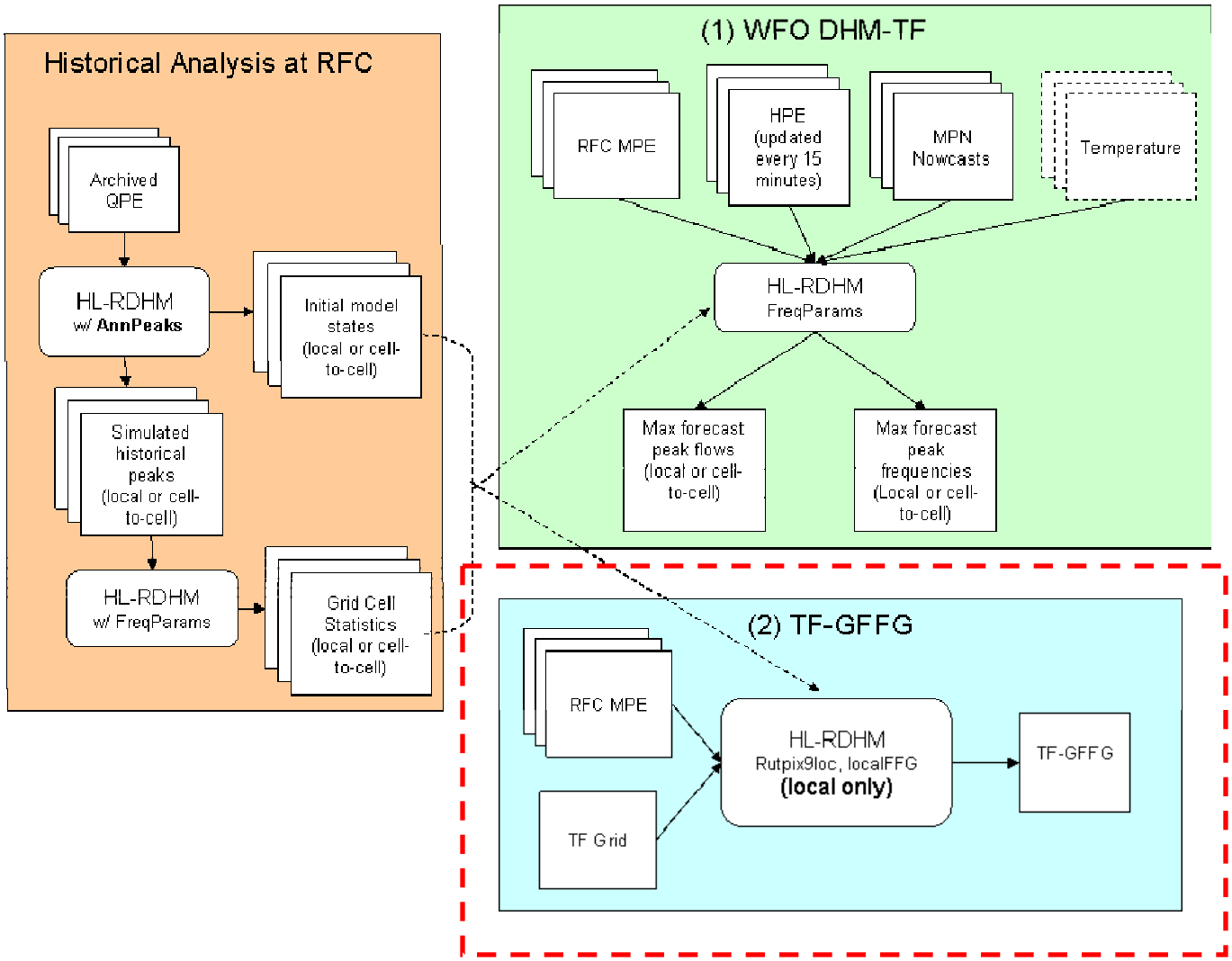
DHM-TF Overview
Seann Reed



What is TF-GFFG?

What is TF-GFFG?

- A low effort subtask in DHM-TF project
- Implemented with two additional HL-RDHM techniques (*rutpix9loc*, *localFFG*)
- Conceptually similar to ABRFC-GFFG
  - Treats each HRAP cell as a headwater watershed
  - Computes flash flood guidance using a-priori, local, cell-averaged properties (e.g. slope, soil, land use)
- Uses a similar approach to NWSRFS. . .
  - Iterative model runs based on current initial states to determine the rainfall depth that would yield a target flood level
- With key differences
  - Calculations are on the HRAP grid
  - Frequencies of routed flows (not runoffs) are compared with the targets
  - Targets are the frequency associated with flooding (not threshold runoffs)

More on TF-GFFG

Benefits

- Incorporates inherent bias correction benefit of the threshold-frequency approach
- Automatically accounts for the amount of flow in the channel (because thresholds are flow-based rather than runoff-based)
- Should work with gridded Snow-17 without changes (although not tested)
- Uses kinematic wave routing rather than unit graphs (more flexibility to match local conditions through parameter estimation techniques)
- User can input a spatially variable grid of threshold frequencies (see example on next slide)
- Uses SACSMA for maintaining model states and for calculating event runoff (rather than mixing SACSMA and SCS methods)

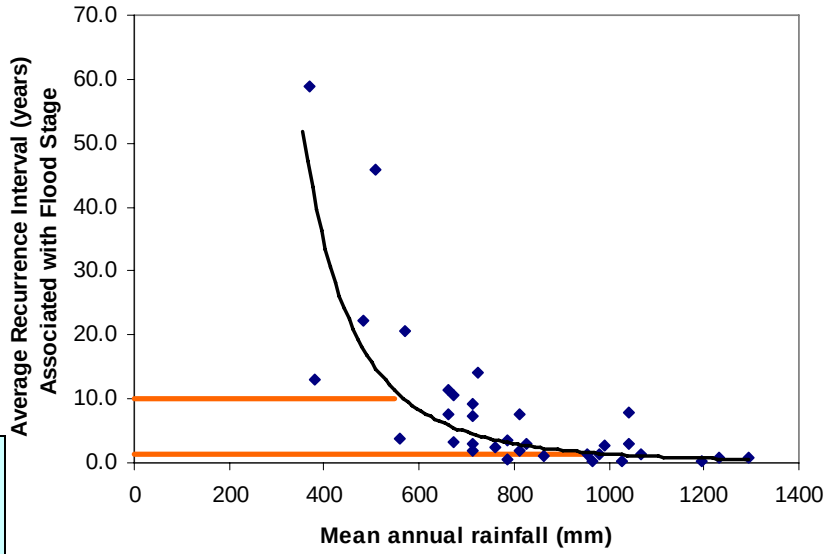
Drawbacks common to all GFFG approaches

- WFO DHM-TF approach superior because of
  - cell-to-cell routing and ability to convey information at multiple scales
  - ability to describe relative event severity on a more meaningful scale -- frequencies as opposed to ‘rainfall-to-ffg’ ratios.
- Updates must be treated properly at the WFO; more frequent updates are preferable

Drawbacks specific to TF-GFFG

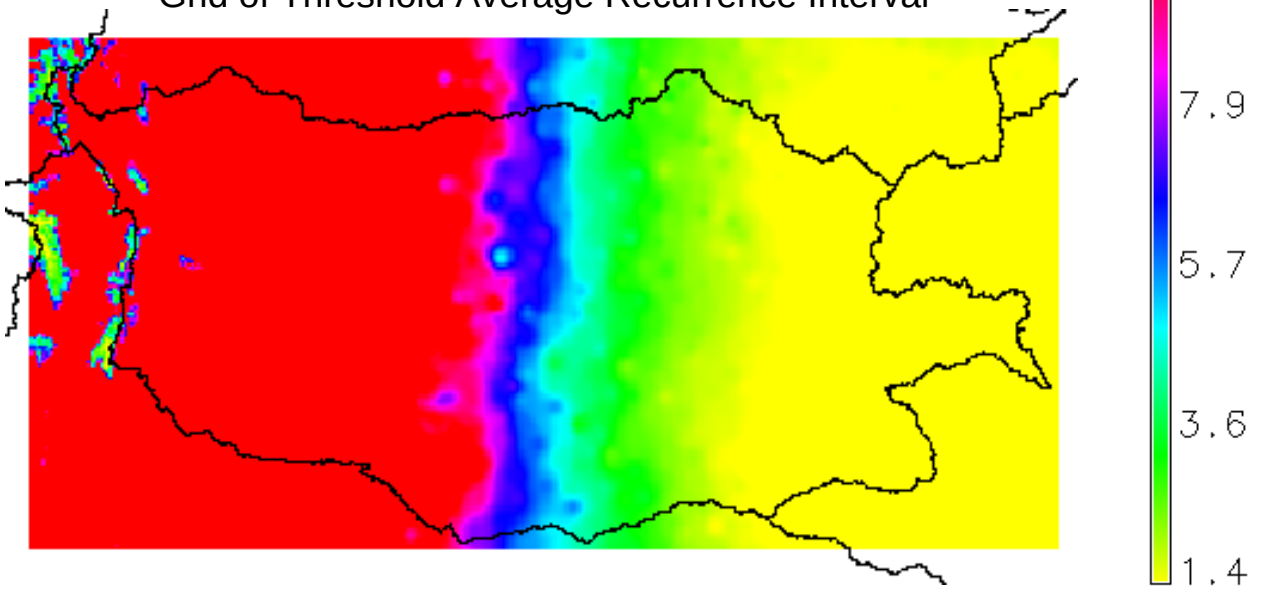
- Requires consistent archive of gridded precipitation (and temperature) data
- Current version only creates 1-hour GFFG, but can be easily modified to work with other durations

Return Period Associated with Flood Stage for 33 Forecast Points in Texas vs. Mean Annual Rainfall

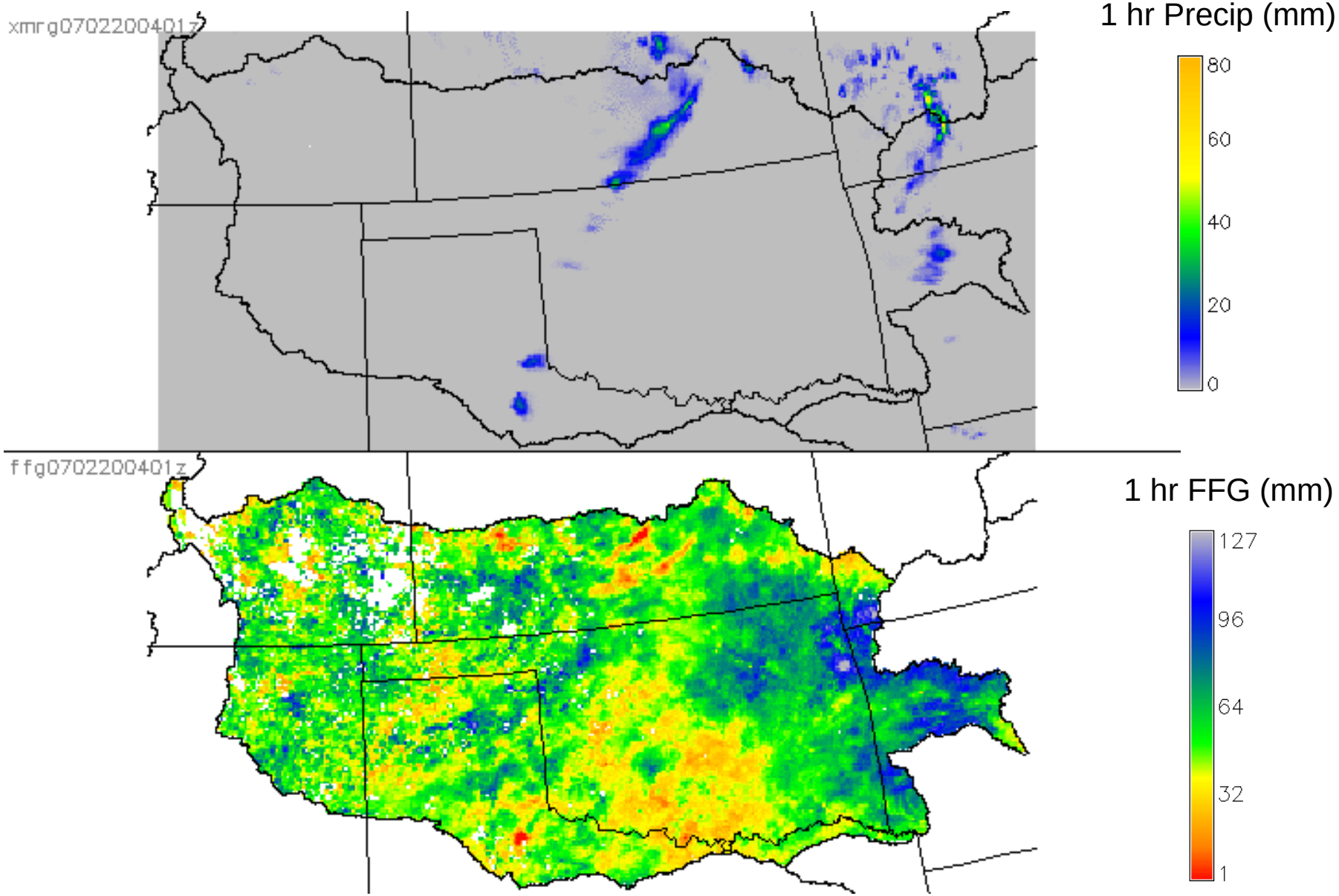


Applied relationship with bounds (orange lines) to create a grid of thresholds.

Grid of Threshold Average Recurrence Interval



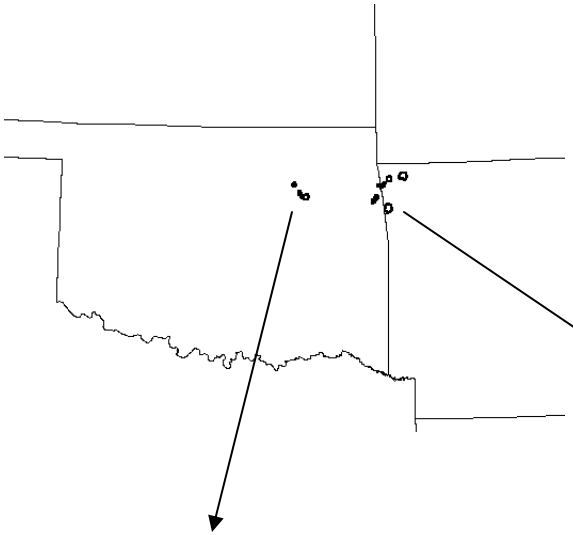
Hourly GFFG-TF



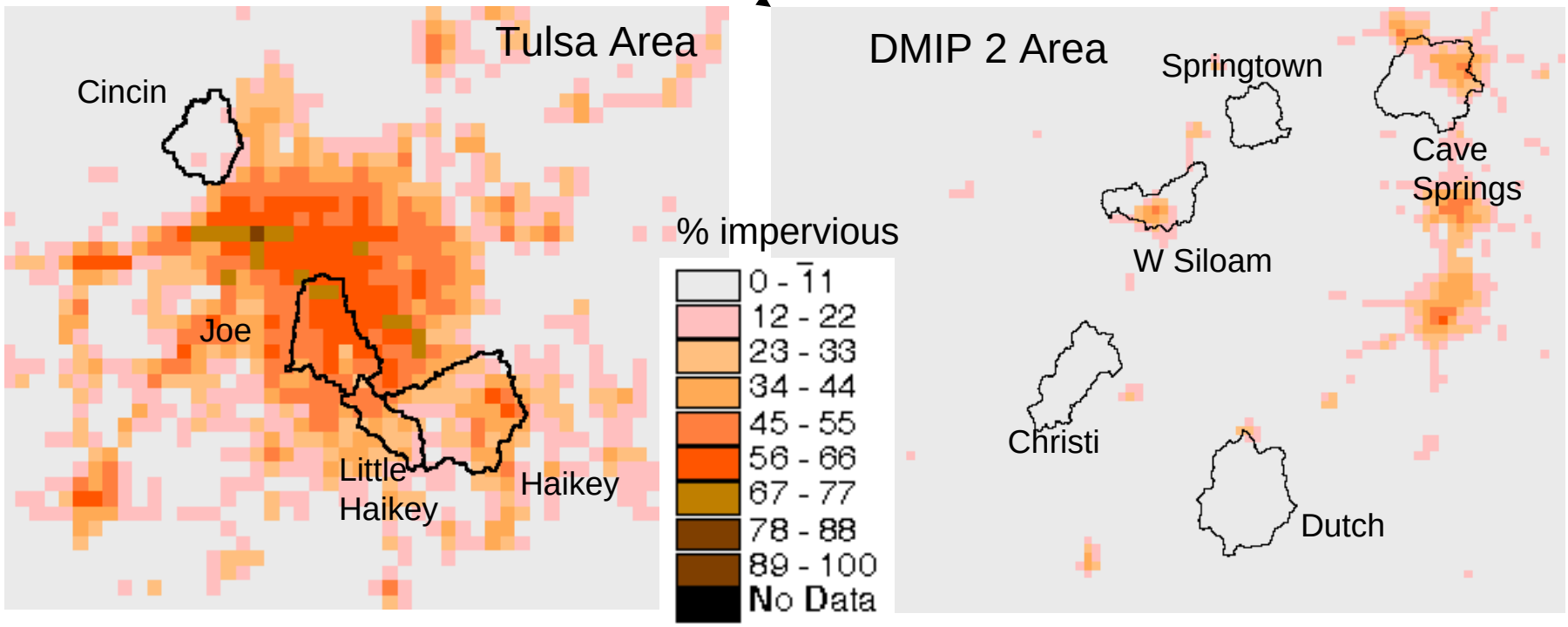
Future Work

- Finalize documentation so any user of HL-RDHM can generate TF-GFFG
- NSSL Verification Work
  - ‘SHAVE’-like experiments
  - Joint proposal with OHD to evaluate different flavors of GFFG
  - Stream gauge based evaluation
- Team considering national GFFG implementation at NOHRSC should consider the pros and cons of this approach

Stream gauge-based validation concept



- For small basins (14 – 105 km^2), the average value of gridded FFG should be a better predictor of peak magnitude than the average value of lumped-model based FFG.
- Event analysis done on 9 small basins in ABRFC area using streamflow data, lumped-model based FFG, and TF-GFFG from 2000 – 2004.



Stream gauge-based validation

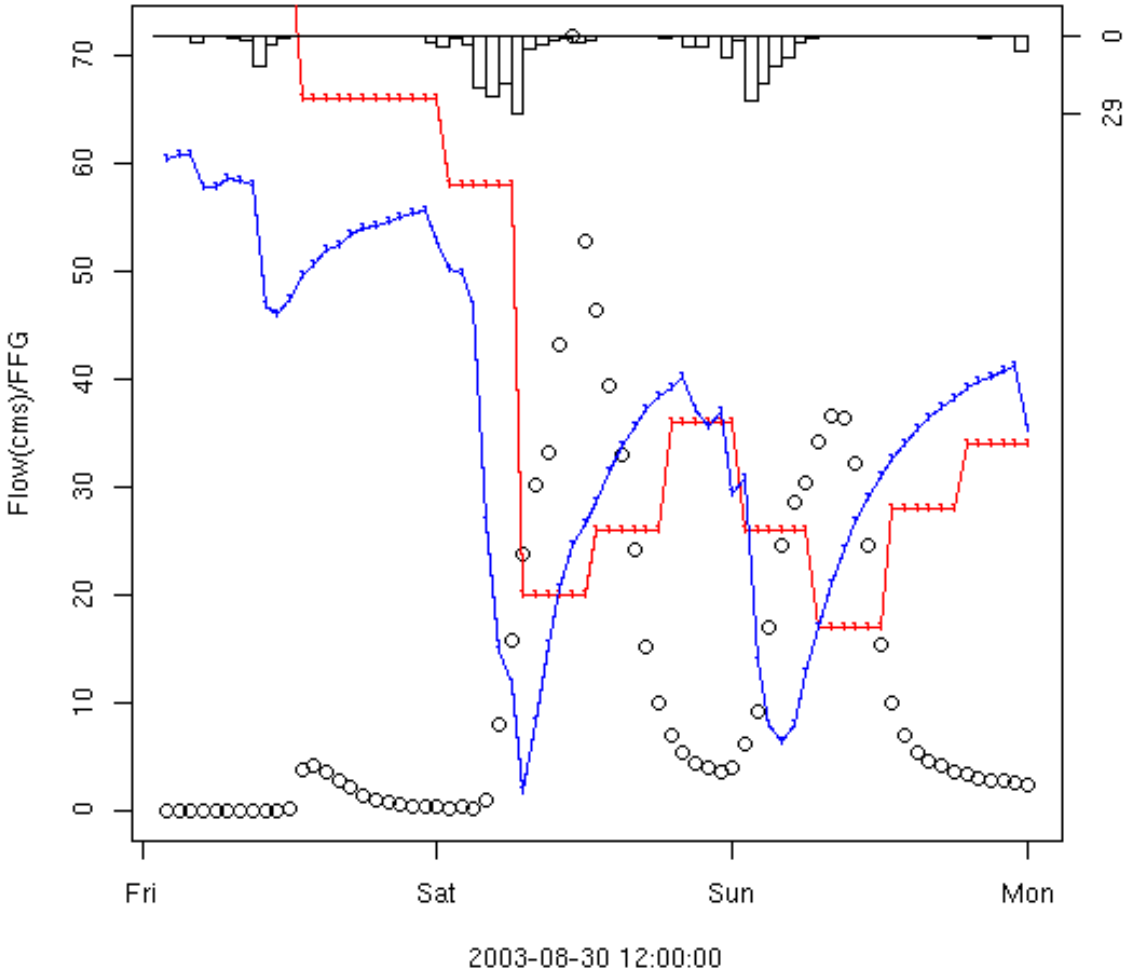
Validation method tested: Compare maximum rainfall/GFFG ratios preceding observed event flow peaks and see if the maximum rainfall/GFFG ratio is a good predictor of event magnitude. Higher rank correlation is better.

			Rank Correlations	
	Area (km^2)	**# Events**	**Lumped FFG**	**TF-GFFG**
Baron Fork at Dutch Mills AR	105	11	**0.77**	0.65
Osage Creek near Cave Springs AR	90	17	0.62	**0.78**
Peacheater Creek at Christie OK	65	9	0.38	**0.62**
Flint Creek at Springtown AR	37	7	**0.79**	0.68
Sager Creek near West Siloam Springs OK	49	18	0.24	**0.43**
Haikey Creek at 101st St South at Tulsa OK	46	20	0.59	**0.8**
Little Haikey Creek at 101st St South at Tulsa OK	14	15	0.71	**0.88**
Joe Creek at 61st St at Tulsa OK	32	15	**0.62**	0.46
Flat Rock Creek at Cincinnati Ave at Tulsa OK	21	14	0.55	**0.57**

Limitation of this comparison: Both logistical (temporal update frequency) and spatial scale differences exist (see next slide).

Comparisons to hourly updated ABRFC-GFFG grids would be more interesting.

Time Series of FFG Values



1 hour GFFG-TF (updated every hour)

1 hour lumped FFG (updated every 6 – 12 hours)

observed streamflow (cms)

Top panel = hourly average precipitation (mm)