EVALUATION OF IMERG-E PRECIPITATION ESTIMATES FOR FIRE WEATHER APPLICATIONS IN ALASKA

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Credit: Rick Thoman, Alaska Center for Climate Assessment and Policy. Data source: Alaska Interagency Coordination Center





BACKGROUND - EVALUATION - BIAS CORRECTION - SUMMARY

International Arctic

ersity of Alaska Fairbanks

Research Center

Canadian Forest Fire Danger Rating System Fire Weather Index System



http://cwfis.cfs.nrcan.gc.ca/





http://radar.weather.gov/Conus/alaska.php

As of 7/5/2020, 228 active stations for 1.72 million km² http://akff.mesowest.org

Importance of precipitation in CFFDRS

- CFFDRS ingests gridded precipitation estimates from the Alaska-Pacific River Forecast Center
- Estimates are a blend of PRISM Climatology (rainfall/elevation relationship) and observed rainfall and in situ observations
- Indices, like Fine Fuel Moisture Code (FFMC), are sensitive to precipitation, especially nonzero estimates less of 10mm or less



IMERG: Integrated Multi-satellitE Retrievals for the Global Precipitation Measurement Mission

Frequency: 0.5 hr ⁻¹ **Resolution:** 0.1°

3 Independent products

- I. Early (-E ~4 hours)
- 2. Late (-L ~ 12 hours)
- 3. Final (-F ~2.5 months)

Note: Poleward of 60°, only microwave swaths over snowand ice-free surfaces



pmm.nasa.gov/GPM



2. Bias correct IMERG-E estimates using a regional quantile mapping method, then repeat verification process. This approach will produce a new precipitation grid

- . Quantitatively evaluate IMERG-E estimates of 24-hour accumulated precipitation from the 2014-2019 fire seasons (1 June 31 August)
 - Use NWS and RAWS stations as truth
 - Calculate verification metrics (bias, root mean sq. error, etc.) by region, accumulation percentile, and fire season







IMERG-E overestimates the frequency of occurrence for all accumulation bins Note: Statewide metrics shown – all regions were similarly overestimated



IMERG-E overestimates in each region and accumulation percentile range for all fire seasons

Root mean squared error increases with event magnitude for all regions and fire seasons

Gowan and Horel (2020)



Comparison of 24-hour accumulated precipitation estimates

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Bias corrected IMERG-E RMSE, averaged over all fire seasons

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- In the recent decades, Alaska's fire seasons have intensified. Early river ice break up dates have signaled longer warm seasons and record breaking temperatures have been recorded across the state
- 2. The CFFDRS, which quantifies daily fire danger and fire potential, uses meteorological observations (temperature, wind, dew point, precipitation) from Alaska's sparse in situ and remote sensing resources.
- 3. We verified daily IMERG-E gridded precipitation estimates to determine their utility as a potential data source for CFFDRS. The evaluations focused on percentile space rather than exact event magnitude. The IMERG-E estimates consistently overpredicted precipitation frequency and magnitude for all regions and fire seasons.
- 4. We bias corrected the IMERG-E estimates using a regional quantile mapping method, producing improved daily precipitation analysis grids. These corrected grids of daily precipitation estimates yielded lower bias and error metrics for all regions, percentile ranges, and fire seasons.

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Additional Material

Quantile Mapping Example