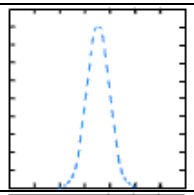
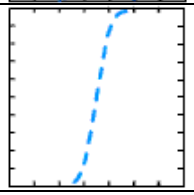
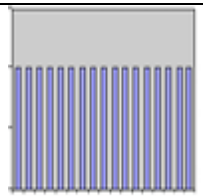
Hydrologic Verification Measures Summary

Produced by the COMET® Program May 29, 2008

Below is a summary of statistics and measures associated with verification topics. For each statistic and measure that is associated with numerical values, you will see the range of potential values and the desirable or optimal value. For measures that are visual, you will see a graphic of how that measure might look for verification of good forecasts. Finally, the table will show which statistics and values are associated with verification of deterministic forecasts and probabilistic forecasts. In some cases the measure is used with both deterministic and probabilistic forecasts.

1. Distribution Properties

Distribution properties provide information about observed and forecast values such as: numerical range, extrema, and typical values.

Measures	Range	Desirable	Forecast Type
Mean	- ∞ to ∞	NA	Deterministic
Variance	0 to ∞	0	Deterministic
Standard Deviation	0 to ∞	0	Deterministic
PDF	NA		Deterministic / Probabilistic
CDF	NA		Deterministic / Probabilistic
Interquartile Range	NA	Small #	Deterministic / Probabilistic
Rank Histogram	NA	 Flat, uniform	Probabilistic

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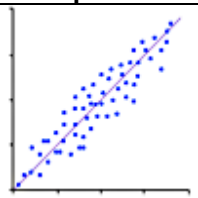
2. Forecast Confidence

Confidence statistics provide a measure of the certainty that the forecast value will fall within the expected range of values. The degree of confidence is related to the number of samples in the data set.

Measures	Range	Optimal	Forecast Type
Sample Size	1 to ∞	Large #	Deterministic / Probabilistic
Confidence Interval	0 to ∞	Small	Deterministic / Probabilistic
Confidence Level	0 to 100%	100%	Deterministic / Probabilistic

3. Correlation Statistics

Correlation provides a measure about the degree that two variables, in our case, forecasts and observations, are related.

Measures	Range	Optimal	Forecast Type
Scatter Plots	NA	 Minimal scatter	Deterministic
Correlation Coefficient	-1 to +1	+1	Deterministic

4. Categorical Forecasts

Categorical forecast verification uses forecast and observation pairs based on threshold criteria. A variety of statistical measures are computed.

Measures	Range	Optimal	Forecast Type
POD	0 to 1	1	Deterministic
POFD	0 to 1	0	Deterministic
FAR	0 to 1	0	Deterministic
CSI	0 to 1	1	Deterministic
Bias	0 to ∞	1	Deterministic
Brier's Score	0 to 1	0	Probabilistic
Ranked Probability Score (RPS)	0 to ∞	0	Probabilistic
Normalized RPS	0 to 1	0	Probabilistic

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5. Accuracy Statistics

The accuracy is defined as how well observed and forecast values are matched. The accuracy statistics are really measures of forecast error and therefore we could call it error statistics.

Measures	Range	Optimal	Forecast Type
Mean Absolute Error (MAE)	0 to ∞	0	Deterministic
Root Mean Squared Error (RMSE)	0 to ∞	0	Deterministic
Mean Error (ME)	- ∞ to ∞	0	Deterministic
Volumetric bias	0 to ∞	1	Deterministic
Continuous RPS	0 to 1	0	Probabilistic

6. Forecast Skill

Unlike error statistics, skill statistics provide a measure of forecast performance relative to some reference.

Measures	Range	Optimal	Forecast Type
Root Mean Squared Error Skill Score (RMSESS)	- ∞ to 1	1	Deterministic
Brier Skill Score (BSS)	- ∞ to 1	1	Probabilistic
Ranked Probability Skill Score (RPSS)	- ∞ to 1	1	Probabilistic

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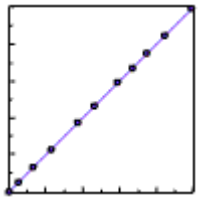
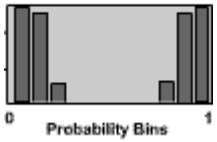
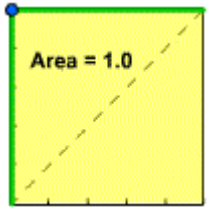
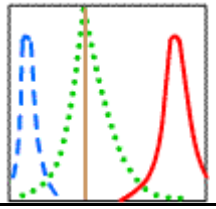
7.	**Conditional Measures**	Conditional verification measures provide information about the performance of forecasts, or forecast probabilities, given a certain event or condition.	**Measures**	**Range**	**Optimal**	**Forecast Type**
			Reliability Diagram	NA	 Plots along diagonal	Deterministic / Probabilistic
			Forecast Sharpness	NA		Probabilistic
			Relative Operating Characteristic (ROC)	0 to 1	Value = 1  Plot goes to upper left	Deterministic / Probabilistic
			Forecast Discrimination	NA		Probabilistic