

# VERIFICATION OF SEASONAL RAINFALL PREDICTION AT THE RIMAC RIVER BASIN

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In this research, we focus on applying verifications measures to verified the skill of the rainfall prediction by means of the statistical tool (CPT from IRI), these seasonal forecasts were done for the special River Basin in Peru from 2006 to 2009; as a result we are going to show the forecasts and their verifications corresponding for the main rainfall season (DJF and JFM).



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### ABSTRACT

This research is based on the verification of the seasonal statistics forecasts, by using probabilistic techniques, considering the scope of the forecast is common to use many variables of very different characteristics, as well as the binary variables (rainfall, non rainfall), categorical (below normal, normal and above normal) and continuous variables (temperature, humidity and others). In addition, the same variables can be considered as binary, categorical or continuous according to the particular application. It is often used the range of a variable, considering a finite number of intervals (below, normal and above). In general, the probabilities of the climatic series are considered to define the thresholds.

We focus on applying this technique to verify the skill of the seasonal rainfall prediction by means of the statistical tool Climate Predictability Tool (CPT), from the International Research Institute for Climate and Society (IRI), these forecasts were done for the Rimac River Basin from 2006 to 2009; as a result we are going to show the forecasts and their verifications corresponding for the rainfall season (DJF and JFM), in which we obtained high scores (up to 80% of hit). The results are interpreted based on the discussion of advantages and limitations of the used methodology.

### INTRODUCTION

We focus on Rimac river basin because its importance for Lima City (Capital of Peru), since one third of the population of Peru lives in there (8 million inhabitants) this river provides Lima its water for human consumption, for irrigations, the industries and for energy production in five different hydroelectric power plants.

Since 2006 the Rimac River basin forecast is working in an operational condition, it has been elaborated in a seasonal term using the statistical tool CPT (Climate Predictability Tool) from de IRI (International Research Institute for Climate and Society) and it has been complemented with information from dynamical models and climate monitoring.

To generate the forecast we use as a predictor historical observed data (at least 30 years) from 16 meteorological stations as a predictor we use sea surface temperature data from the ERSST, which is obtained from the R1.2.1.2.

The CPT has available 3 analysis methods, for our research we run the model using the probabilistic correlation analysis (CCA).



### METHODOLOGY

• Hit Rate (H): This quantity is defined by  $H = P(A|B)$  is the proportion of occurrences that were correctly forecast.

• False Alarm Rate (FAR): is defined by  $F = P(A|\bar{B})$  The false alarm rate is the proportion of non-occurrences that were incorrectly forecast.

• Heidke Skill Score: is a proportion correct, adjusted to account for the proportion of forecast that would have been correct by chance in the absence of skill.

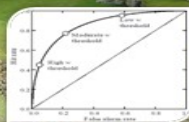
$$\text{Heidke} = (H - E)/(N - E)$$

• Receiver operating characteristic (ROC) is a graphical plot of the number of hit rates vs. the number of False Rate. ROC curves are used to evaluate the results of a predictor.

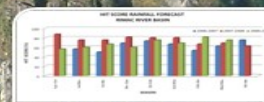
### RESULTS

#### THRESHOLDS SEASONAL VERIFICATION

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SEASON	DATE	FORECAST	ACTUAL	HIT	MISS	FALSE ALARM	NO DETECTION	SCORE	PERCENTAGE
2006	1	Normal	Normal	1	0	0	0	1	100%
	2	Normal	Normal	1	0	0	0	1	100%
	3	Normal	Normal	1	0	0	0	1	100%
	4	Normal	Normal	1	0	0	0	1	100%
2007	1	Normal	Normal	1	0	0	0	1	100%
	2	Normal	Normal	1	0	0	0	1	100%
	3	Normal	Normal	1	0	0	0	1	100%
	4	Normal	Normal	1	0	0	0	1	100%
2008	1	Normal	Normal	1	0	0	0	1	100%
	2	Normal	Normal	1	0	0	0	1	100%
	3	Normal	Normal	1	0	0	0	1	100%
	4	Normal	Normal	1	0	0	0	1	100%
2009	1	Normal	Normal	1	0	0	0	1	100%
	2	Normal	Normal	1	0	0	0	1	100%
	3	Normal	Normal	1	0	0	0	1	100%
	4	Normal	Normal	1	0	0	0	1	100%



### HIT SCORE AND HEIDKE SKILL SCORE PERFORMANCE



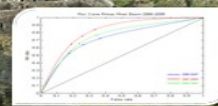
### SEASONAL RAINFALL PREDICTION



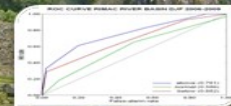
### RAINFALL ANOMALY



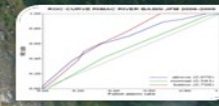
### ROC CURVES



### ROC CURVES DJF 2006-2009



### ROC CURVES JFM 2006-2009



### DISCUSSION

• The forecast verification systems allows us to determine a good confidence in a forecast system for the Rimac river basin.  
 • Since 2006 the forecast for DJF and JFM are the most reliable, these months are very important due to take preventive measures to mitigate risks in case of drought and flood occurrence.  
 • The best results using CPT as a predictor shows a good confidence between the SST patterns in the Pacific Ocean and rainfall in the Rimac River Basin.

### REFERENCES

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