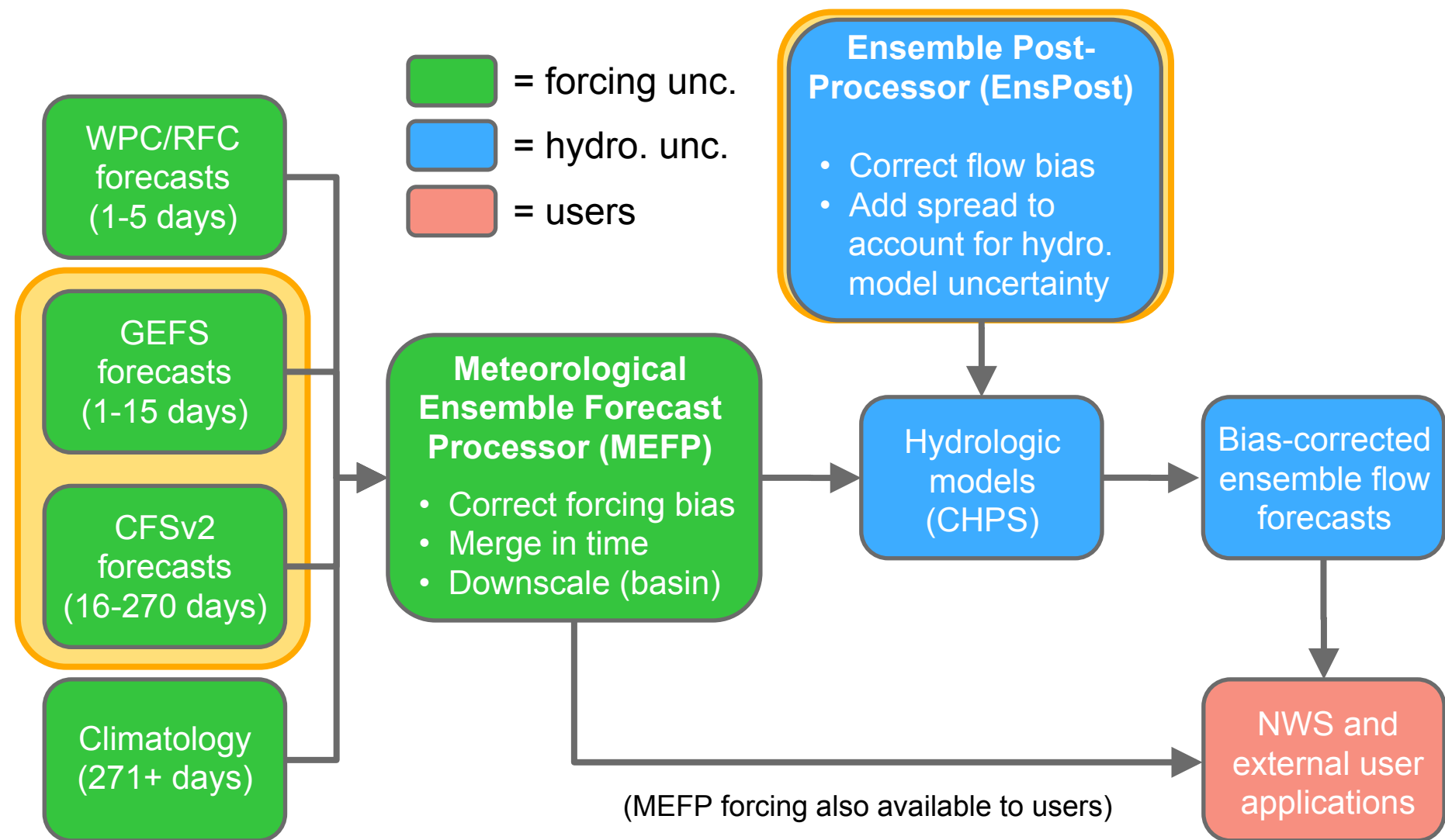


# Including Meteorological Models in Ensemble Streamflow Prediction (ESP)

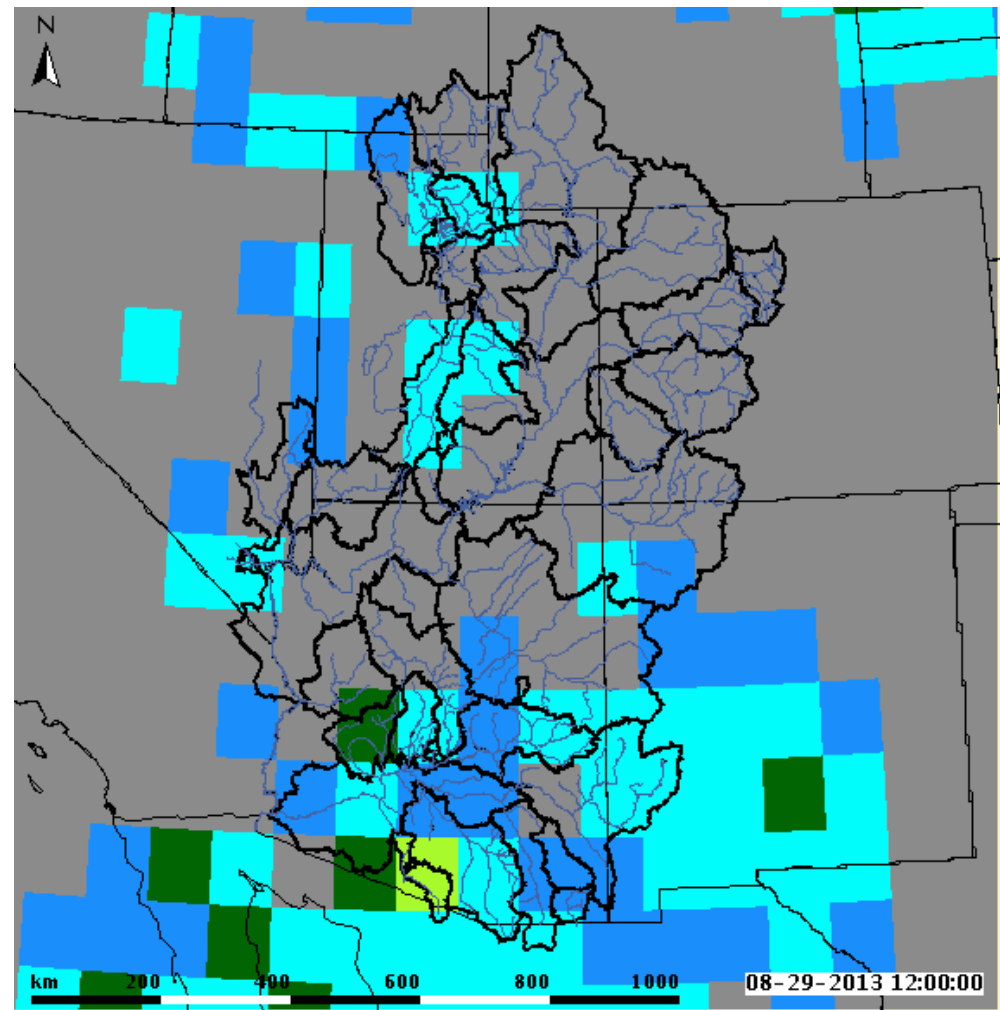


# Meteorological Forecasts in ESP



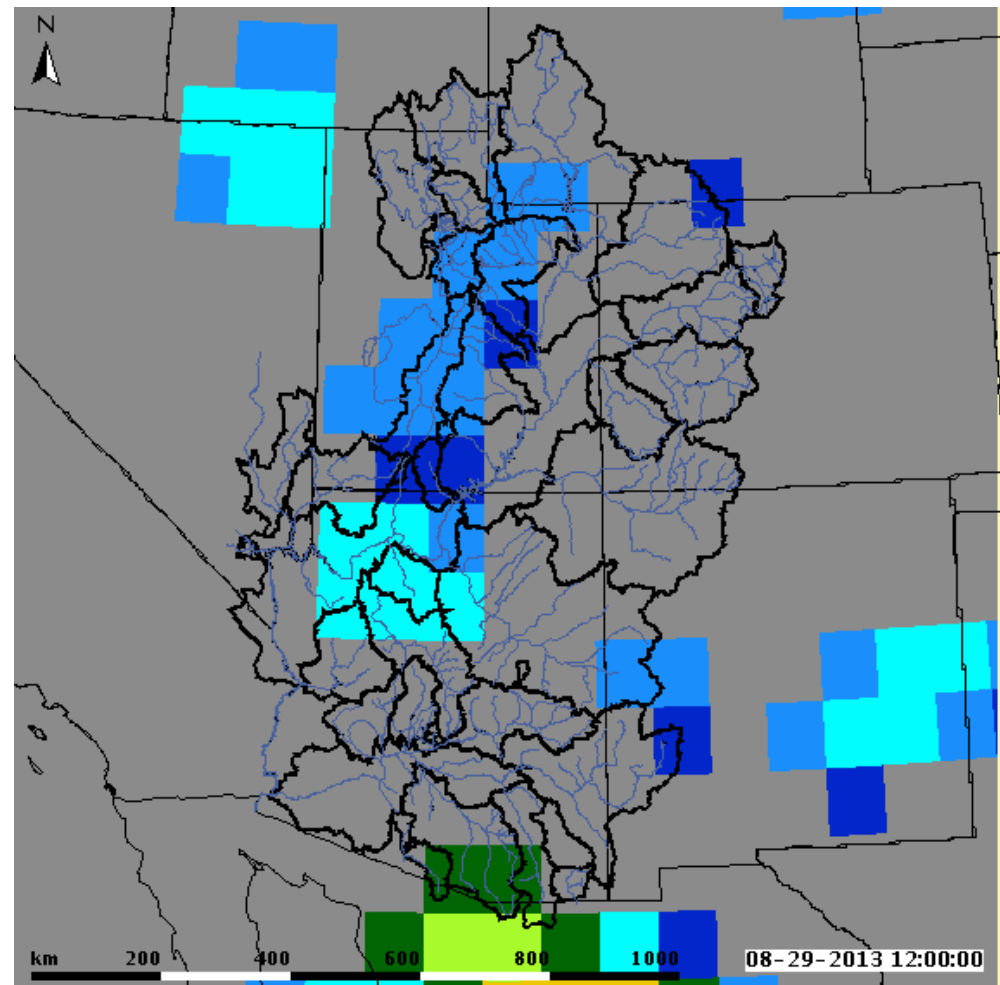
# Global Ensemble Forecast System (GEFS)

short term forecast 15 days  
out  
precipitation and  
temperature max/min  
comes as gridded product  
1 degree resolution  
use the average of the GEFS  
20 traces  
reforecasts available for  
1985-2010  
[http://  
www.emc.ncep.noaa.gov/  
GEFS/faq.php](http://www.emc.ncep.noaa.gov/GEFS/faq.php)



# Climate Forecast System (CFSv2)

long term forecast out 9  
months (270 days)  
precipitation and  
temperature max/min  
comes as gridded product  
1 degree resolution  
use the lagged ensemble  
mean  
reforecasts available for  
1982-2011  
[http://cfs.ncep.noaa.gov/  
cfsv2.info](http://cfs.ncep.noaa.gov/cfsv2.info)





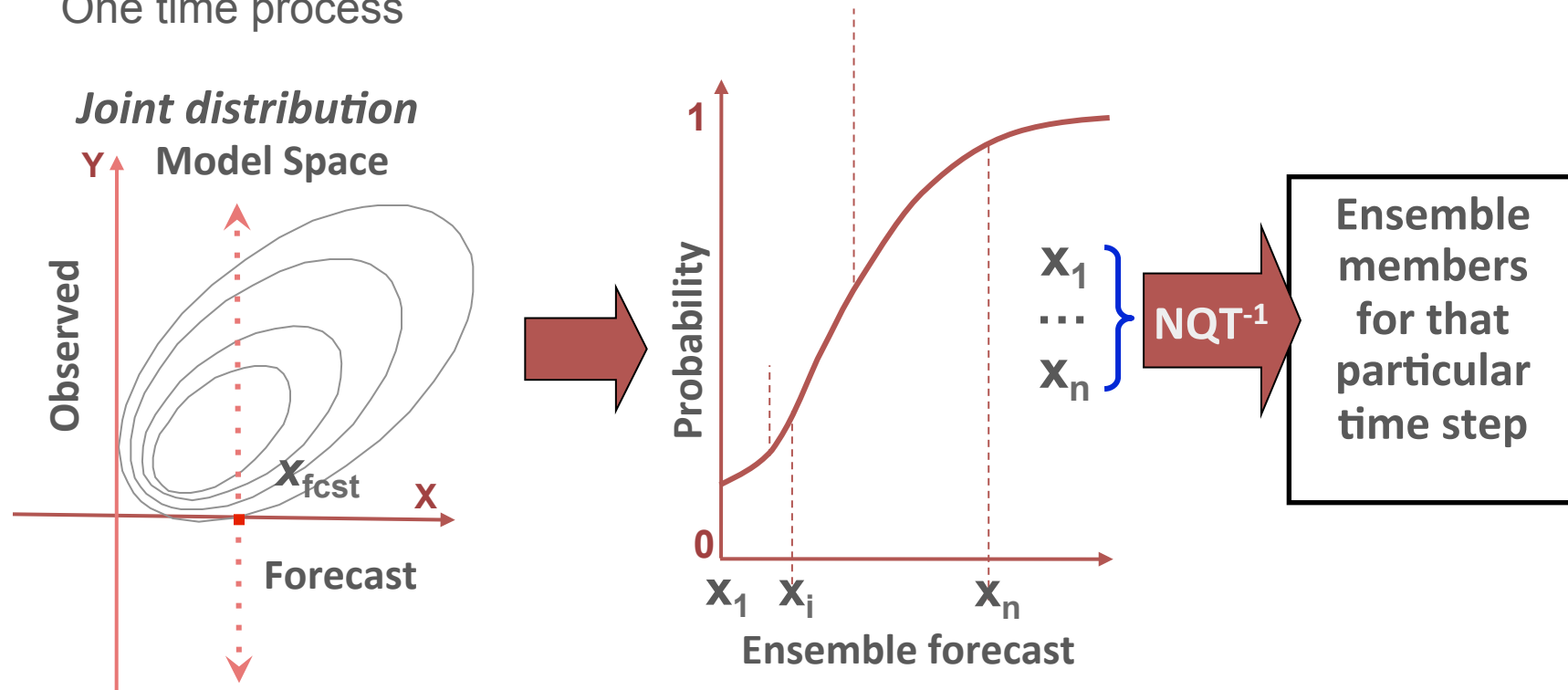
# GEFS and CFSv2 Processor (MEFP)

Meteorological Ensemble Forecast Processor

Historical Observation, precipitation and max/min temperature, are statically related to GEFS and CFSv2 hindcasts to develop a bivariate relationship

Parameters used in forecast process

One time process



[http://www.nws.noaa.gov/oh/hrl/general/HEFS\\_doc/Aug\\_2014\\_Seminar/Seminar\\_D\\_MEFP\\_Theory.pdf](http://www.nws.noaa.gov/oh/hrl/general/HEFS_doc/Aug_2014_Seminar/Seminar_D_MEFP_Theory.pdf)

# GEFS Temperature MAX Skill

Lower

Mid

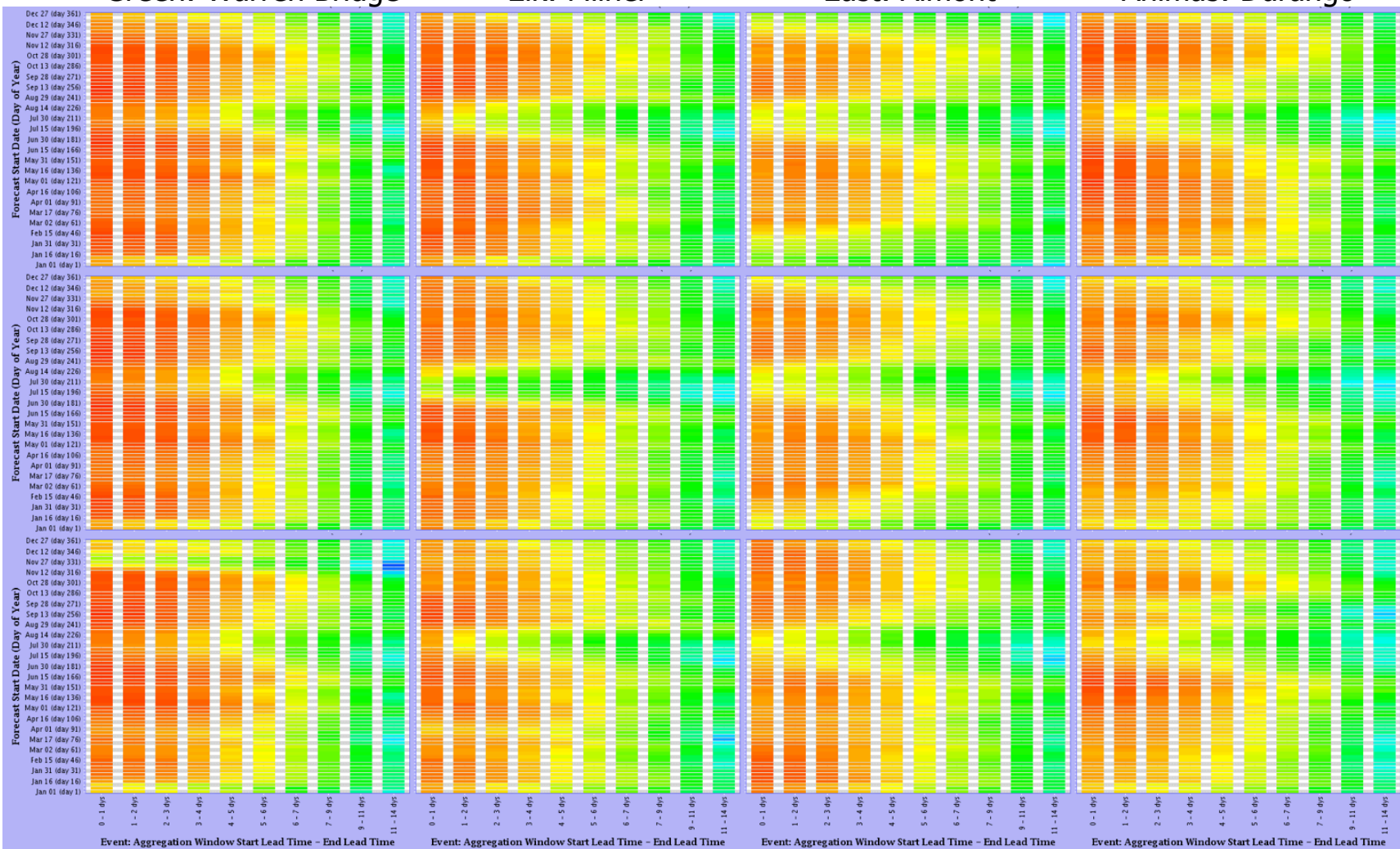
Upper

Green: Warren Bridge

Elk: Milner

East: Almont

Animas: Durango



# GEFS Temperature MIN Skill

Lower

Mid

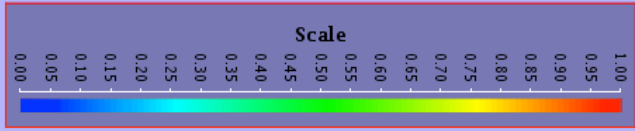
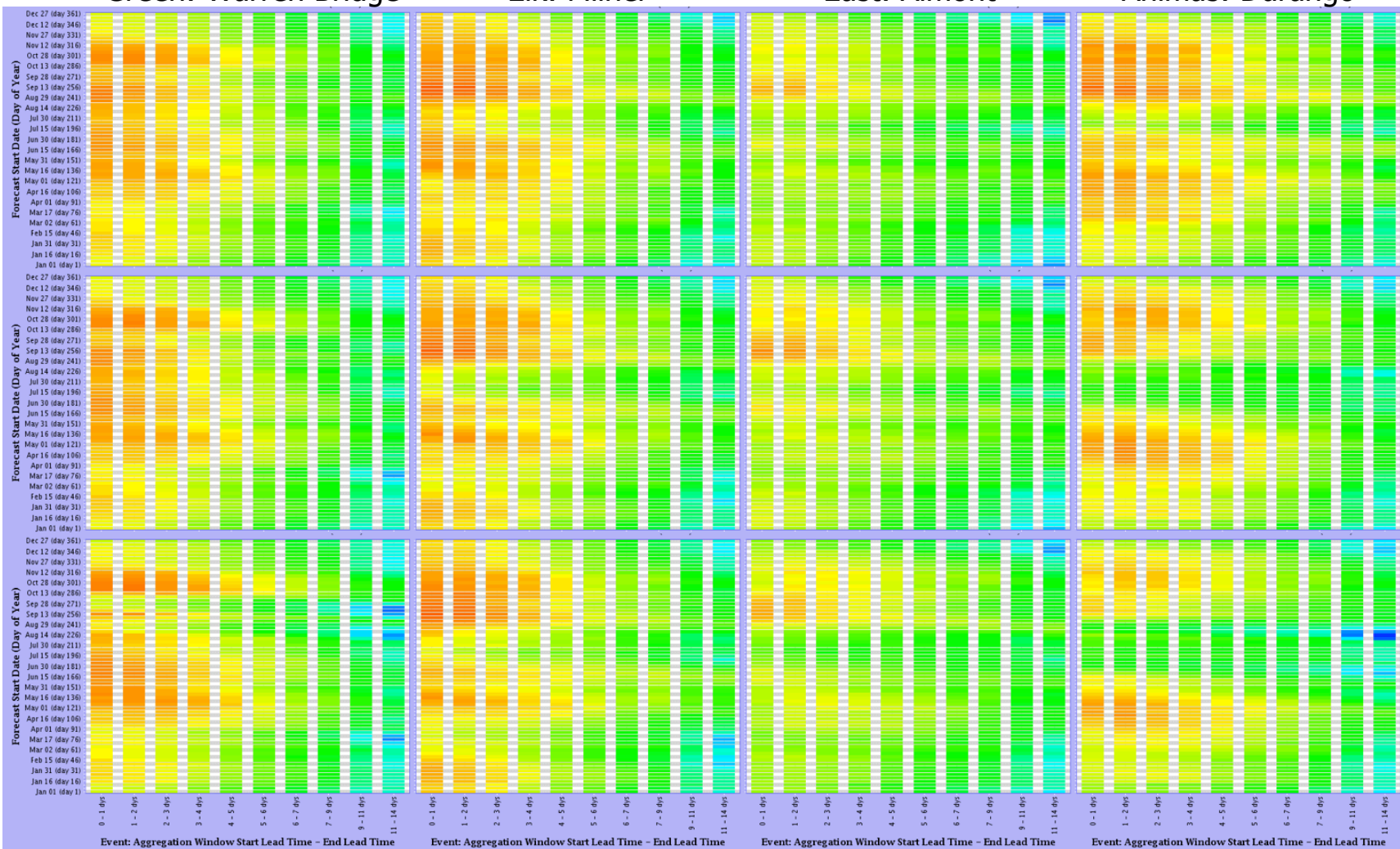
Upper

Green: Warren Bridge

Elk: Milner

East: Almont

Animas: Durango





# GEFS Precipitation Skill

Green: Warren Bridge

Elk: Milner

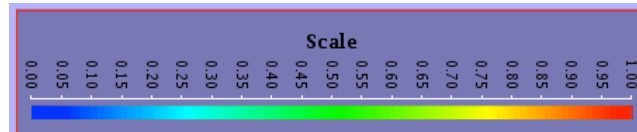
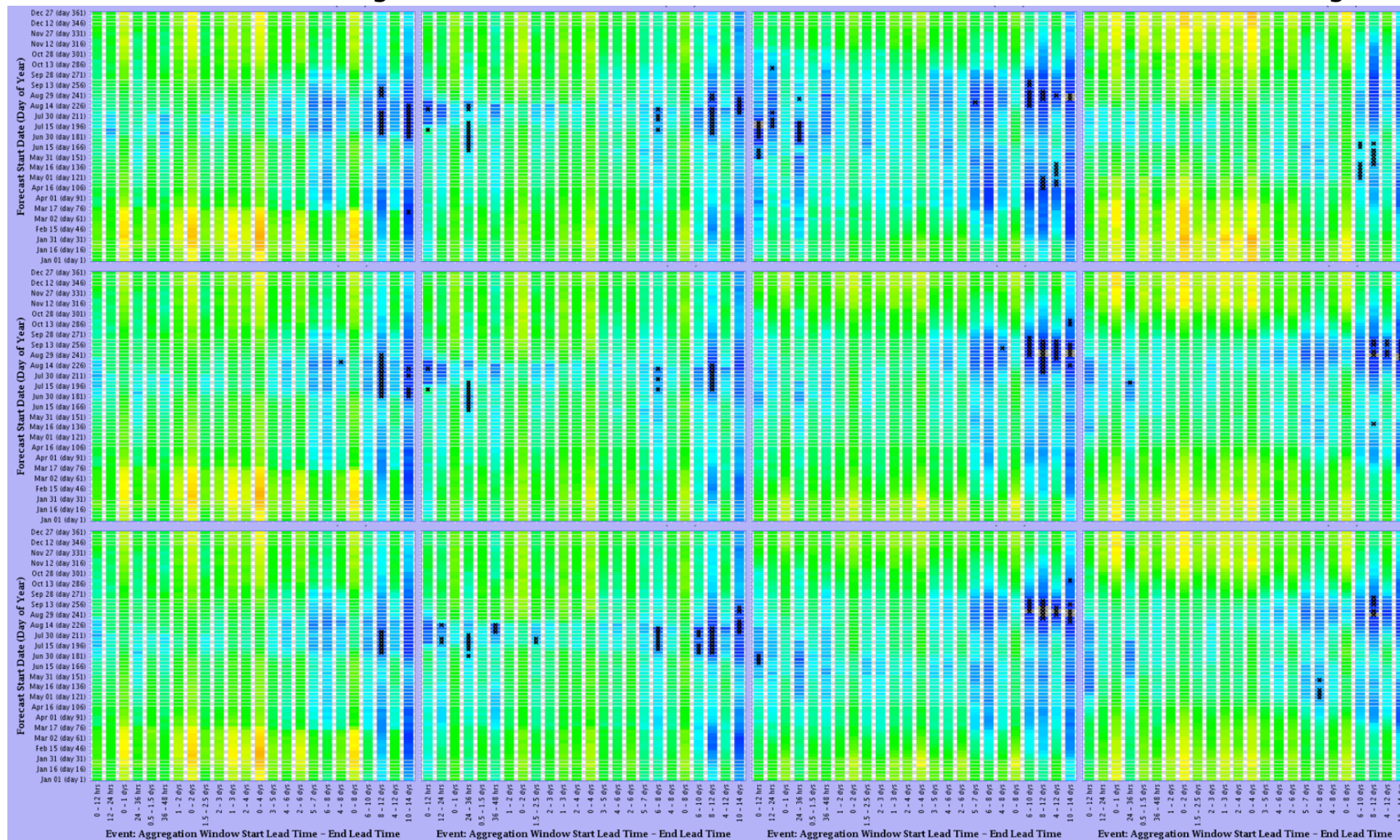
East: Almont

Animas: Durango

Lower

Mid

Upper



National Oceanic and Atmospheric Administration's  
National Weather Service





# CFSv2 Temperature MAX Skill

Green: Warren Bridge

Elk: Milner

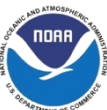
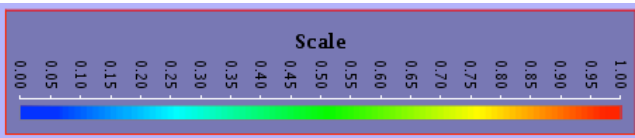
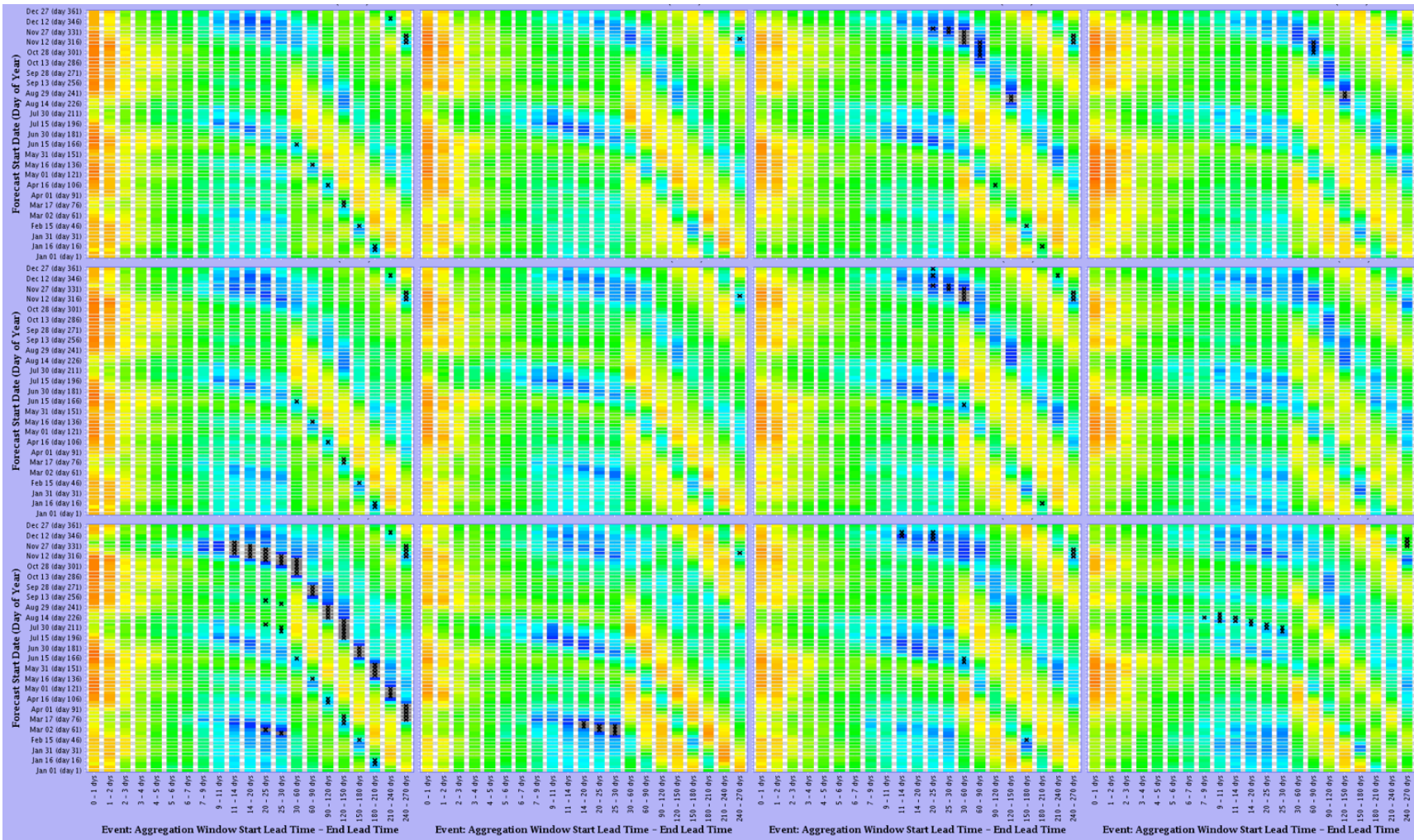
East: Almont

Animas: Durango

Lower

Mid

Upper



# CFSv2 Temperature MIN Skill

Green: Warren Bridge

Elk: Milner

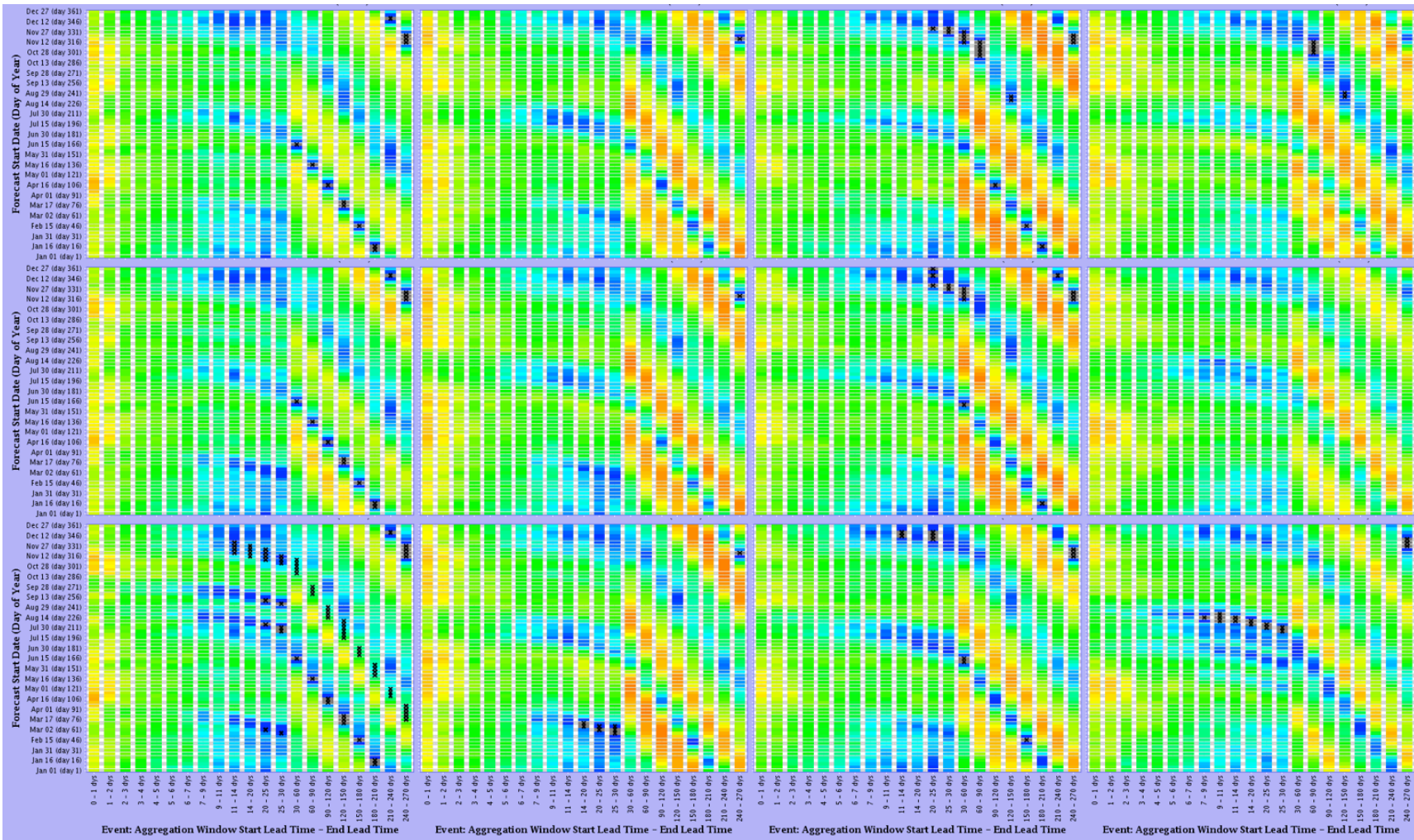
East: Almont

Animas: Durango

Lower

Mid

Upper





# CFSv2 Precipitation Skill

Green: Warren Bridge

Elk: Milner

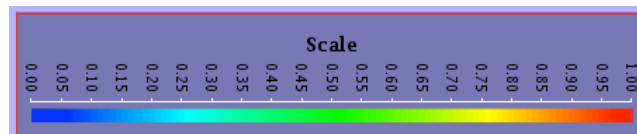
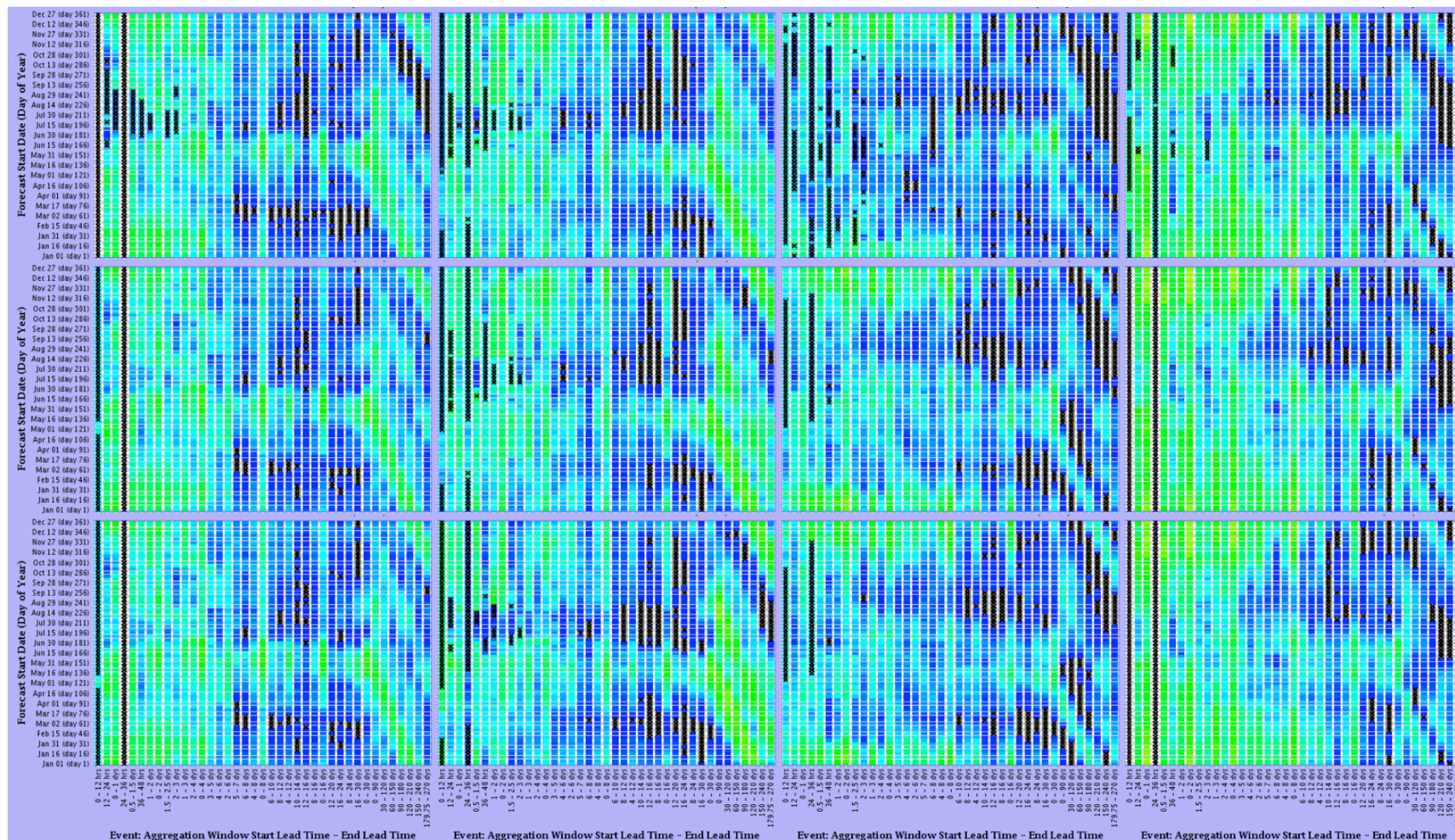
East: Almont

Animas: Durango

Lower

Mid

Upper

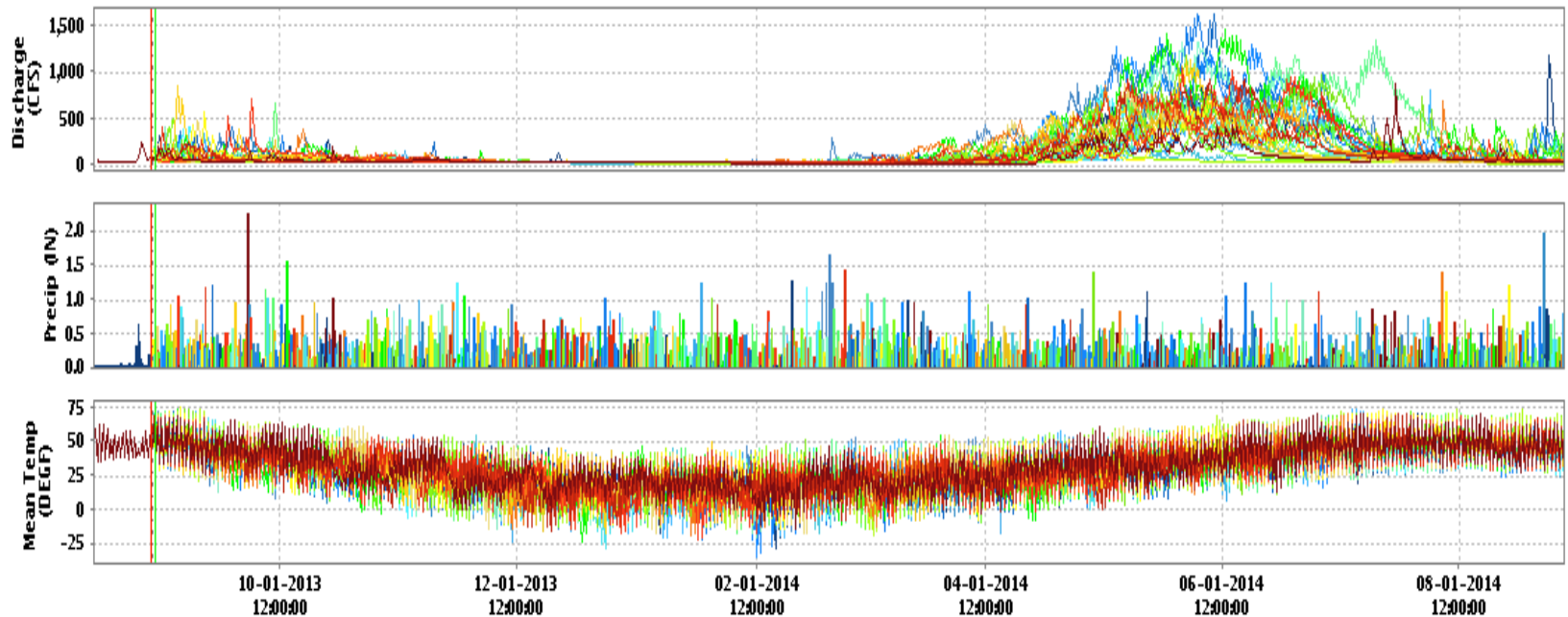


# GEFS and CFSv2 in Stream Forecast

Forcings are used in ESP

Output is a standard mean daily flow

This is the Hydrologic Ensemble Forecast Service (HEFS)

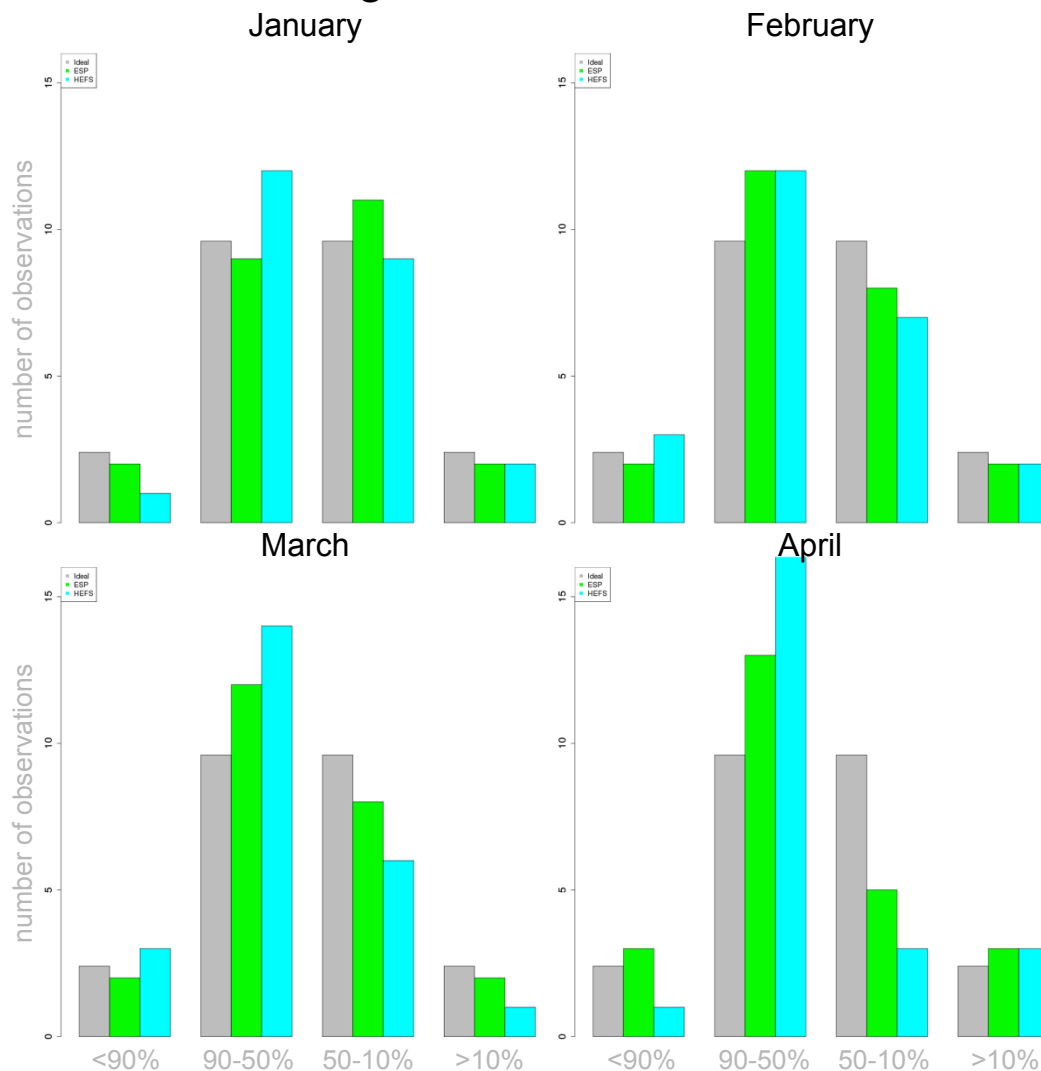
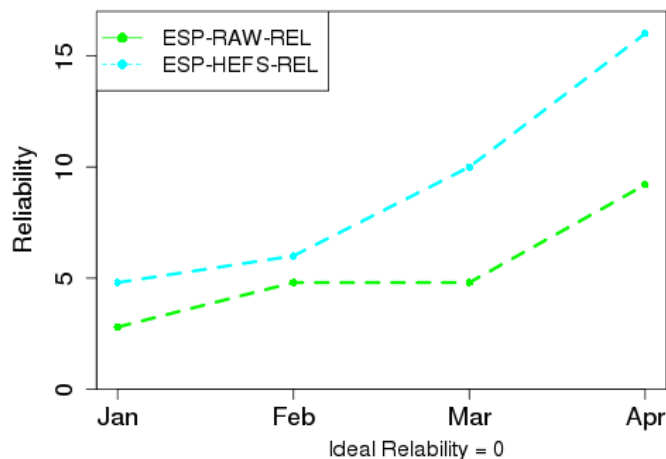
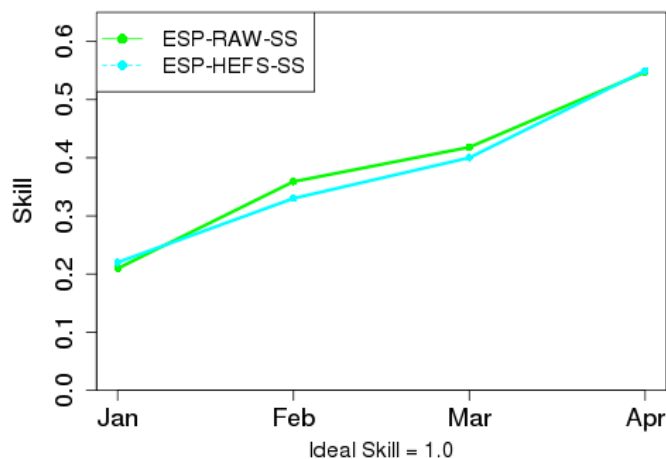


HEFS\_FG\_Forecasts: [1] 08-29-2013 12:00:00 Current

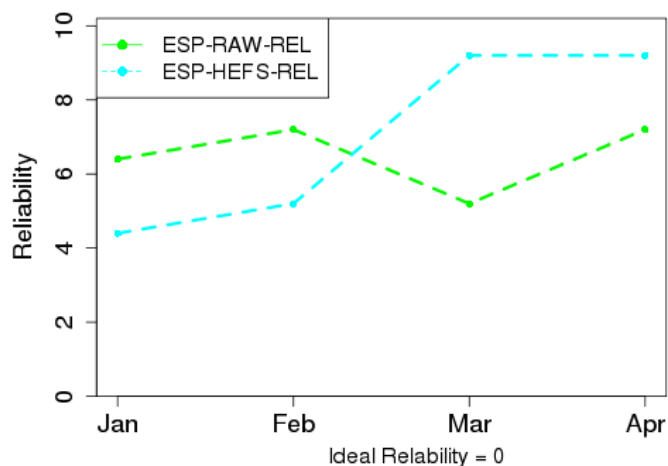
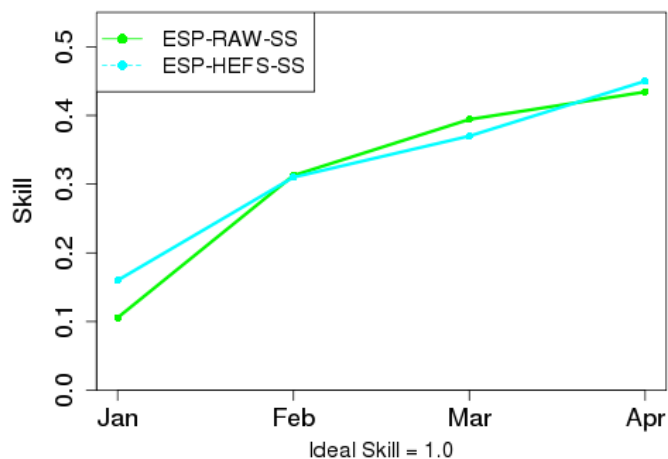


# April - July Volume HEFS Skill

## Green Warren Bridge



# April - July Volume HEFS Skill



## Elk - Milner

January

February

number of observations

March

April

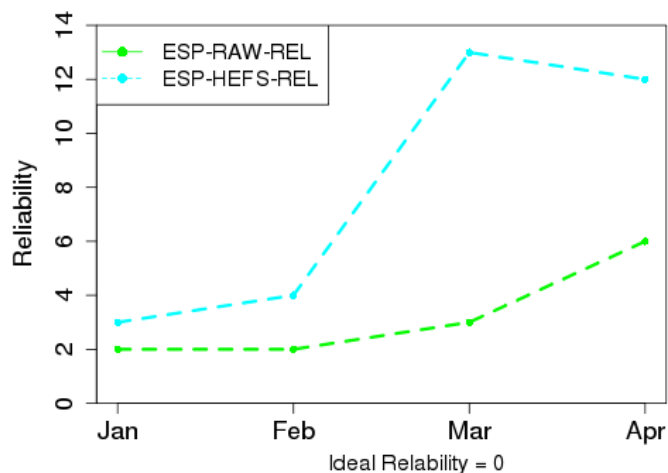
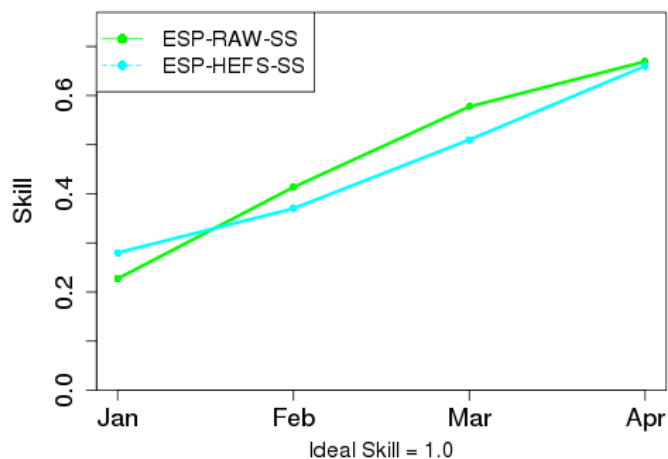
number of observations

<90% 90-50% 50-10% >10%

<90% 90-50% 50-10% >10%



# April - July Volume HEFS Skill



## East - Almont

January

number of observations



February



March

number of observations



April



<90%

90-50%

50-10%

>10%

<90%

90-50%

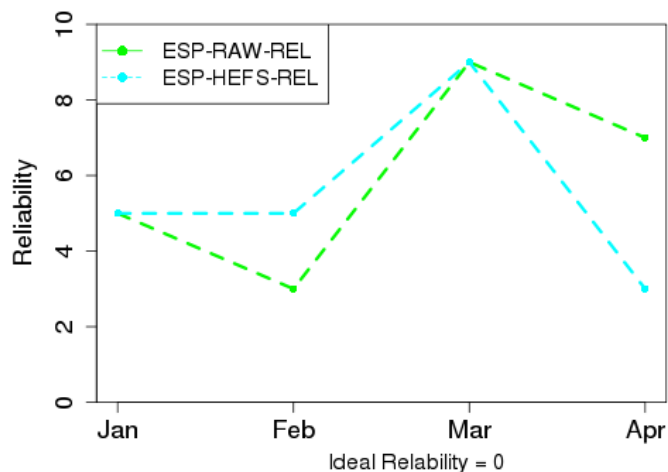
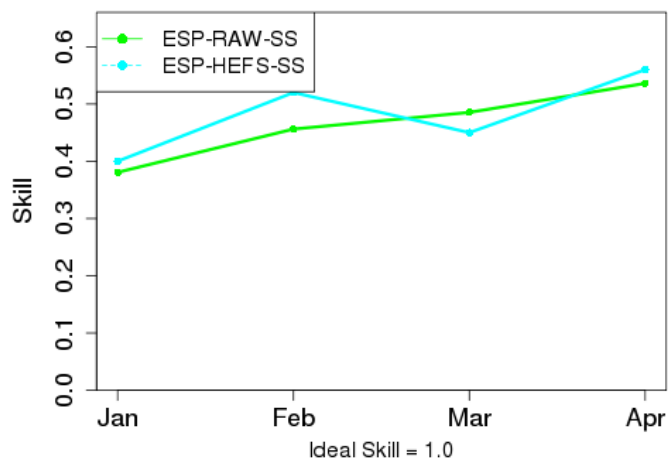
50-10%

>10%



# April - July Volume HEFS Skill

## Animas - Durango



### January



### February



### March



### April



<90%

90-50%

50-10%

>10%

<90%

90-50%

50-10%

>10%



# Initial Conclusions / More Questions

Little, if any, skill added with GEFS/CFS forecast  
not unexpected given not much skill in CFSv2

Need to do more analysis on a monthly scale

Does adding GEFS/CFS improve forecasts in Lower Basin  
in process of generating parameters

How does CFS forecast fair when looking at ENSO signal  
limited sample size so it will be difficult to draw any conclusions from

