Flash Flood Warning Operations Methodology
(Last updated: 10/18/22)

1. Familiarize with the environment using NSHARP, favorable parameters:

- Above average PWs (> 75th percentile)
- Deep warm cloud layer (> 10 kft)
- Long, skinny CAPE (500-2000 J/kg)
- Moist vertical profile (Low/Mid RH > 70%)
- Slow "LCL-EL (Cloud Layer)" wind (< 10-15 kt)
- Slow Corfidi Up/Down shear vectors (< 10-15 kt)

2. Familiarize with the antecedent soil conditions and topography

a. Look at FLASH soil moisture to see recently saturated areas (> 50%)
b. Become familiar with 1- and 3-hr FFG values across your CWA
c. Consider topography and urban areas

3. Choose your optimal precip source: Dual-Pol or MRMS

a. Assess QPEs at all durations, comparing with observations when possible

	Purpose	Compare QPEs with…	Notes
Storm-total	Get a feel for totals	Mesonets *(note the units)*	Know when Mesonets reset; zoom in before sampling
1-hr	Get a feel for recent accumulations	METARs *(PXXXX = XX.XX in)*	Time-match at top of hour; zoom in before sampling
Rates	See how rates affect precip classifications	n/a	*Instantaneous* rates change quickly → be careful when interpreting

b. Assess QPE quality
   - Is there **melting hail** that could be high-biasing the estimates?
     - Look for KDP > 4-5 deg/km
   - Is your threat area **below the melting layer** for your chosen radar?
     - Being below the melting layer adds confidence that the radar is sampling liquid precip

c. FFMP precip source options

DPR	DP, single radar	use for Dual-Pol estimates that may have beam blockage
HPE	DP, mosaic	use for DP + mosaic (*preferred DP source*)
MRMS	mosaic	uses DP below melting layer, unique precip type and Z-R logic, high temp res

4. Analyze streamflow signatures in FFMP and FLASH

a. Use **FFMP** to diagnose flash flood threat using optimal precip source above
   - Ideal set-up: "All & Only Small Basins" *(Layer menu)* and "Ratio" *(D2D menu)*
     - Ratio > 100% : to identify areas of flash flooding
     - Diff > 0 in. : to assess severity of flash flooding
   - Look at 1-, 3-, and 6-hour durations *(for both short-term and training potential)*
   - Advanced: use all-hour basin trend graph to identify timing and durations for analysis

b. Use **FLASH** to diagnose flash flood threat
   - CREST Unit Streamflow *(recommended values below)*
   - All FLASH products use MRMS as QPE input → remember this while interpreting them!

5. Issue Flash Flood Warnings and reassess regularly for Flash Flood Statements

Duration	No less than 3 hours
Polygon size	Small buffer around current threat (FFMP & FLASH); broaden for evolving threat (next couple hours); consider downstream direction
Text	how much rain has fallen; how much more is expected over the warning duration; cities impacted; reports included; 1-2 Call-to-Action statements
IBW tag	Consider extent of impacts; consider CREST Unit Streamflow values (below)

Recommended CREST Unit Streamflow values to analyze flash flood threat:

CREST Unit Streamflow	IBW Tag	Action
< 200 cfs/mi^2	--	Monitor area for increasing FF potential
200-400 cfs/mi^2	BASE	Monitor closely; initial threshold for FFW
400-600 cfs/mi^2	CONSIDERABLE	Higher confidence in warning issuance and elevated impacts
600+ cfs/mi^2 (w/ verif)	CATASTROPHIC	Significant FF event; significant impacts expected

*Look for values that are continuous in space and time

Loading the FFMP Basin Trend Graph:

1. Right-click on basin name in FFMP Basin Table
2. FFMP text legend "editable", Click menu in FFMP table set to "Basin Trend", right-click on basin in D2D