

Hydrologic Ensemble Forecasting Service (HEFS)

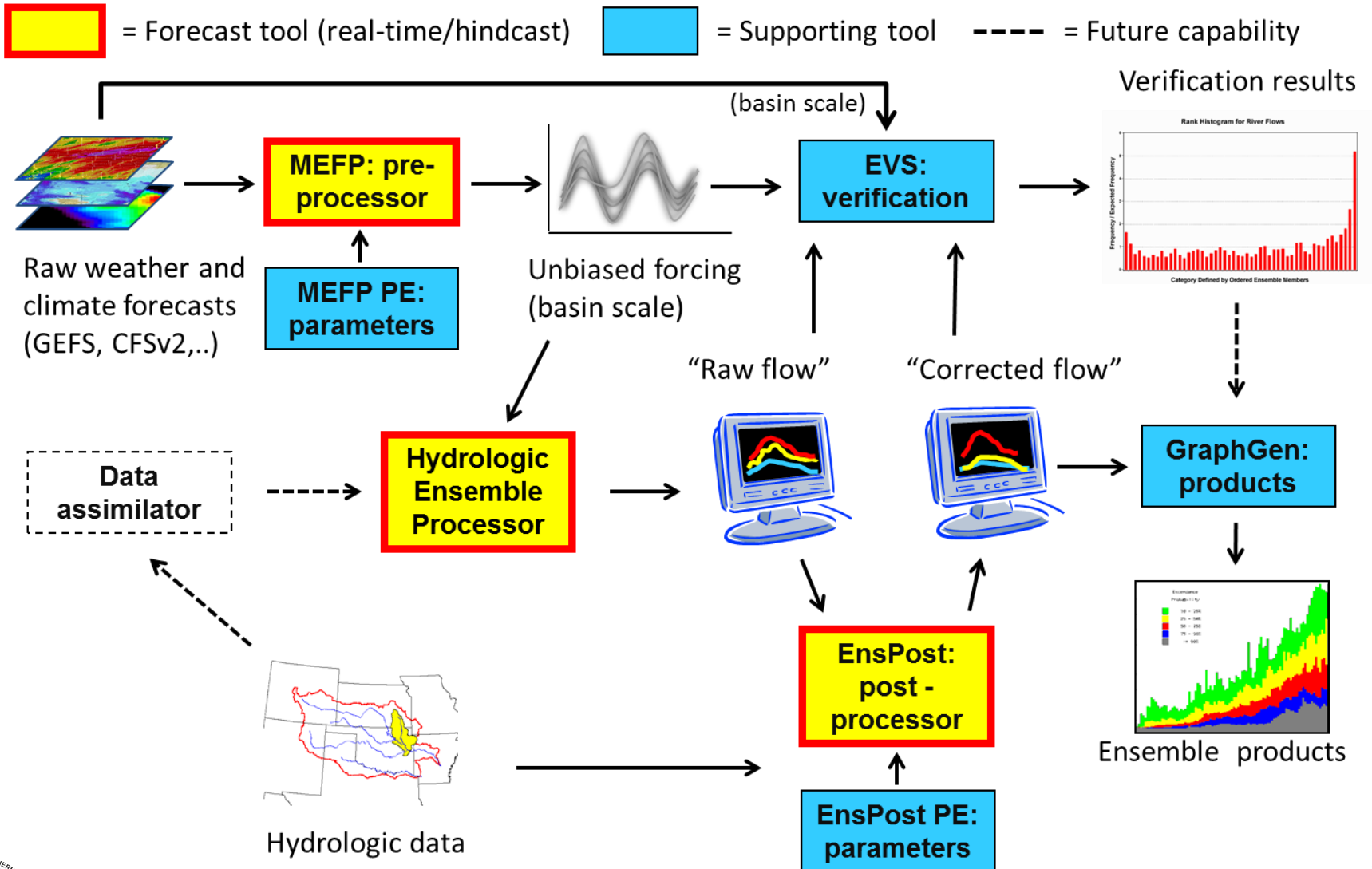
Seminar F HEFS ConOps

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HEFS Components



Objective

- Objective: Discuss parts of HEFS ConOps which impact an RFCs implementation strategy**
- Recommendations are provided where possible and appropriate**
- ConOps was finalized in July, but plan to evolve it from a Rollout Plan and ConOps to purely a ConOps. Ideas on how to improve are welcome**

HEFS Test RFCs

Coverage after 2 years. Now average 10-20 hours per week on HEFS, maintaining and/or extending coverage

- ABRFC:** MEFP at 440 precip. and 103 temp. basins; ensemble streamflow at 239 points; & EnsPost and Graphics Generator for ~140 of those points.
- CBRFC:** MEFP for 622 sub-basins; ensemble streamflow for 331 points; and EnsPost at 234 points.
- CNRFC:** MEFP for 319 basins for precipitation and temperature; ensemble streamflow at 199 points; and EnsPost for 30 points. They are in the process of adding more EnsPost points and plan to add the Graphics Generator.
- MARFC:** 2 separate runs: an internal run with MEFP, ensemble streamflow, the EnsPost, and the Graphics Generator at 53 points, and a separate run for NYC includes the MEFP and streamflow for 14 points.
- NERFC:** 2 separate runs: an internal run with MEFP and ensemble streamflow for 31 points and EnsPost for 17 of those, and a separate run 2X/day for NYC includes the MEFP and streamflow for 8 points.

Operational Runs

❑ Run times (as of May 2014) vary due to configuration, coverage and hardware, prior to RP refresh:

RFC	Run times (minutes)	MEFP precipitation basins	MEFP temperature basins	Ensemble streamflow locations
ABRFC	39	440	103	239
CBRFC	155	622	622	331
CNRFC	30	319	319	199
MARFC	21	53	53	53
NERFC	2	8	8	8

Scheduling Runs

- **Earliest recommended times. Shift to meet RFC needs**
 - Grid downloads
 - CFSv2: 4x daily {0Z, 6Z, 12Z, 18Z} with 28hr lag to download
 - GEFS: 1x daily {0Z} with 8hr lag to download (i.e. 8Z)
 - Grid ingest into CHPS
 - CFSv2: 1-hour lag from download (5Z, 11Z, 17Z, & 23Z)
 - GEFS: 1-hour lag from download (9Z)
 - MEFP ensemble generation
 - 1x daily with T0=12Z, but executed after 17Z, if using latest CFSv2, or as early as 12Z, if not using the latest (or any) CFSv2¹
 - Streamflow ensemble generation
 - 1x daily with T0=12Z
 - After MEFP ensemble generation
 - EnsPost needs the most recent deterministic QINE (for the observed data)²

Scheduling Continued

- Run at least a short-medium range daily to support (eventually public) 14-day product**
 - o Can run more often to support flooding ops with updated observations, but still 00Z GEFS
- Manually or automatically scheduled initiated workflows; recommend against running HEFS through the CHPS IFD**
- HEFS schedules to date**
 - o ABRFC: once/day at 1420Z out to 270 days
 - o CBRFC: once/day at 18Z out to 365 days
 - o CNRFC: part of MEFP at 12Z, & manually initiates the remainder of the workflows (out to 365 days) after deterministic forecasts
 - o MARFC: 2/day internal at 1745Z for NYC at 13Z both out to 365 days
 - o NERFC: 3 runs/day – one internal out to 90 days, manually initiated and for NYC at 1230 and 1630Z out to 365 days

Hardware

- ❑ **Recommend: run HEFS (real-time) on RP3 without synching with the operational CHPS**
 - Only needed until HEFS joins CHPS baseline in early 2015.
 - Completed your RP refresh? If not, hopefully soon. In the meantime, you can get started on an SA (configuring & running PEs)
 - If RP3 is used for HEFS, RP3 should not be used for other tasks, such as CHPS beta testing
 - Prevents synching from operational CHPS which would wipe out your HEFS configurations
 - Requires maintaining separate HEFS configuration for about 6 months.
- ❑ **Alternatives (not recommended)**
 - (CBRFC) Configure HEFS on operational CHPS and RP3 w/ synching, but running executables only on RP3 and isolating HEFS on the operational CHPS using file permissions
 - (CNRFC) Configure and run HEFS on operational CHPS

MEFP

□ Forcings – available forecast horizon: recommendation

- RFC QPF (0 to X days): recommended if ‘large’ archive available
- RFC QTF (0 to X days) – recommended, but believe there’s no supportive archive
- GEFS (0 to 15 days) – recommended
- CFSv2 (0 to 270 days) – optional; no worse than climatology
- Climatology options – recommended for operations
 - CHPS raw climatology – not recommended for hindcasting since it adds ‘observed’ as one member
 - MEFP resampled climatology – some smoothing and diurnal pattern applied and subject to MEFP issues

Calibration Data Requirements

- Depends on several factors, so estimates are rough
- Major floods are rare, so more data required for extremes
- MEFP calibration data requirements**
 - o Ideally 20+ years for precipitation
 - o Minimally, need 5-10 years for precipitation
 - o May need less data for temperature (less skewed)
- EnsPost calibration data requirements**
 - o Ideally 20+ years for flow simulations/observations
 - o Minimally, need 5-10 years
- Can test requirements through hindcasting/validation**

MODs

- ❑ Manual changes to ensemble traces and means – not recommended
- ❑ MODs could undermine the calibration of the EnsPost, which does not incorporate flows with MODs
 - Impacts of MODs will be explored through hindcasting and validation in collaboration with OHD
- ❑ Be aware that MODs defined within modifiersGroup will be used with all ensembles

example from CNRFC

```
<modifiersGroup id="ensembles">  
  <modifierId>tschng</modifierId>  
  <modifierId>setqmean</modifierId>  
  <modifierId>chblend</modifierId>  
  <modifierId>setmsng</modifierId>  
  <modifierId>rrihng</modifierId>  
  <modifierId>mfc</modifierId>  
  <modifierId>uadj</modifierId>  
  <modifierId>switchTs</modifierId>  
  <modifierId>uhgchg</modifierId>  
</modifiersGroup>
```

Hindcasting and Verification

- ❑ **Recommend hindcasting/verification at RFCs in partnership with OHD**
 - o Provide objective guidance for better implementation
 - o Validate HEFS as the source of public products, such as AHPS - OHD/RFCs need to develop criteria and plans
 - o Practical tips - already provided & in hindcasting guide
 - o Workshop Training planned a few months from now

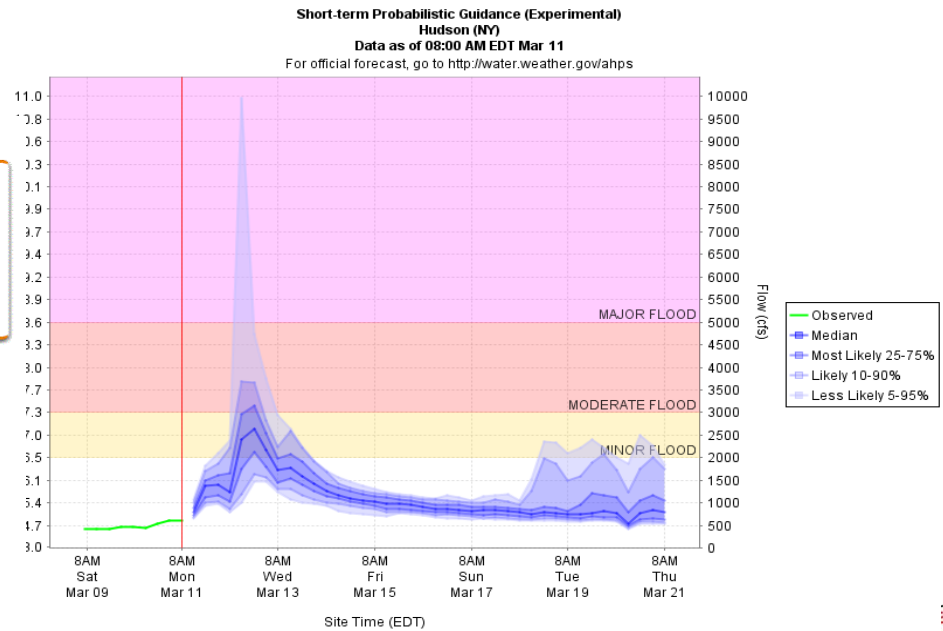
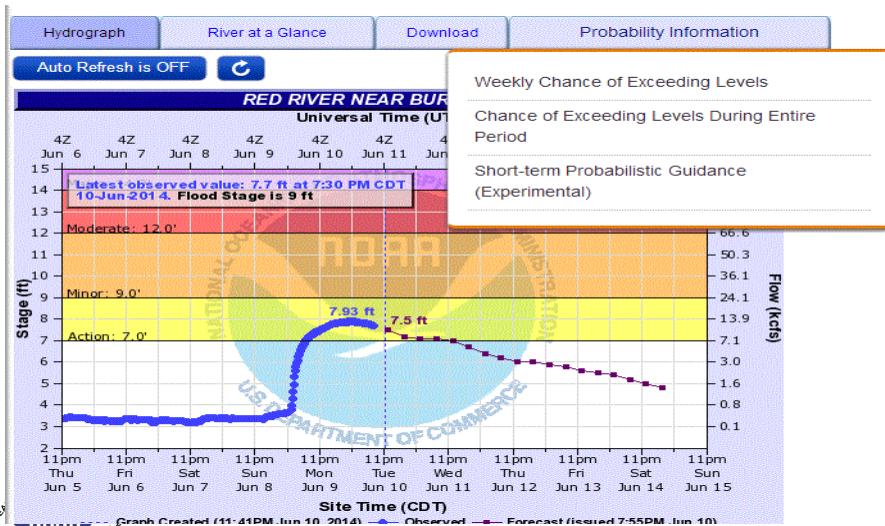
Archiving

□ What to archive – recommended at RFCs

- o Latest 30 days of CFSv2 and GEFS XML time series (move to NWC?)
 - To recreate current forecast and investigate recently reported problems
- o RFC QPF (already archived?)
 - Based on WPC QPF?
- o MEFP temperature and precip ensembles
- o Operational Streamflow
 - Based on MEFP without and with EnsPost (if produced)
 - ESP

Products

- ❑ New product, eventually public: 14-day streamflow forecast with uncertainty bounds
 - o This (and any) new product(s) will have a baseline GG template
- ❑ Provide streamflow forecasts for internal guidance



Training and Out-reach

- This HEFS Training Workshop will be held annually, as needed
- OHD will develop an introduction to HEFS for
 - o RFC Staff – outreach, WFOs, and internal training
 - o FAQs also being developed for the HEFS webpage

Top Issues

- MEFP biases in the forecast probability of precipitation and light precipitation. Will be resolved in HEFS 1.2.1**
- MEFP discontinuities or “jumps” in the temperature and precipitation forecasts. Due to ‘canonical events’, and most noticeable in long range forecasts**
- Work ongoing to improve the MEFP for extreme precipitation amounts**
- EnsPost discontinuities or “jumps” in the streamflow forecasts at sub-daily scales. Due to aggregation, and workaround is in HEFS 1.2.1 (providing streamflow obs are available at 6hr or less)**
- EnsPost quantifies hydrologic uncertainty in a lumped way**
- No Data Assimilator to explicitly account for uncertainty in the initial conditions (also useful for deterministic forecasting)**
- Need weather/climate model updates with reforecasts – working with NCEP**

Questions and comments?

