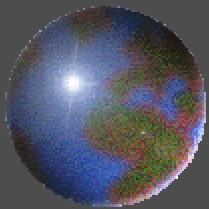
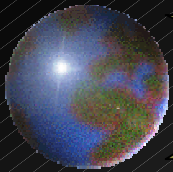


Ensemble Streamflow Forecast Verification



Allen Bradley
IIHR Hydrosience &
Engineering,
The University of Iowa

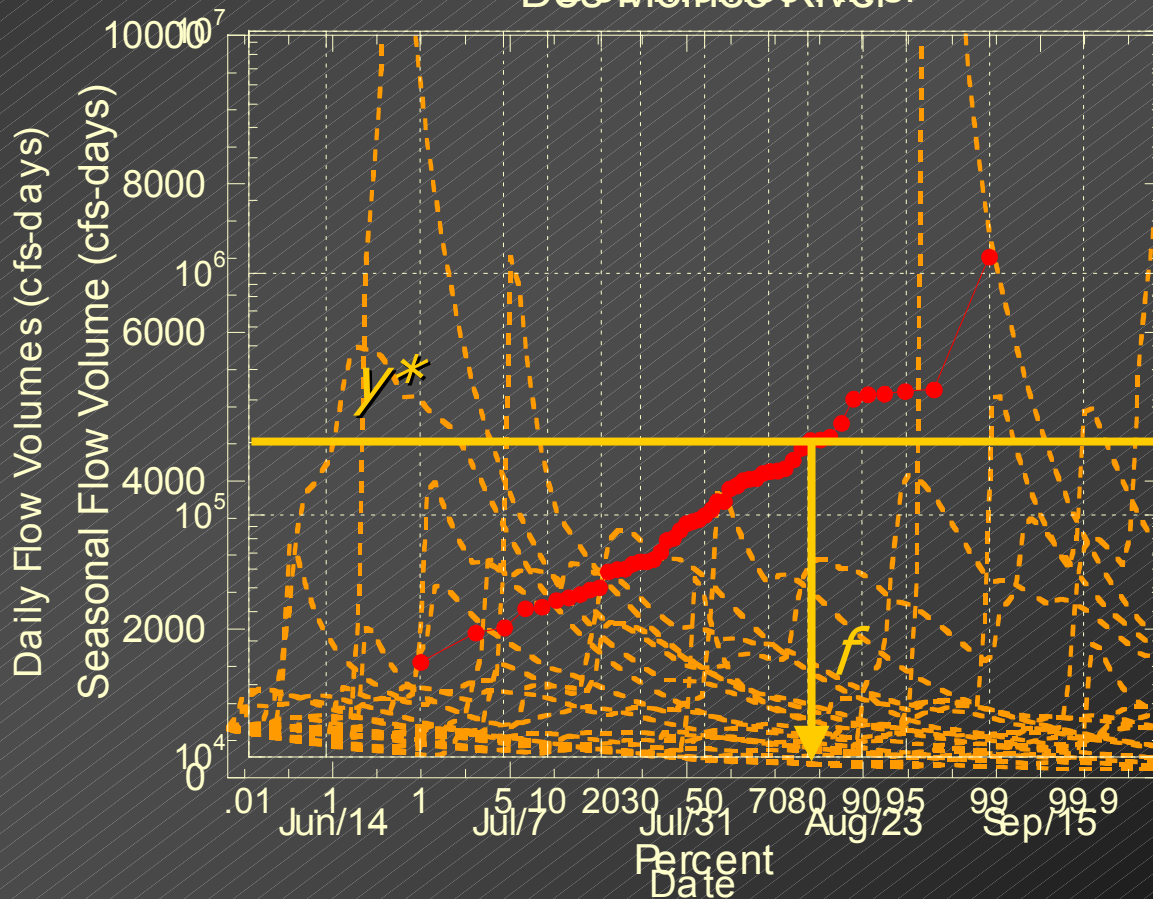


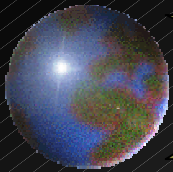


Ensemble Forecasts

Ensemble Streamflow Predictions

Des Moines River

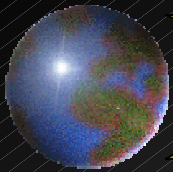




Ensemble Forecast Verification

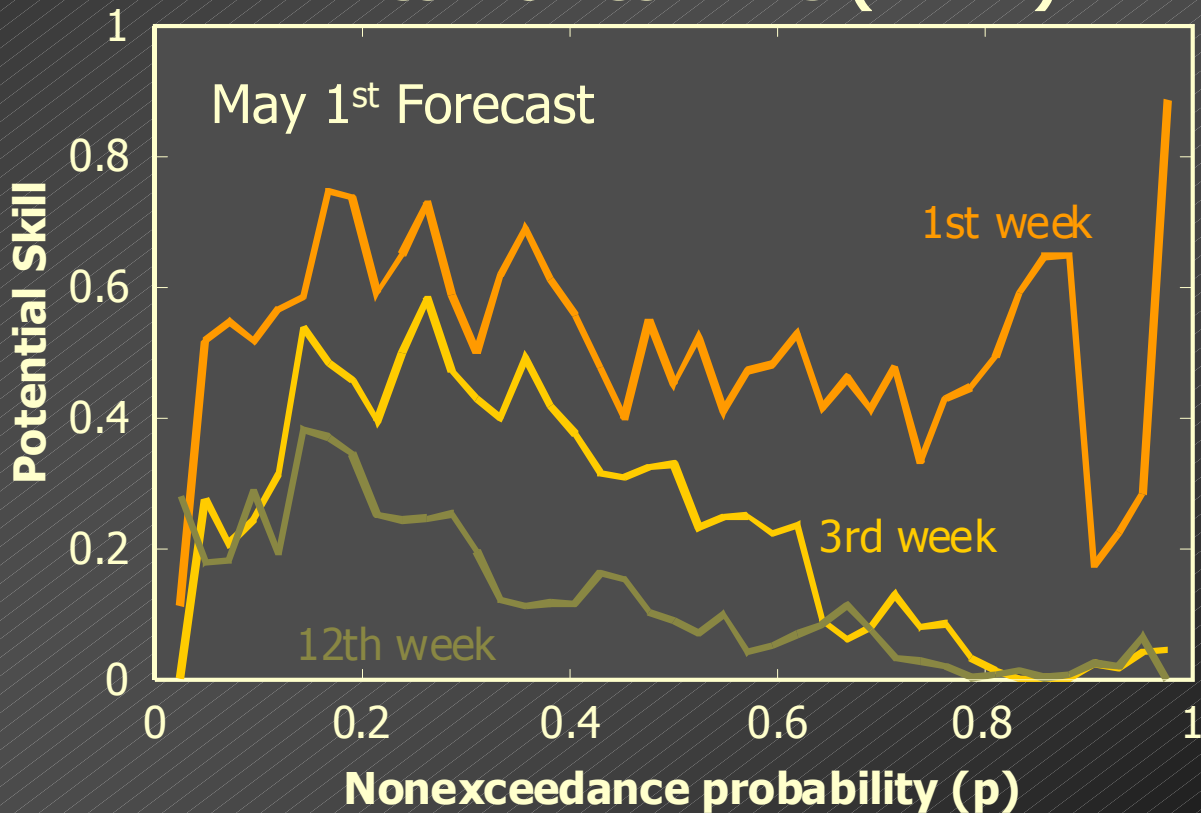
| Forecast Date | $y < y^*$? | |
|------------------|-------------|-----|
| | f | x |
| 1949/09 | 0.805 | 1 |
| 1950/09 | 0.952 | 1 |
| 1951/09 | 0.128 | 0 |
| ⋮ | ⋮ | ⋮ |
| 1964/09 | 0.804 | 0 |
| 1965/09 | 0.732 | 0 |
| 1966/09 | 0.962 | 1 |
| ⋮ | ⋮ | ⋮ |
| 1999/09 | 0.365 | 0 |
| 2000/09 | 0.130 | 1 |

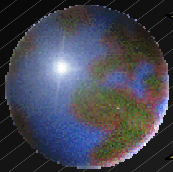
- Develop forecast verification data sets for specific thresholds y^*
- Evaluate forecast quality over entire range of thresholds $Q(y^*)$



Weekly Flow Volume

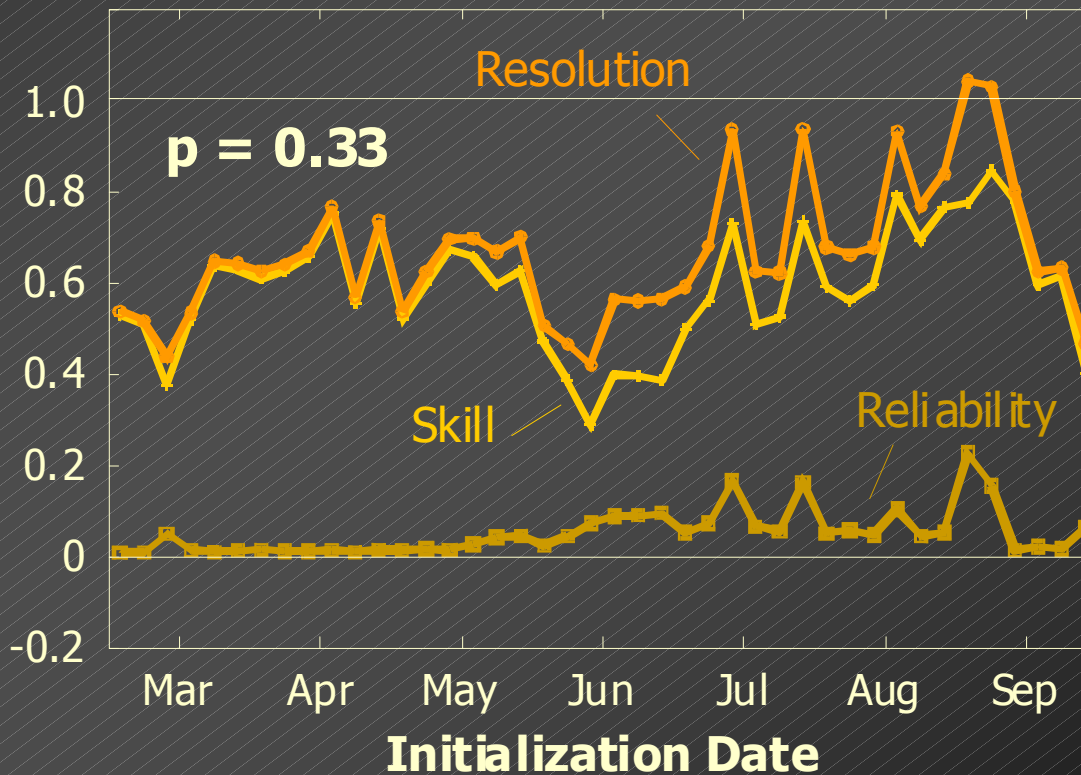
Des Moines AHPS (N=42)

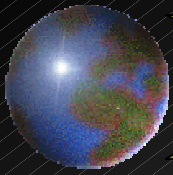




90-Day Minimum Weekly Flow

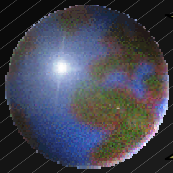
AHPS Des Moines (N=42)





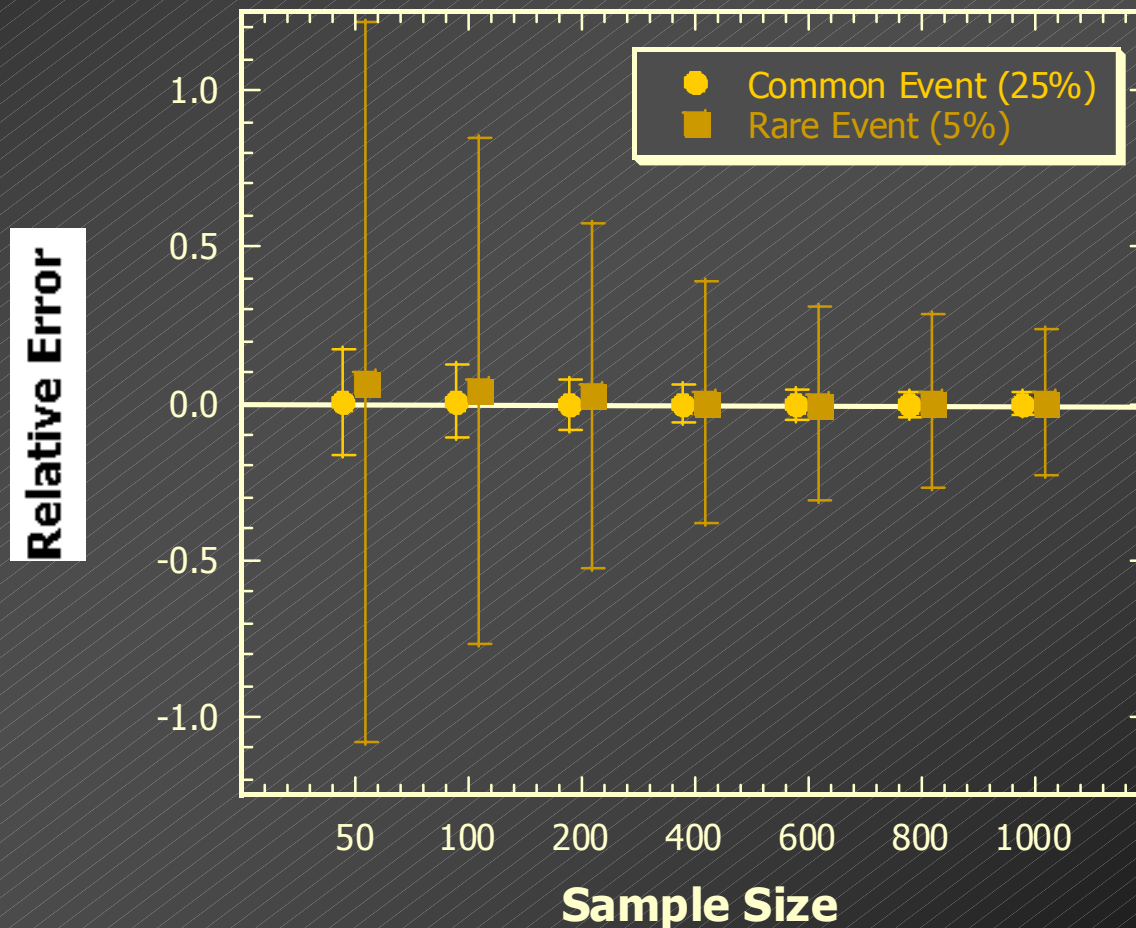
Unique Challenges

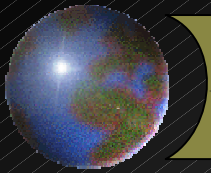
- Small hydrologic verification data samples
 - Pooling forecasts from alternate locations/times difficult
- Concerned with rarely occurring, high impact, events (floods & droughts)
- Verification measures are sample estimates (with uncertainty)



Effect of Verification Sample Size

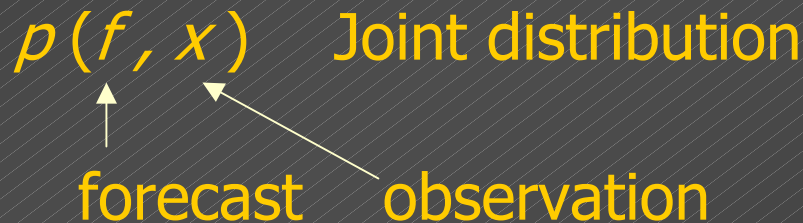
MSE (Ensemble Forecasts)



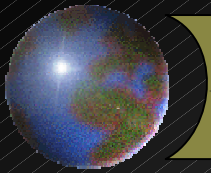


HEPEX Needs in Verification

- Utilize diagnostic verification
 - Distributions-oriented framework

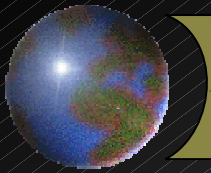


- Relative operating characteristics
 - Related to a prototype decision made based on forecasts (yes/no)



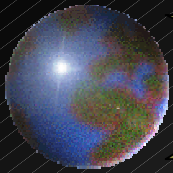
HEPEX Needs in Verification

- Develop retrospective ensemble forecasts, spanning decades, and updated frequently
 - Develop statistically sound methods for pooling hydrologic forecasts
 - Assess forecast quality and its uncertainty
 - Develop bias correction techniques for inputs/outputs from hydrologic models



HEPEX Needs in Verification

- Produce and distribute ensemble members (not just products)
 - Establish standard formats for ensemble hydrologic forecasts to facilitate research and technology transfer



HEPEX Basic Building Blocks

