

Interactive Verification Program Exercise 1

River stage forecasts have been archived for the years 1993-2002 for stations BLKO2, GLOO2, MORA4, QUAO2, and WTTO2. Actual forecasts are available with forecast type source 'FF', and persistence forecasts are available with forecast type source 'FR'. Each group will be assigned one location to analyze, which will be specified in the batch input file `exercise1.bat` within the group's `$(vsys_input)` directory. Perform the instructions in Getting Started and, using the data for the group's location, answer the questions provided below.

NOTE: This data set is very large; some verification products may take a large amount of time to produce, so please be patient. Also, in order to save time, avoid any statistic that requires sorting pairs: quantiles and CDF, to be specific.

Getting Started

Login to your assigned machine (lx1, lx3-6). Run the following commands to setup the IVP for execution and start the program:

```
. /home/hrl/setup_ivp_training
go vsys_scripts
ivp
```

When the **Verification Group Manager** window pops up, click on **Load From Batch** and select the file `exercise1.bat`. Click on **Create Display**.

Questions

Consider the questions below. While the data is loading, think about what plots need to be generated for each question, focusing on these details for each plot:

- What are the statistics that will be plotted along the primary (left-hand) y-axis?
- What statistics, if any, will be plotted along the secondary (right-hand) y-axis?
- What is the x-axis variable?
- What is the comparison variable, if any?
- Is any restriction necessary on the forecast value or observed value within the pairs to be used (must each pair have an observed value above flood stage, for example)?

Answer these questions:

- a. At what lead time do the forecasts appear to perform no better than persistence relative to RMSE? Relative to correlation? Relative to the ROC curve with the observation threshold being the flood stage (set the Observed Category Used to be "Category 2")?
- b. Is the forecast skill dependent on the month? Why do you think the skill is or is not dependent on the month? Given your answer, do you believe statistics should be computed using all pairs throughout the year lumped together, or should statistics be computed separately for different months or seasons?
- c. Have the actual forecasts improved over the years?

Interactive Verification Program Exercise 2

An experiment was conducted in which hindcasts were generated for three stations: BLUO2, TIFM7, and WTTO2. The following scenarios were used to test the affects of some aspects of forecasting:

- *Calibration*: uncalibrated (using automatically generated parameters) vs. calibrated model
- *Initial State Updating*: no initial state updating vs. initial state updating (the updating was done using variational assimilation, or VAR)
- *QPF*: 0-QPF vs. real QPF (for first 24 hours, followed by 0) vs. perfect QPF.

These scenarios lead to twelve sets of hindcasts, each one being assigned to a forecast type source:

Type Source	Cal./Uncal.	VAR/No VAR	QPF
XA	UNCAL	NO VAR	ZERO
XB	UNCAL	NO VAR	REAL
XC	UNCAL	NO VAR	PERFECT
XD	UNCAL	VAR	ZERO
XE	UNCAL	VAR	REAL
XF	UNCAL	VAR	PERFECT
XG	CAL	NO VAR	ZERO
XH	CAL	NO VAR	REAL
XI	CAL	NO VAR	PERFECT
XJ	CAL	VAR	ZERO
XK	CAL	VAR	REAL
XL	CAL	VAR	PERFECT

In addition, there is a persistence forecast available for each location with the type source 'FR'. Each group will be assigned to analyze either TIFM7 or WTTO2, since the data for BLUO2 is not appropriate for some of the problems. The location to analyze will be specified in the batch input file `exercisel.bat` within the group's `$(vsys_input)` directory. Perform the instructions in Getting Started and, using the data for the group's location, answer the questions provided below.

NOTE: This data set is very large; some verification products may take a large amount of time to produce, so please be patient. Also, in order to save time, avoid any statistic that requires sorting pairs: quantiles and CDF, to be specific.

Getting Started

Shutdown IVP (in order to free up all used memory) and perform the same Getting Started steps as in Exercise 1, except load the file `exercise2.bat`.

Questions

Consider the questions below. While the data is loading, think about what plots need to be generated for each question, focusing on these details for each plot:

- What are the statistics that will be plotted along the primary (left-hand) y-axis?
- What statistics, if any, will be plotted along the secondary (right-hand) y-axis?

- What is the x-axis variable?
- What is the comparison variable, if any?
- Is any restriction necessary on the forecast value or observed value within the pairs to be used (must each pair have an observed value above flood stage, for example)?

Answer these questions:

- a. Which forecast type sources are best relative to RMSE for each lead time? What do the scenarios that correspond to the best forecast type sources have in common? Is this also the case if the pairs analyzed are restricted to those where the observation is above flood stage (i.e. set the Observation Category Used to “Category 2”)?
- b. For each lead time, do the 0-QPF or real QPF generated forecasts generally perform better when all pairs are used? Which perform better when only pairs with an observation above flood stage are used?
- c. Is it better to have a calibrated model (CAL) with no initial state updating (NO VAR) or an uncalibrated model (UNCAL) with initial state updating (VAR)? Justify your answer.
- d. In your opinion, which of the three factors, calibration, accounting for initial state updating, or precipitation forecast, is most important to producing good forecasts. Which is least important? Why?
- e. Assuming you are using a calibrated model, if you were given the choice between spending resources to implement an initial state updating technique (such as VAR) or to improve precipitation forecasting (assuming improvement is possible), which would you choose? Justify your answer.