

Flash Flood Warning Operations Methodology
(Last updated: 2/21/19)

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

- Long, skinny CAPE (< 1000 J/kg)
- Moist vertical profile (Low/Mid RH > 70%)
- Above average PWs (> 75th percentile)
- Deep warm cloud layer (> 10 kft)
- Slow “LCL-EL (Cloud Layer)” wind (< 10 kt)
- Slow Corfidi Up/Down shear vectors (< 15 kt)

2. Familiarize with the antecedent soil conditions and topography

- a. Become familiar with 1-, 3-, and 6-hr FFG values across your CWA
- b. Consider topography and urban areas
- c. Look at FLASH soil moisture to see recently saturated areas; where FFG may be too high

3. Choose your optimal precip source

- a. Find nearest radar and assess Melting Layer to determine confidence in DP QPE
- b. Assess first-guess QPE biases: BIAS/#G-R
 - Legacy biases in STP, DP biases in MPE Misc menu
 - **BIAS**: > 1: QPE under-estimating, < 1: QPE over-estimating
 - **#G-R**: num. of gauge-radar pairs used to calculate bias → more pairs = more confidence
- c. Assess QPE biases at gauges: Compare QPE with observations at close to moderate ranges
 - Identify the precip source with the highest instantaneous precip rates
 - Compare 1-hr QPE to METARs (PXXXX = XX.XX inches)
 - *NOTE: Time-match QPEs and obs, zoom all the way in before sampling!*
 - Compare storm-total QPE to Mesonet gauges (note when Mesonets reset!)
- d. Precip source options
 - DHR (Legacy): use when you want Legacy estimates, single Z-R
 - DPR (DP): good near the radar, use when you want Dual-Pol estimates, high spatial res
 - HPE (DP mosaic): use for DP + mosaic (consider DPR when there’s beam blockage)
 - BHPE (DP mosaic w/ biases applied): use when you want DP and when biases help
 - MRMS (mosaic): unique precip type and Z-R calculations (no DP), high temporal res

4. Analyze heavy rainfall and streamflow signatures in radar, FFMP, and FLASH

Dual-Pol product	Values	Interpretation
Z	50-60 dBZ	Enhanced reflectivity/rainfall
ZDR	2.0-5.0 dB	Bigger drop size
CC	> 0.96	Uniform precip type
KDP	> 1.0 deg/km*	Increasing liquid water content

*KDP > 4.0 deg/km could indicate water-coated hail, so be wary of rain rates in these areas (use ZDR and CC to diagnose hail)

- a. Use FFMP to diagnose basin threat, coverage, and timing
 - Set-up with “All & Only Small Basins” Layer and “Ratio” product (use County Layer to filter basins)
 - Ratio > 100% to identify areas of flash flooding (w/ consideration of biases found in #3)
 - Diff > 0 in. to assess severity of flash flooding
 - Look at 1-, 3-, and 6-hour durations (for both short-term and training potential)
 - Use All-hour basin trend graph to identify timing, storm training, and optimal durations for analysis
- b. Use FLASH to assess flood threat, precip anomaly → MRMS QPE-to-FFG Ratio, MRMS Precip Return Period
- c. Use FLASH to analyze streamflow and rivers → CREST Unit Streamflow, SAC-SMA Unit Streamflow

5. Issue Flash Flood Warnings with proper criteria and routinely reassess

- a. Duration: no less than 3 hours
- b. Polygon size: small buffer around current threat, extend for threat evolution & couple basins for runoff
- c. Text includes:
 - How much rain has fallen, how much more is expected over the warning duration, cities impacted, reports included, and 1-2 Call-to-Action statements

CREST Max Unit Streamflow	Action
< 100 cfs mi ⁻²	Monitor area for increasing FF potential
100-200 cfs mi ⁻²	Monitor closely; initial threshold for warning consideration
200-1000 cfs mi ⁻²	Higher confidence in warning issuance and impending FF impacts
> 1000 cfs mi ⁻²	Likely a significant FF event

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

