

Objective Verification of WPC's MPDs

Erica Bower, Michael J. Erickson, James A. Nelson, Mark Klein, Andrew Orrison

<https://doi.org/10.1175/WAF-D-23-0199.1>

Background

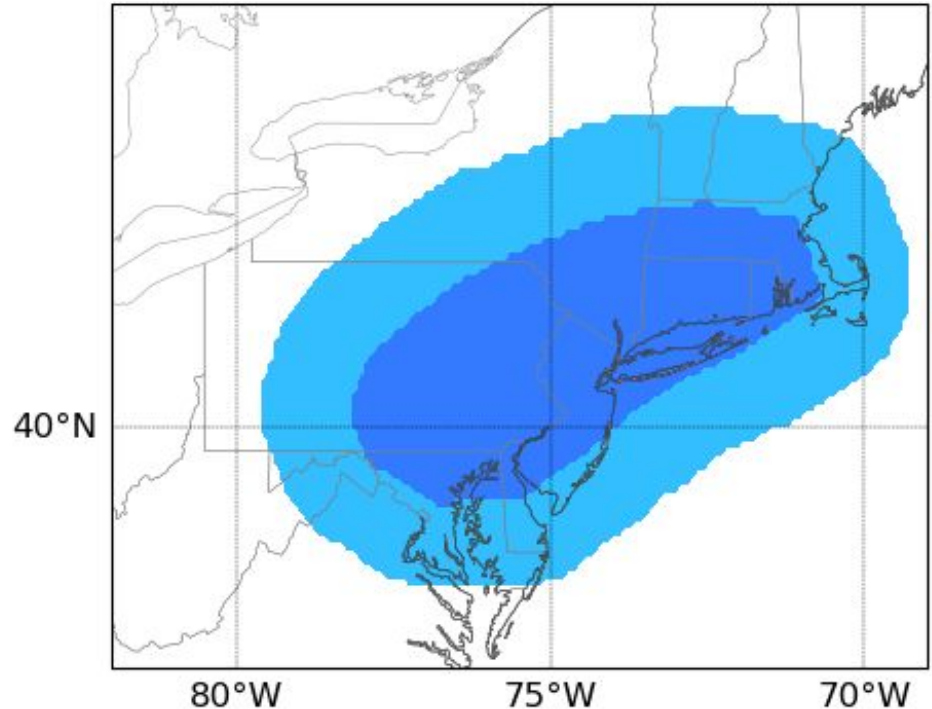
- MetWatch desk has been active since April 10, 2013
- Looking at mostly mesoscale weather
- Desk's responsibilities are mostly to issue MPDs
- Until end of 2022, had no objective verification

Mesoscale Precipitation Discussions (MPDs)

- Nowcast product- weather that's occurring now or about to occur
- Flash flood product
- Typically valid for up to 6 hours
- Exception to the rules: ARs
- Target audience- WFOs (but more broadcast meteorologists and the general public are using them more in recent years)

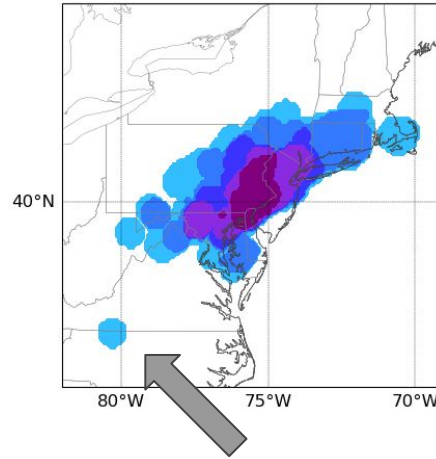
MPD Shape

- Ex: MPD 2021 #0925
- Post-Tropical Cyclone Ida
- Darker blue: native MPD
- Lighter blue: neighborhood for considering verification objects



UFVS Verification

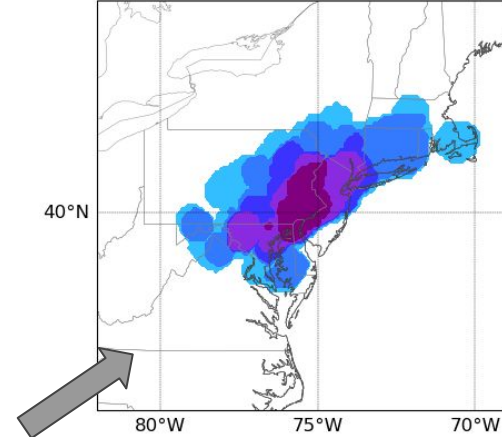
- Isolate flood obs and proxies (LSRs, USGS, FFG and ARI exceedance) that occur within 120 km of the native MPD
- Account for obs that were just outside the MPD (some misses in addition to hits and false alarms)
- NOTE: UFVS objects have a 20 km radius around the point observation/proxy (based on the MetWatch quantifiables, 2021)



One observation,
plus radius

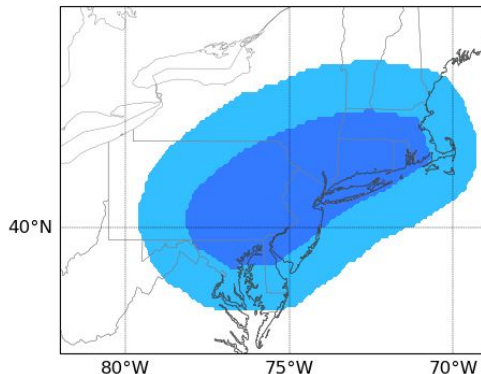
This file is read into
MODE with the
native MPD shape.

Excluded here due to
distance from MPD-
likely included in
prior MPD

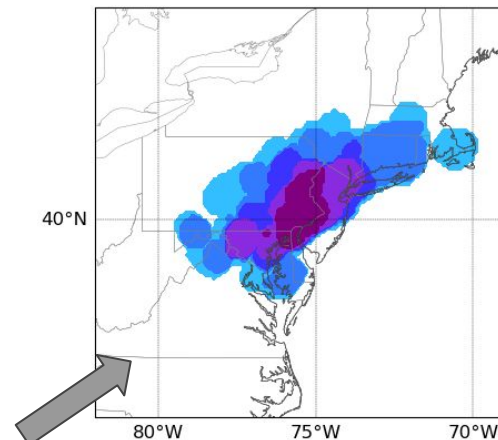


Process:

- Process raw MPD info (valid times, borders, etc)
- Find corresponding obs and proxies occurring within 120 km of MPD
- Determine each MPD's region/season
- Object-based verification (MODE)
- Compute bulk stats
- Directional biases

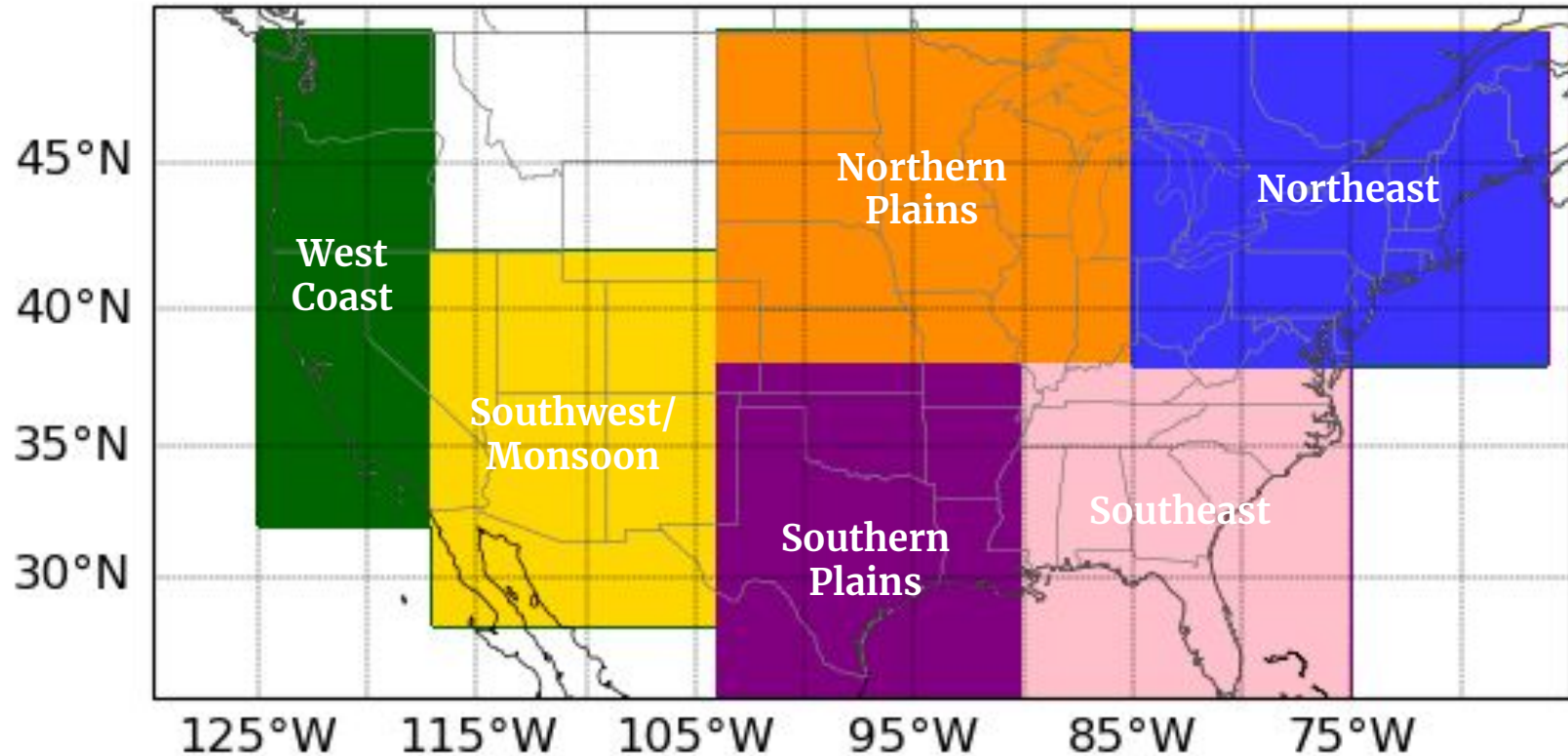


Verify the native MPD (dark blue)...



...against these observations extending 120 km from the MPD border

Regions



Metrics for Evaluation

- Critical Success Index (CSI)
- Fractional Coverage
- Frequency Bias
- False alarm (number of MPDs with no corresponding obs or proxies)
- Rose plots (indicate directional bias of observation object centroid with the MPD centroid being the origin of the plot)

Definitions

- $\text{CSI} = \text{hits} / (\text{hits} + \text{misses} + \text{false alarms})$
- $\text{Fr Cov} = \text{hits} / (\text{hits} + \text{false alarms})$
- $\text{Bias} = (\text{hits} + \text{false alarms}) / (\text{hits} + \text{misses})$

Websites:

Objective baseline verification

Interactive site

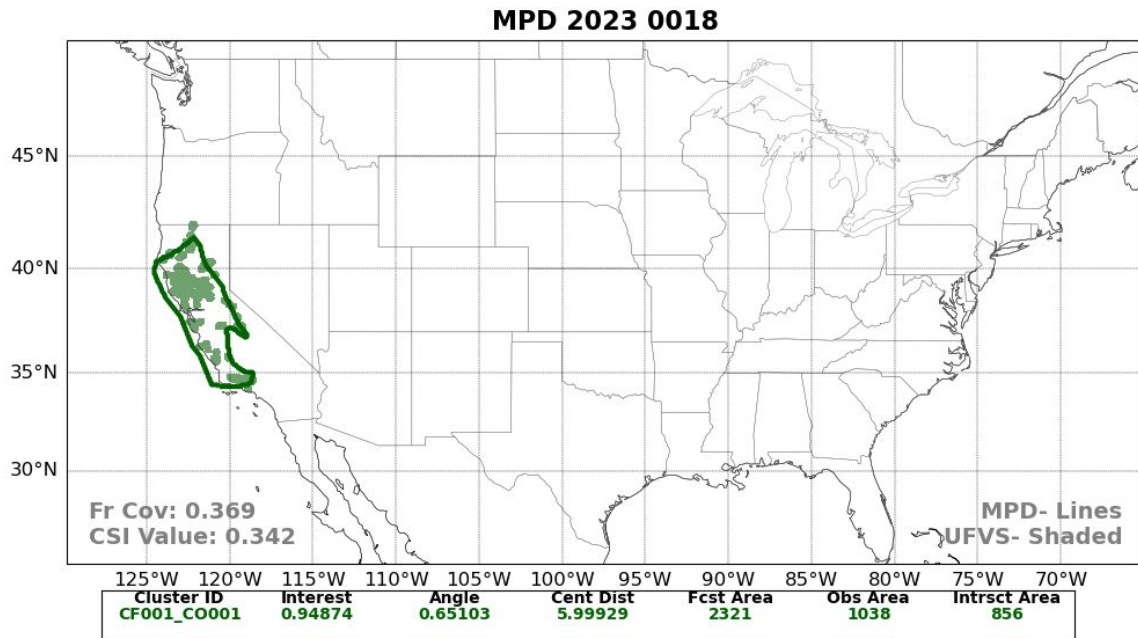
Sites update on the 10th of every month. In March, June, September, and December, seasonal statistics also update. Annual statistics are computed in January each year.

Discussion

- West Coast MPD performance
- Southwest monsoon MPD performance

West Coast Example

- MPD 0018 from 2023
- Atmospheric River event
- High fractional coverage, interest score
- Large-scale event, synoptically driven (as opposed to summer convection)
- Drastic improvement in WC winter MPDs since 2016



Southwest Monsoon Example

- MPD 0731 from 2022
- Mentions dry washes, slot canyons, burn scars
- Widespread convection, lacked organization
- Low fractional coverage and CSI, but encompasses most observations from that time frame

