Weekly Report – November 22, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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SOCIAL MEDIA AND BLOG POSTS

First Major Snow of the Season Hits the Rockies

CISESS Satellite Liaison to the NWS Weather and Ocean Prediction Centers, Chris Smith, describes in meteorological detail the blast of winter that hit the Rockies in early November in his latest posting on the Satellite Liaison Blog. Over the course of three days, northern New Mexico and southern and eastern Colorado experienced substantial total snow accumulations and widespread liquid-equivalent snowfall rates of ~0.10”/hour. Thundersnow was also part of the show at times. By 10 November, skies were clear from New Mexico northward, and the fresh snowpack was visible from satellite imagery. In total, Smith reports, Denver International Airport received 19.2 inches of snow, while areas farther south received over four feet of snow.

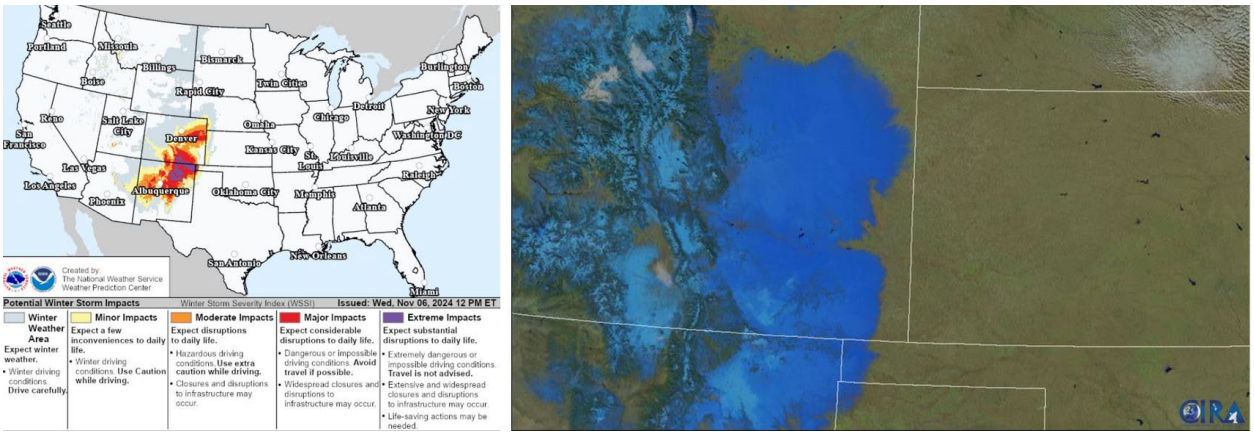

Figure. (left) NWS Weather Prediction Center Day-3 Winter Storm Severity Index on 06 November 2024. (right) Visible Infrared Imaging Radiometer Suite Snowmelt imagery at 19h20 UTC on 10 November 2024. Dark blues represent wet, more compact snow, and light blues represent fresher snow.

(Christopher Smith, CISESS, csmith70@umd.edu; Funding: GOES-R PGRR)

PUBLICATION(S)

Using Transfer Learning to Estimate Land Surface Temperatures
Citation: Xu, Shuo, Dongdong Wang, Shunlin Liang, Aolin Jia, Ruohan Li, Zhihao Wang, and **Yuling Liu**, 2024: A novel approach to estimate land surface temperature from Landsat top-of-atmosphere reflective and emissive data using transfer-learning neural network. Sci. Total Environ., 955, 176783, https://doi.org/10.1016/j.scitotenv.2024.176783.
Summary: Land surface temperature (LST) is a key parameter in research on urban heat islands, hydrological cycles, and vegetation monitoring, among others. Traditional satellite-based physical LST-retrieval methods usually rely on auxiliary data, especially land surface emissivity (LSE), which are additional sources of uncertainty. Conventional machine-learning LST-retrieval methods require representative training data, which can be a challenge to acquire, and have difficulty in making the best use of data from various sources. CISESS Scientist Yuling Liu and her graduate student Shuo Xu and colleagues address these issues in a paper recently published in the journal *Science of the Total Environment*, where they introduce a new way to estimate LST based on transfer learning (TL) that requires only top-of-the-atmosphere Landsat reflective and emissive data, streamlining the conventional LST retrieval process. They demonstrate that this original approach is superior to other methods, such as the single-channel and split-window methods, which both require accurate LSE information. They also note that their TL algorithm has larger errors when atmospheric water vapor levels are high. This will be examined in the future as they refine the algorithm. To make possible the generation of LST data from Landsat 8 and 9 for environmental studies by others, the TL algorithm is freely available on Google Earth Engine.

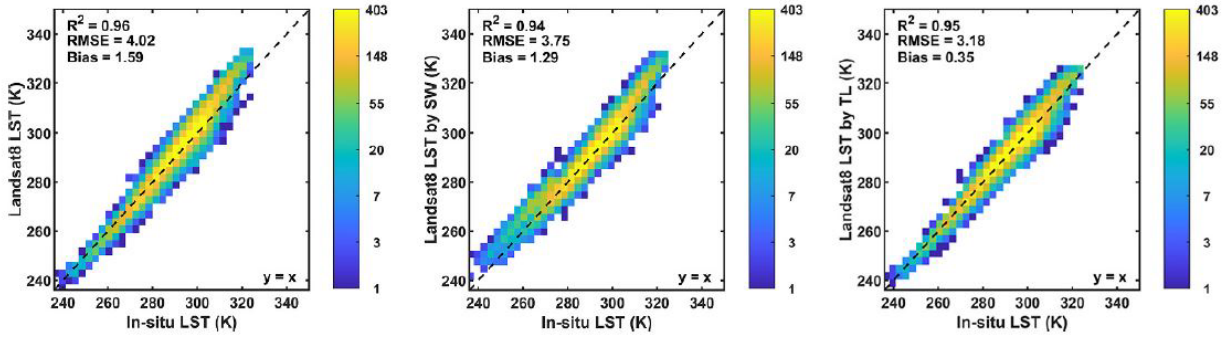

Figure. (from left to right) Comparison between the Landsat-8 land surface temperature (LST) product generated by the single-channel (ST) algorithm, Landsat-8 LST data generated by the split-window (SW) algorithm, and Landsat-8 LSTs predicted by the transfer-learning (TL) model as a function of in-situ measurements. The TL model performs the best, with the highest correlation of determination (R^2) value and lowest root-mean-square error (RMSE) and bias values.

(Shuo Xu, CISESS, shuoxu98@umd.edu, Funding: JSTAR; Yuling Liu, CISESS, yuling.liu@noaa.gov, Funding: DACS, JSTAR)

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