Weekly Report – October 6, 2023

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

Submitted by: Debra Baker & Kate Cooney
Email: drb@umd.edu
Phone: 301-405-5397

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HIGHLIGHTS FOR NESDIS LEADERSHIP

People

CISESS Scientist Hu (Tiger) Yang received a NASA Exceptional Achievement for Science Award. Dr. Yang is part of the JPSS-2 Instrument and Imagery Cal & Val Teams, which was recognized for their outstanding mission-critical support to the pre- and post-launch calibration/validation of the JPSS-2 satellite.

(Hu Yang, CISESS, huyang@umd.edu; Funding: JSTAR)

PUBLICATIONS

Abiotic and Biotic Factors impacting Tundra Productivity in Alaska:
Citation**: Zhang, Qingyuan**; Xuesong Zhang, Mark J Lara, Zhengpeng Li, Jingfeng Xiao, Kaiguang Zhao, and Tongxi Hu, 2023: Impacts of abiotic and biotic factors on tundra productivity near Utqiaġvik, Alaska, *Environ. Res. Lett.*, **18**(9), 094070, https://doi.org/10.1088/1748-9326/acf7d6.
Summary: CISESS Scientist Qingyuan Zhang has published a paper entitled "Impacts of abiotic and biotic factors on tundra productivity near Utqiaġvik, Alaska" at Environmental Research Letters. Earlier snowmelt, warmer temperatures and herbivory are among the factors that influence high-latitude tundra productivity near Utqiaġvik in northern Alaska. However, our understanding of the potential interactions between these factors is limited. MODIS observations provide cover fractions of vegetation, snow, standing water, and soil, and fractional absorption of photosynthetically active radiation by canopy chlorophyll (fAPARchl). We evaluated a 14-year time-period that the tundra experienced large interannual variability in vegetation productivity metrics, which was explainable by both abiotic and biotic factors. We found earlier snowmelt to increase June fAPARchl, and APARchl, while warmer temperatures significantly increased monthly fAPARchl and APARchl. However, abiotic factors failed to explain stark decreases in fAPARchl and APARchl during August of 2008, which coincided with a severe lemming outbreak. MODIS observations found this tundra ecosystem to completely recover two years later, resulting in elevated productivity (fAPARchl) (see Figure). This study highlights the potential roles of both climate and herbivory in modulating the interannual variability of remotely retrieved plant productivity metrics in Arctic coastal tundra ecosystems. The open access link is https://iopscience.iop.org/article/10.1088/1748-9326/acf7d6/pdf.

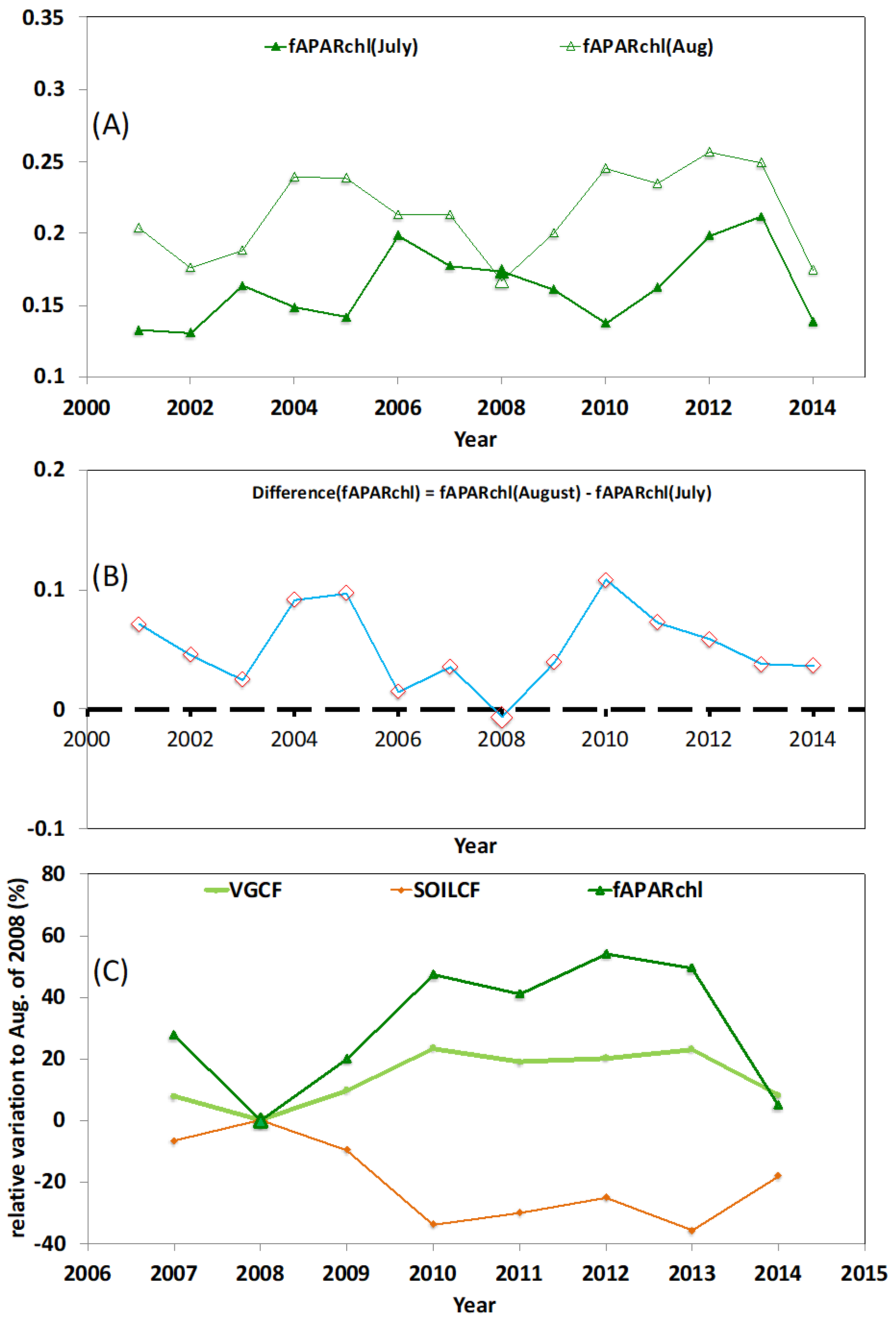

Figure: Influence of lemming herbivory on vegetation: (A) monthly fAPARchl in July and August during 2001 – 2014; (B) difference of monthly fAPARchl between August and July during 2001 – 2014; and (C) relative variations of August VGCF, SOILCF, and fAPARchl to year 2008 in format (Varix ⁄Vari2008 -1) ×100% where Vari = VGCF, SOILCF, and fAPARchl, and x=2007 – 2014. (Qingyuan Zhang, CISESS, qyzhang@umd.edu; Funding: JSTAR & DRSA)

Performance Evaluation of Lightning Observations from Space:
Citation**: Zhang, Daile**; Kenneth L. Cummins, Timothy L. Lang, Dennis Buechler, and **Scott Rudlosky**, 2023: Performance Evaluation of the Lightning Imaging Sensor on the International Space Station, *J. Atmos. Oceanic Technol*., **40**(9), 1063–1082, https://doi.org/10.1175/JTECH-D-22-0120.1. Summary: CISESS Scientist Daile Zhang, Scott Rudlosky (NOAA & CISESS), and colleagues published a study that uses the well-documented Tropical Rainfall Measuring Mission (TRMM) Lightning Imaging Sensors (LIS) performance to determine if the International Space Station (ISS) LIS performs well enough to bridge the gap between TRMM LIS and the new generation of Geostationary Lightning Mappers (GLMs). Overall, the two LIS instruments produced similar event, group, and flash parameter values within their shared latitude range. ISS LIS detected 0.8 fewer events per group and 1.1 fewer groups per flash. These differences were likely due to larger pixels for ISS LIS that occur because of flight altitude and a slight tilt of the sensor away for nadir. Total and mean event energy density on the ISS LIS pixel array indicated some anomalous hotspot pixels or “patches” that were not present with the TRMM LIS. It was also found that radiometric sensitivity decreases radially from the center of the array to the edges for both instruments and that the ISS LIS falloff behavior was larger than the TRMM LIS. Despite these differences, it was found that ISS LIS provides similar parameter values to TRMM LIS with the expectation of somewhat lower lightning detection capability. The results indicated that recalculation of the event, group, and flash areas for both LIS datasets are strongly recommended since the archived values in the current release versions have significant errors.

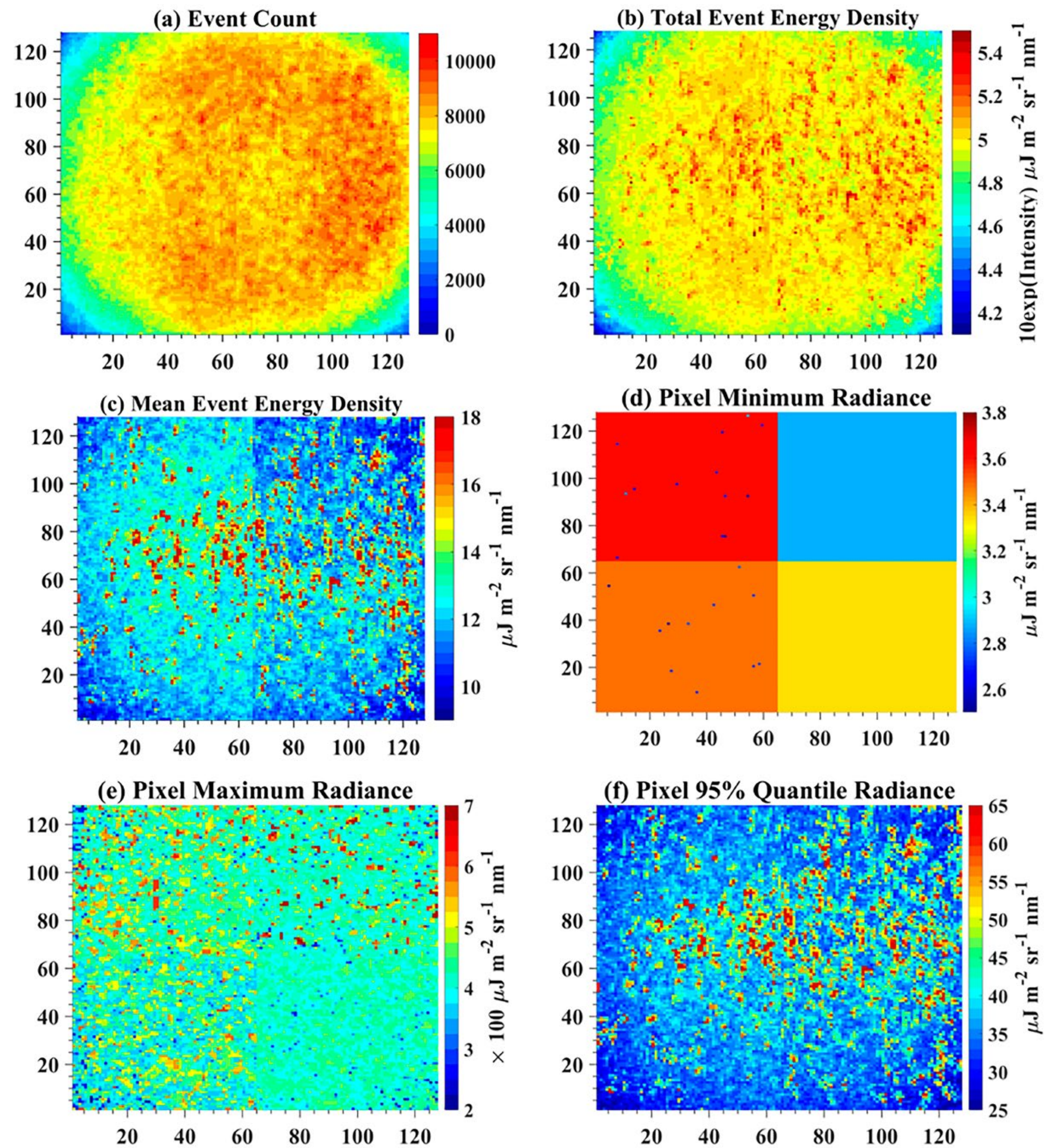

Figure: The International Space Station Lightning Imaging Sensors 128 X 128-pixel array of (a) event count, (b) total event energy density, (c) mean event energy density, (d) pixel minimum energy density, (e) pixel maximum energy density, and (f) pixelwise 95% quantile energy density during March 2017–September 2020, computed separately for each pixel, indexed by CCD pixel numbers.

(Daile Zhang, CISESS, dlzhang@umd.edu; Funding: GOES-R AWG, STAR)