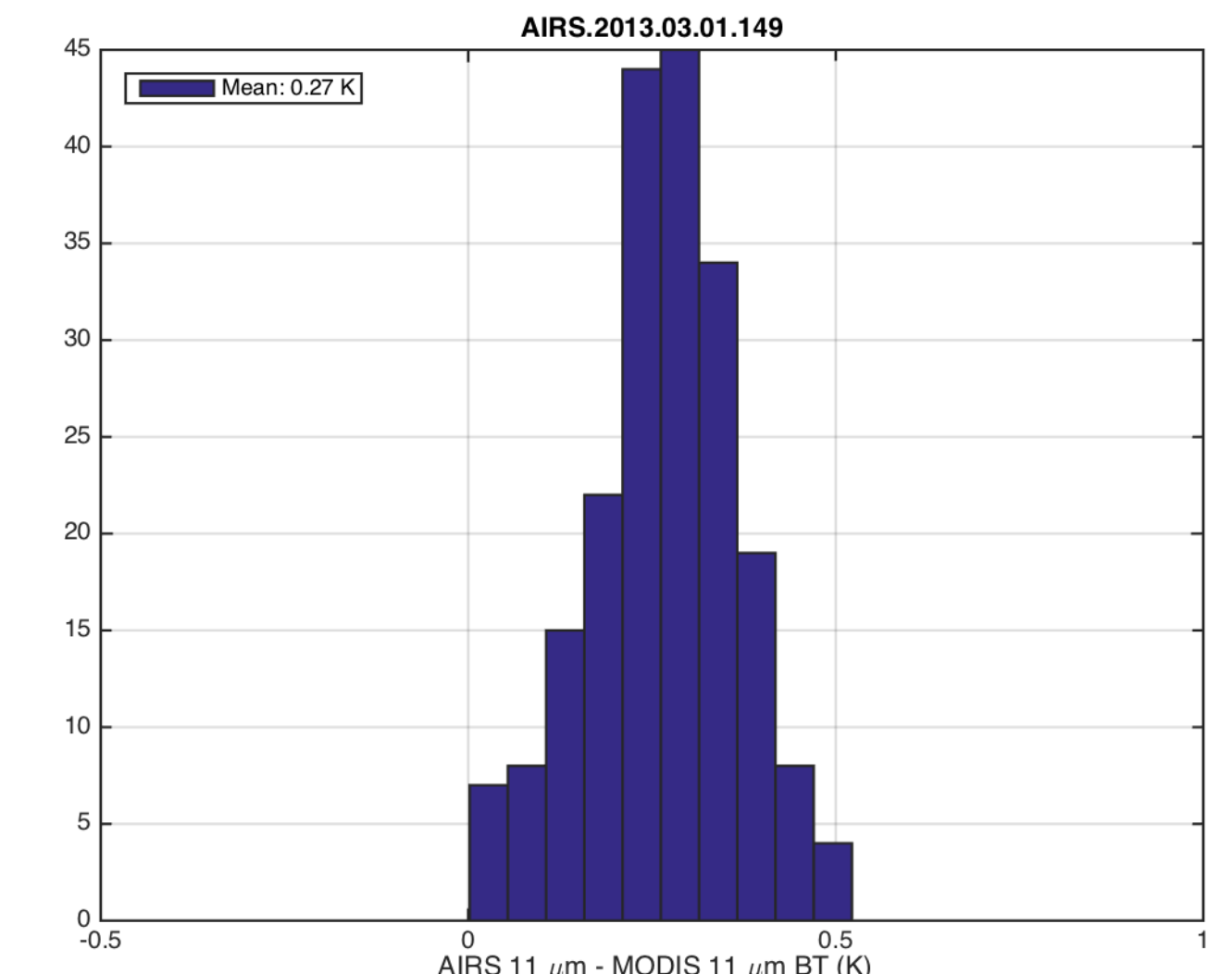
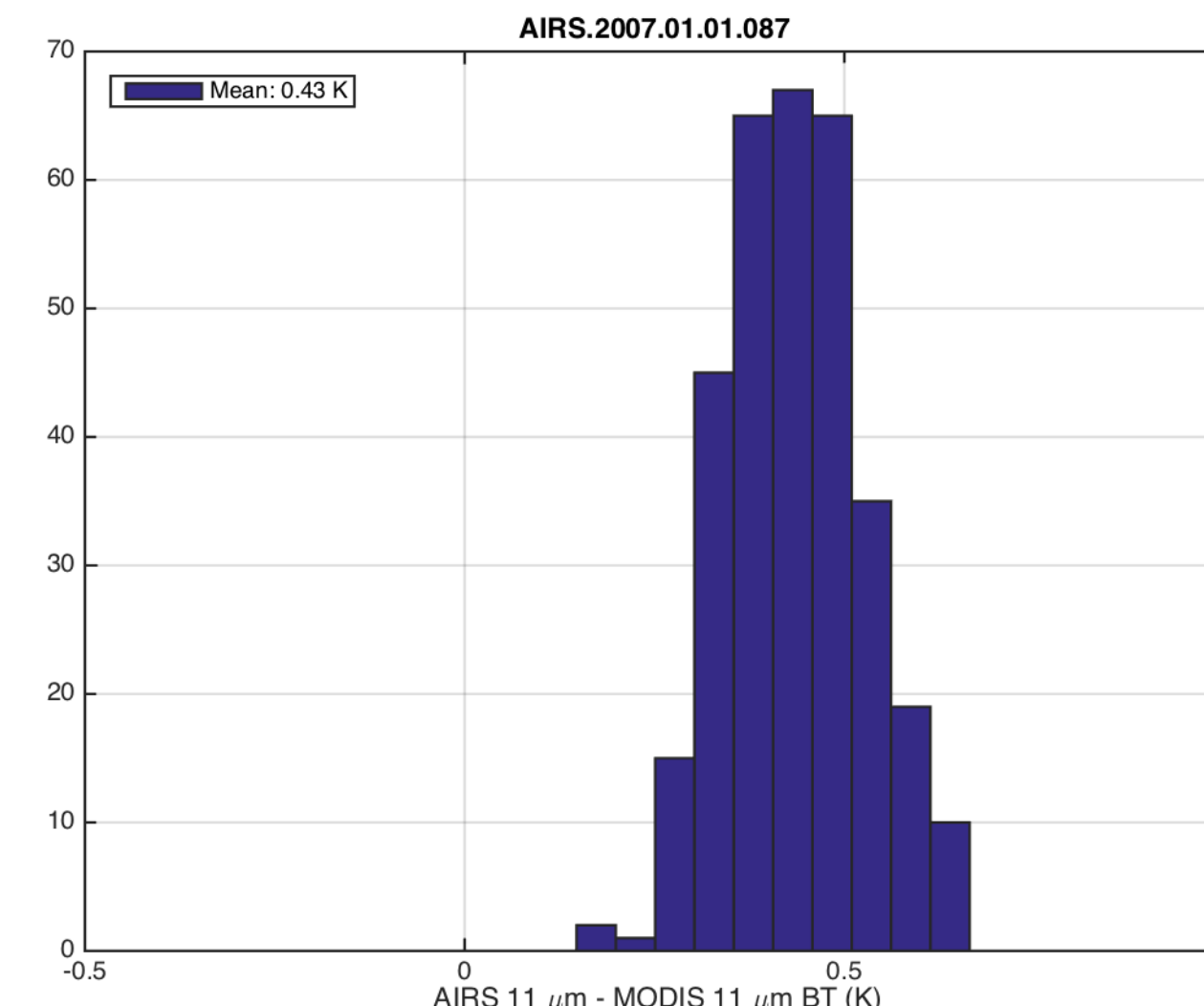
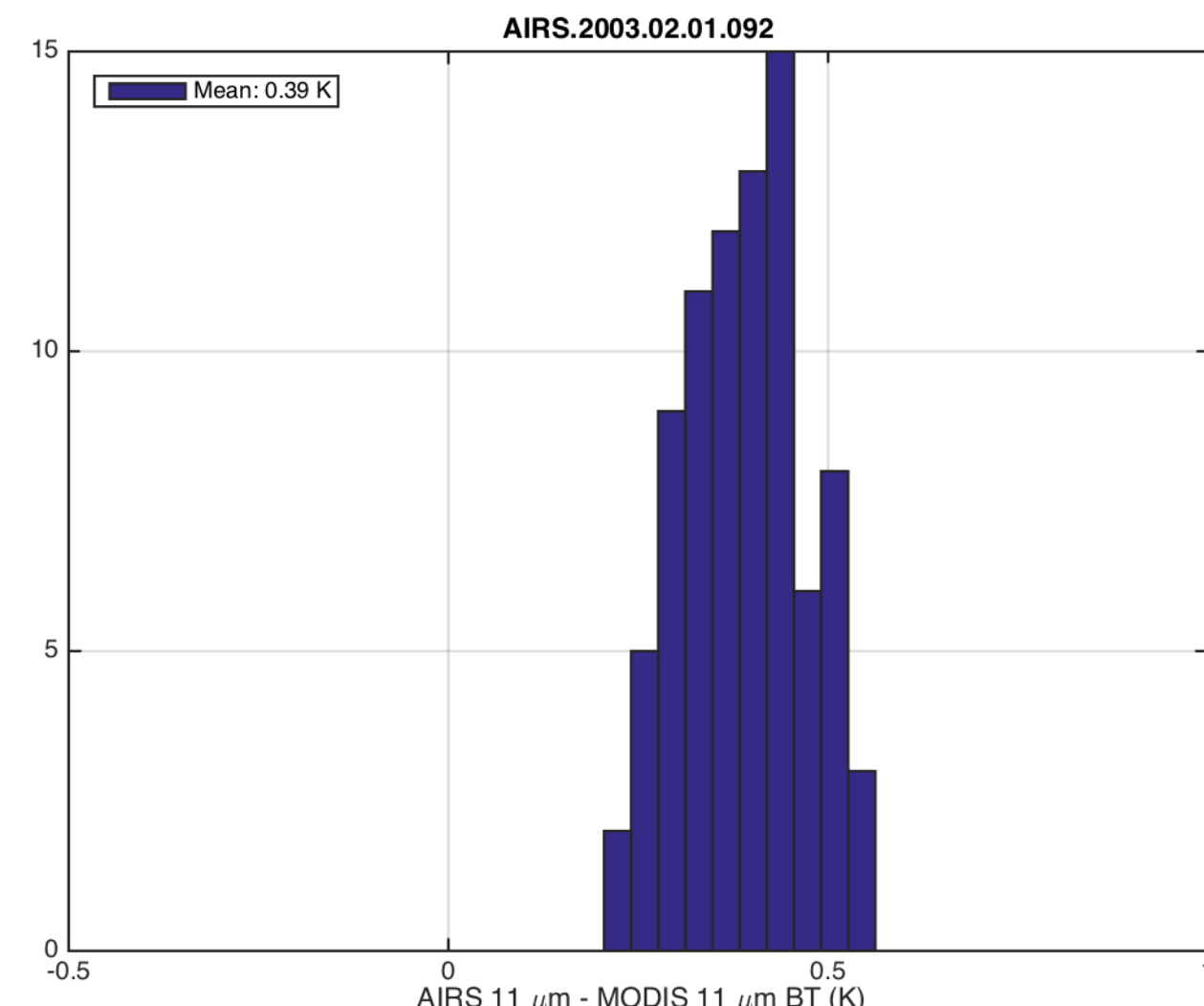
Future work includes the use of IASI and CrIS data to provide an independent estimate of the Greenland ICT and to carry the AIRS record forward in time. In addition, the new **MEASURES LST product** will be compared with the NASA AIRS and other hyperspectral sensor data to evaluate the performance of the new MODIS product for the eleven year period 2003-2013.

2003

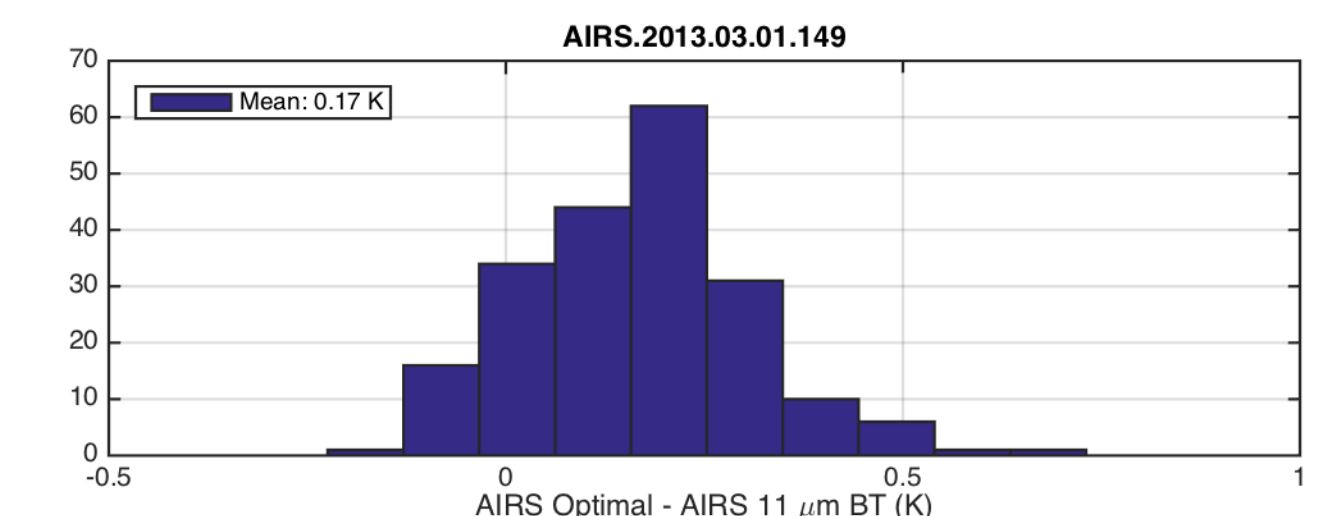
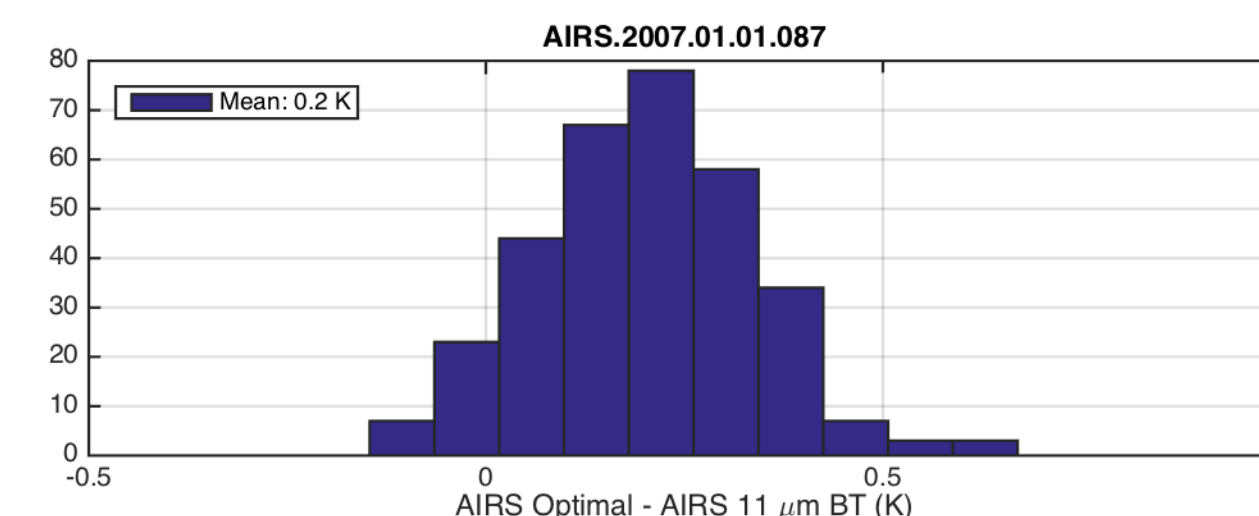
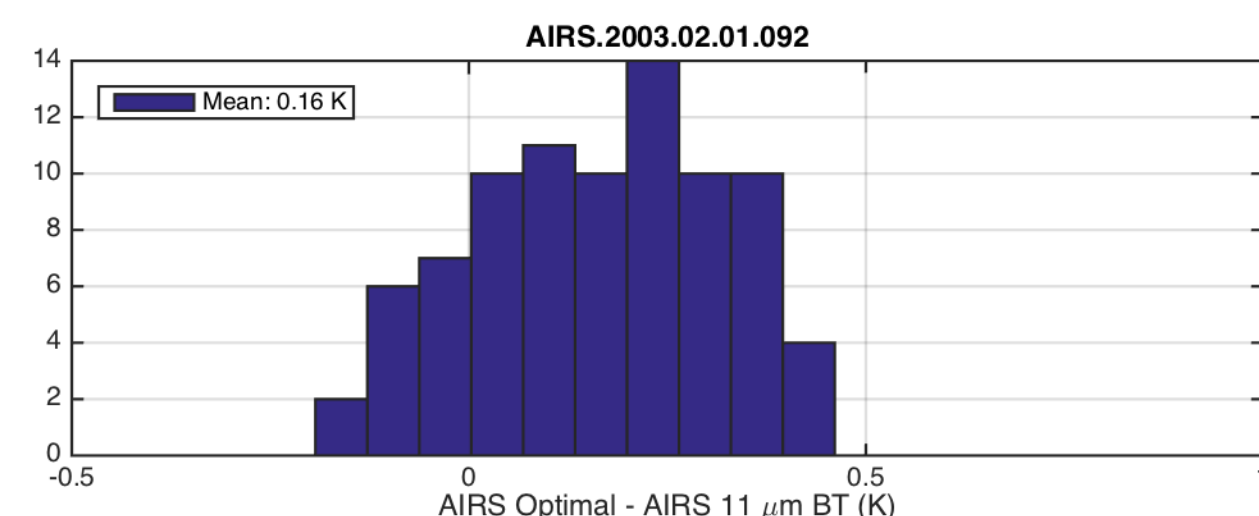
2007

2013

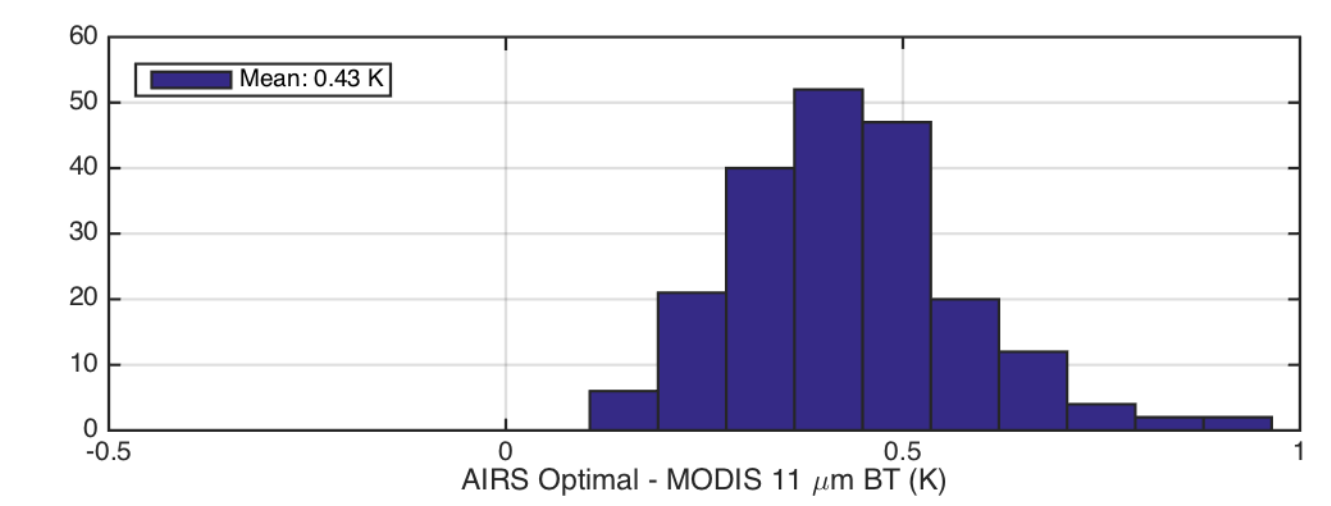
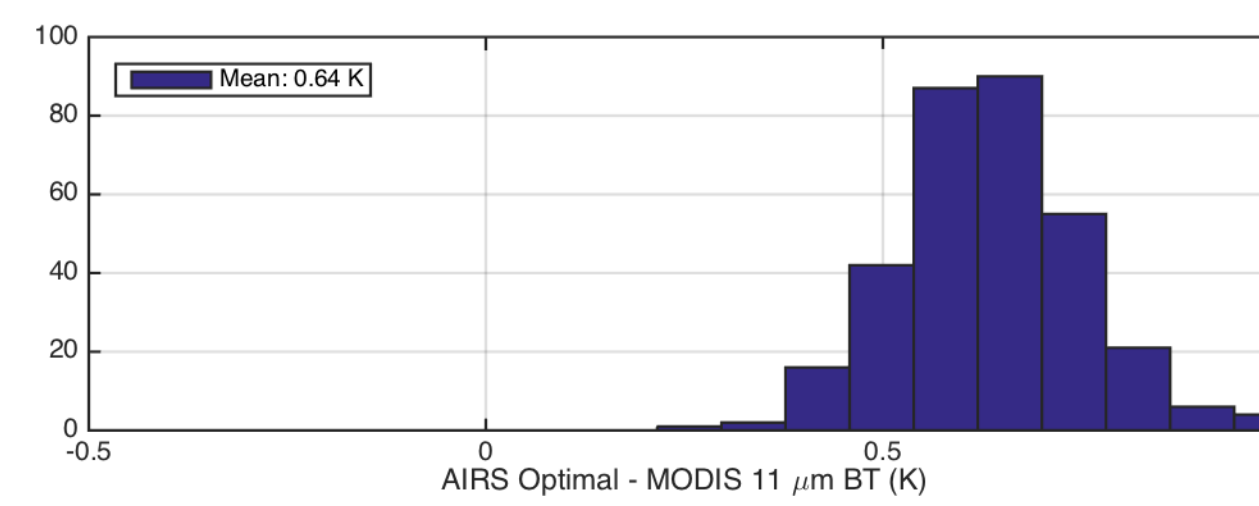
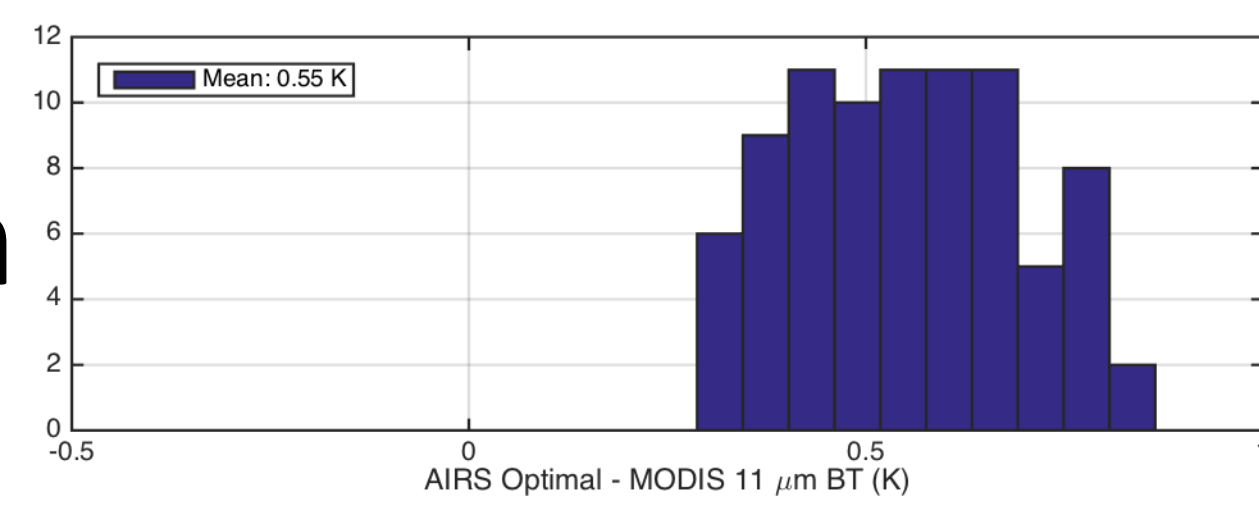
AIRS – MODIS
11 μm



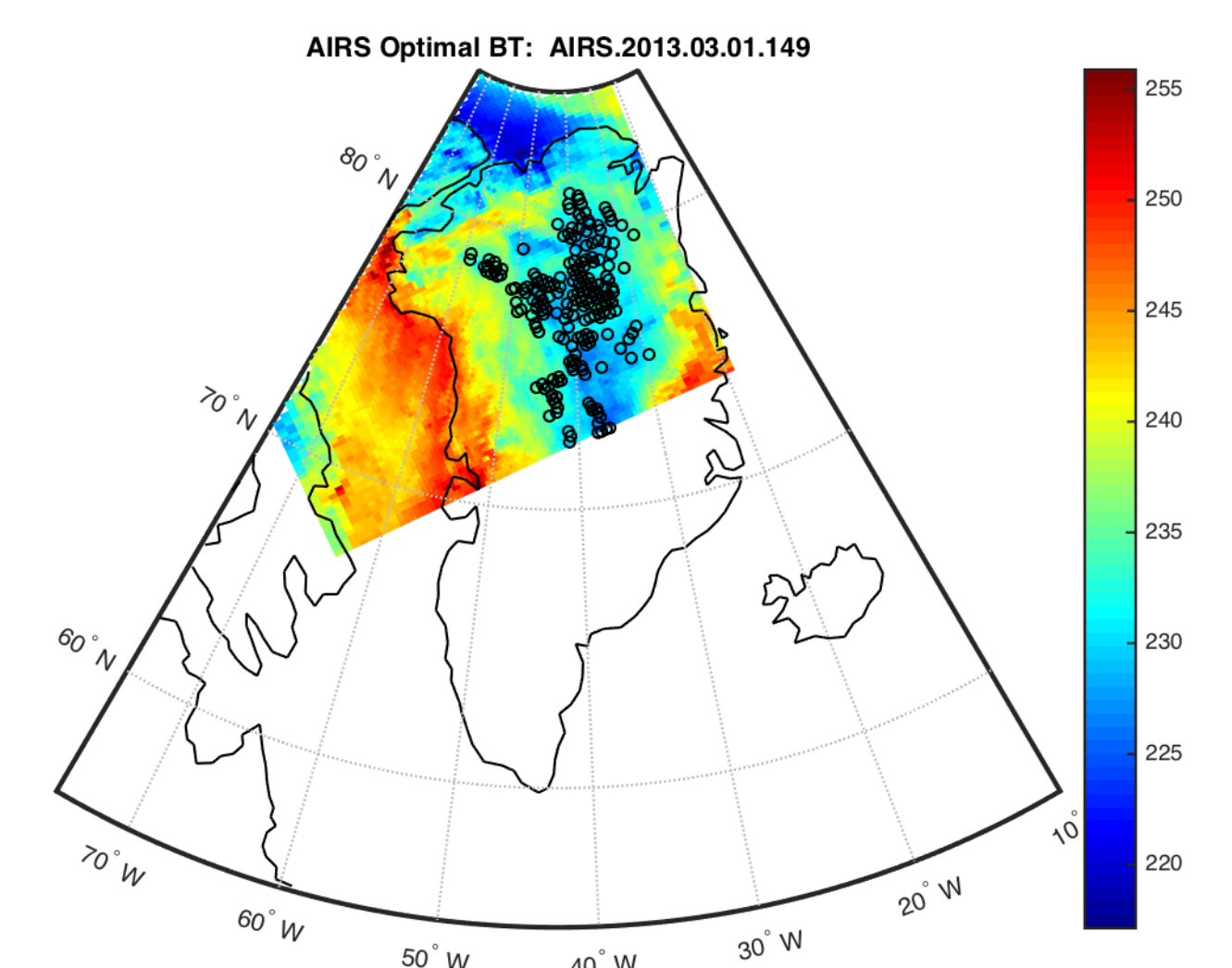
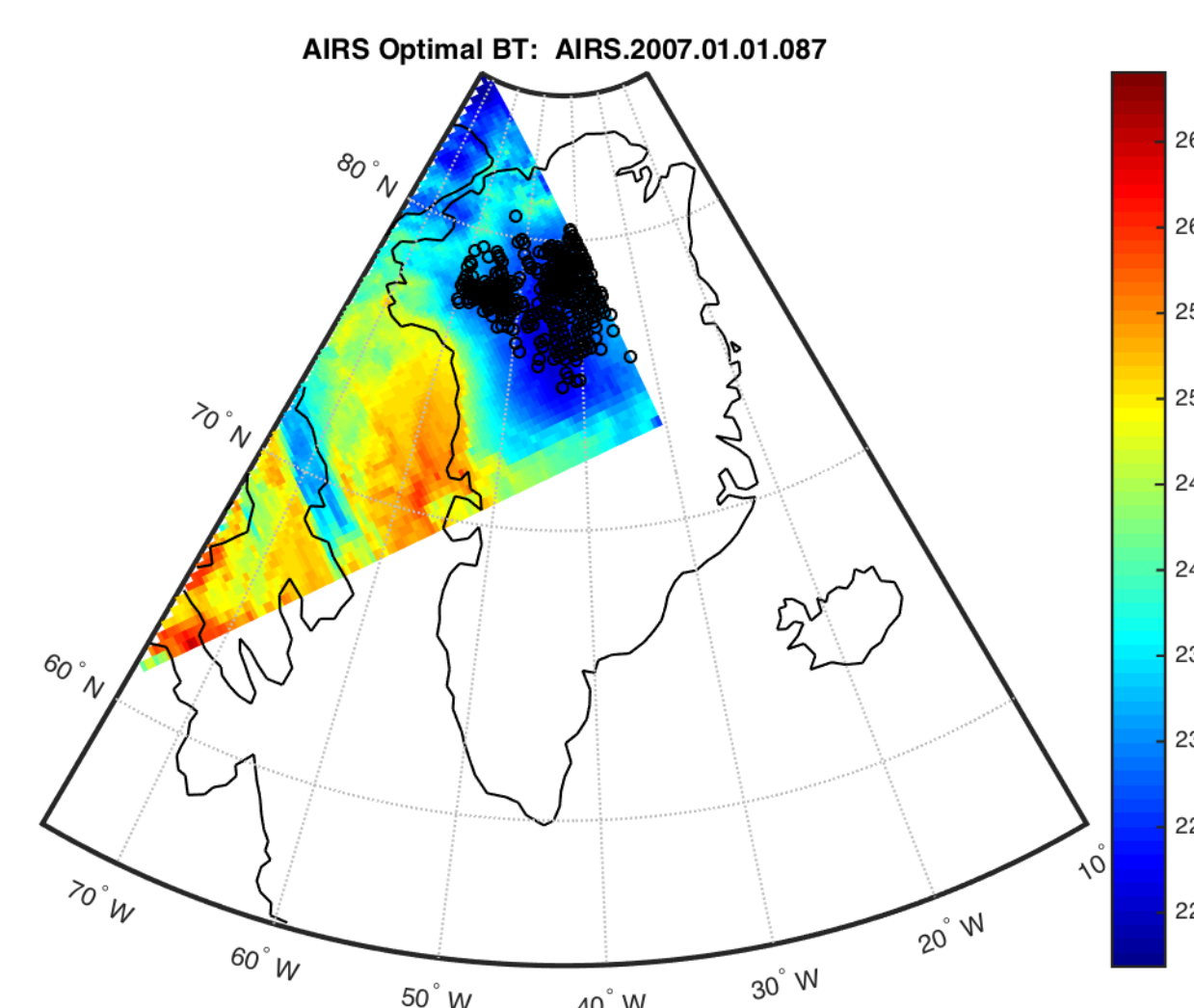
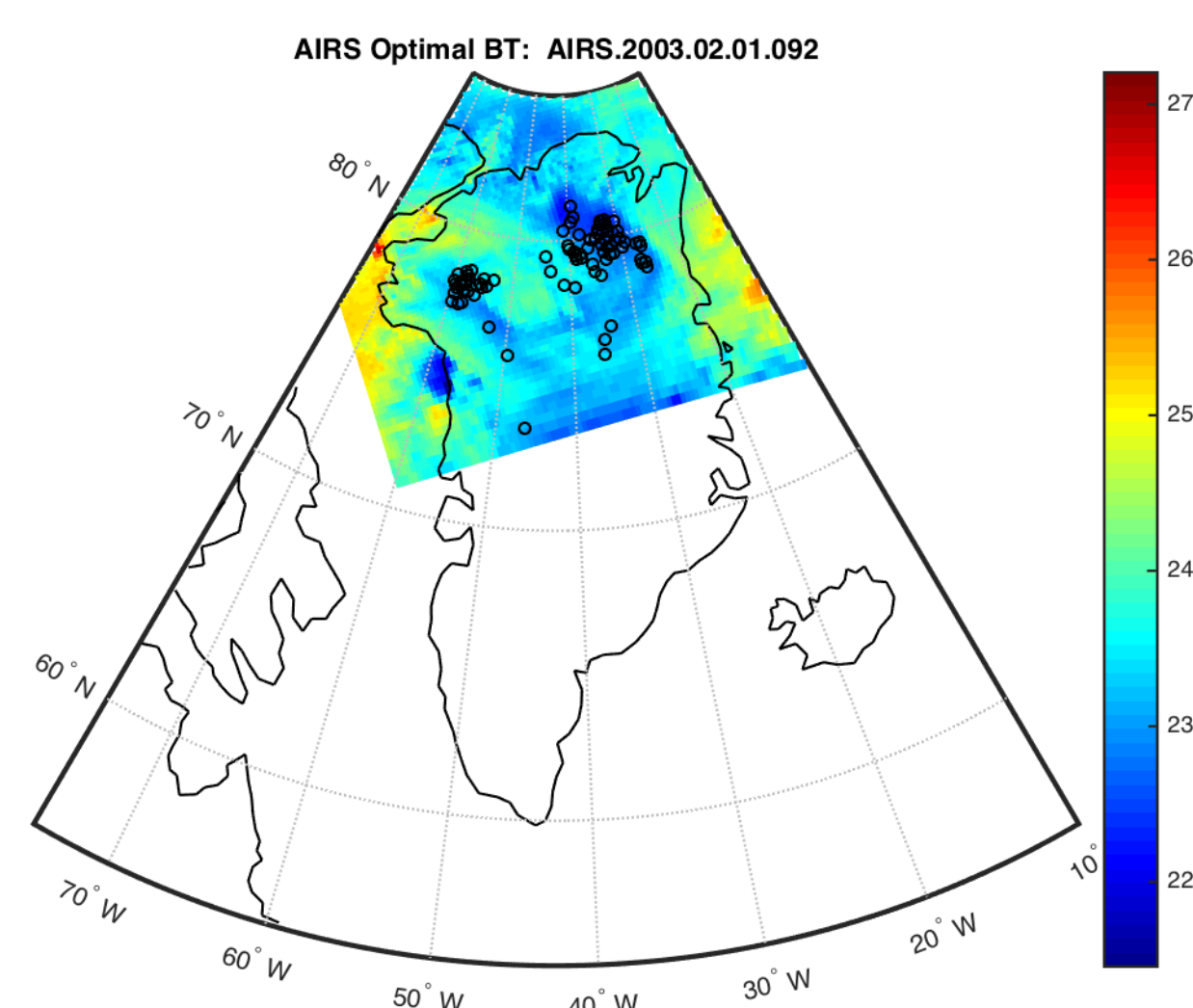
AIRS Peak – AIRS 11 μm



AIRS Peak – MODIS 11 μm



AIRS Peak BT (962 cm^{-1})
[Stdev < 0.33 K]



AIRS – MODIS
11 μm

