Hydrologic Ensemble Forecast Service (HEFS)
The 6th NCEP Ensemble User Workshop

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Streamflow hindcasting with HEFS

Selected basins

- Four RFCs
- Hindcasts: 1985-1999 (limited by obs. data)
- Upper/lower pairing
- USGS gauge at the outlet of each basin
- Relatively small basins (largest 2000 sq. miles)
- Lower elevations in AB and MA
- Higher elevations in CB and CN
- CB and CN have MAT/MAP sub-basins
Forcing: MEFP-GEFS vs. MEFP-GFS

MEFP-GEFS adds value

• Compared forcing from MEFP-GEFS vs. MEFP-GFS

• Skill (CRPSS) from two basins in ABRFC, precipitation (top) and temperature (bottom)

• Sample climatology as baseline (unconditional) with MEFP conditional climatology also shown (red)

• Raw GEFS improves substantially on GFS and this is reflected in MEFP-GEFS results shown here

• Improvements particularly noticeable in first week for P, longer for T
Streamflow: MEFP-GEFS vs. MEFP-GFS

Value also added to flow

- Streamflow skill shown for lower and upper basin in each RFC with MEFP-CLIM baseline
- Results include hydrologic bias-correction
- Skill from hydro. initial conditions dominates early lead times
- GEFS consistently beats GFS once forcing washes through, but hydro. uncertainty is also key
- On time horizon of ~4-10 days, GEFS adds ~1-2 days in lead time in terms of CRPSS, notwithstanding sampling uncertainty
Hydrologic Ensemble Forecast System

Use of Reforecasts

• Implementation and rollout of the Hydrologic Ensemble Forecast System (HEFS) at 13 RFCs (in 2014)
  o 5 RFCs already have partial coverage
  o Calibration of the meteorological component of HEFS, the Meteorological Ensemble Forecast Processor (MEFP)
  o System evaluation through streamflow hindcasting and verification

• Collaboration with other agencies who need HEFS hindcasts, supported by meteorological reforecasts, for high priority operational objectives
  o Example: NYCDEP requires HEFS hindcasts to calibrate and evaluate a decision support tool used to improve water supply to New York City
Hydrologic Ensemble Forecast System

Requirements of GEFS

• Reforecasts - Long period of record to support reliable calibration with reasonably small sampling uncertainty
  o As long as possible, but at least 20 years, every day
  o Including high impact events in the reforecast period is very important
  o Reforecasts currently available 1985-2010

• Operational models to be frozen for a period of several years to allow for downstream applications to transition to new models/reforecast data sets
  o It is time-consuming to re-calibrate and re-evaluate the HEFS with new met models


References

