Nº : A21B-01

STATISTICAL DOWNSCALING OF THE PRESENT CLIMATE IN SÃO PAULO, BRAZIL

PRISCILA DA SILVA TAVARES and SIN CHAN CHOU

National Institute For Space Research – INPE

Earth System Science Center - CCST

priscila.tavares@inpe.br, chou.sinchan@cptec.inpe.br

Rod. Pres. Dutra km 39,12630-000, Cachoeira Paulista, SP, Brasil

INTRODUCTION

Simulations for the present climate (1961-1990) at 40-km resolution were produced over the South America with the regional Eta/CPTEC Model forced by HadCM3 as lateral boundary conditions. The Eta Model was adapted to carry through integrations of decadal timescale for studies of climate change scenarios (Chou et. al., 2010; Pesquero et. al., 2009).

OBJECTIVE

To adjust the simulations of the present climate, using statistical correction over model grid-boxes, according to daily precipitation of 20 meteorological stations located in São Paulo state.

DATA

Precipitation observations of 20 meteorological stations distributed in the state were used. These observations were provided by the Information System for Water Resources Management of the São Paulo State (SIGRH), by Site: www.sigrh.sp.gov.br.

METHODOLOGY

The correction method is based on bias removal of monthly precipitation for each 20 stations. Bias was calculated for different monthly mean precipitation rates (mm.day^{-1}) (example shown in Fig.1). The correction factors were determined in the period between 1961 and 1985 and were applied in the period between 1986 and 1990 (test period).

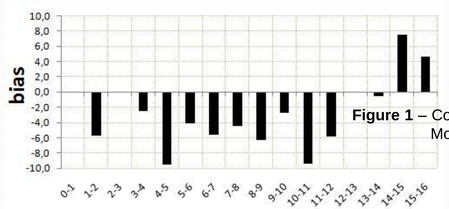


Figure 1 – Correction factors for precipitation rate of Mongaguá station for January.

The method was evaluated based on the mean absolute error (MAE), the root mean square error (RMSE) and the Skill Score (SS) before and after corrections. The performance of the method has been classified subjectively such as: ***Excellent (E)*** - *Reduction of model errors* in almost every month*;* ***Satisfactory (S)*** - *Reduced model errors in most of the months (7 and 8 months); and* ***Unsatisfactory (Un)*** - *Increased model errors after correction.*

RESULTS

•Verification of precipitation climatology

The largest precipitation amounts occur in the eastern part of the State with annual means between 5 and 7 mm.day^{-1}. In central part of the State the daily mean is below 4 mm.day^{-1} (Fig. 2a).

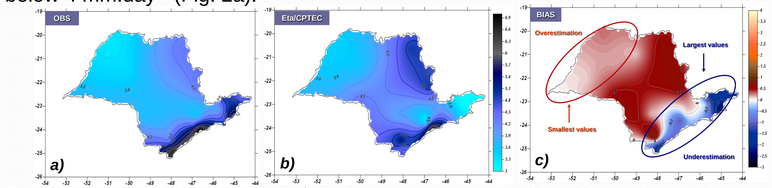


Figure 2 – Annual precipitation (mm.day^{-1}) during the present climate (1961-1990): a) observed data and b) Eta/CPTEC modeled estimates e c) annual bias model (mm.day^{-1}).

The rainy (drier) season occurs between the December and February (June and August) months with values above (below) 11 mm.day^{-1} (1 mm.day^{-1}) in the stations located near the coast (middle) of the State (Figure 3a). In general, the rainy months (drier) exhibited negative (positive) bias, therefore underestimated (overestimated) the precipitation (Figure 3c).

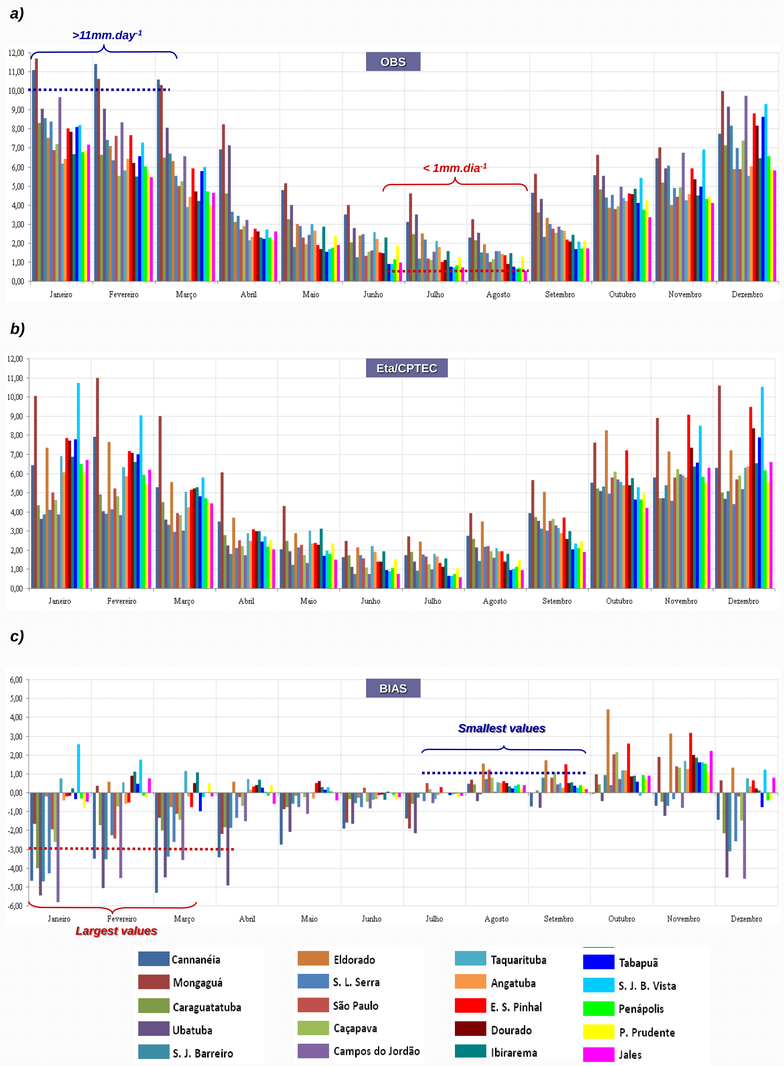


Figure 3 – Monthly precipitation (mm.day^{-1}), for the 20 selected stations, during the present climate (1961-1990): a) observations and b) Eta/CPTEC model e c) monthly model bias (mm.day^{-1}).

•Simulation errors before and after corrections

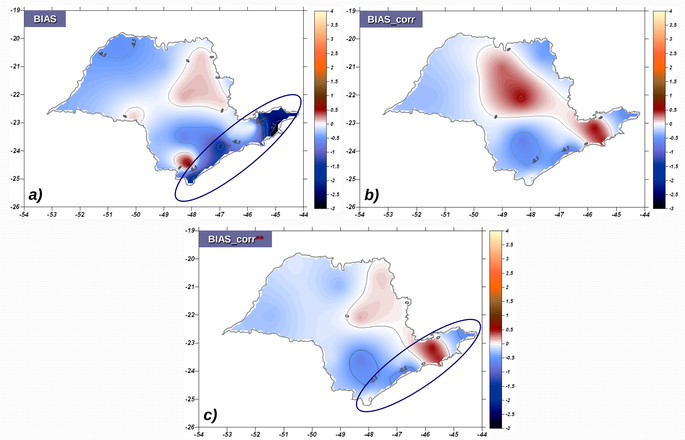
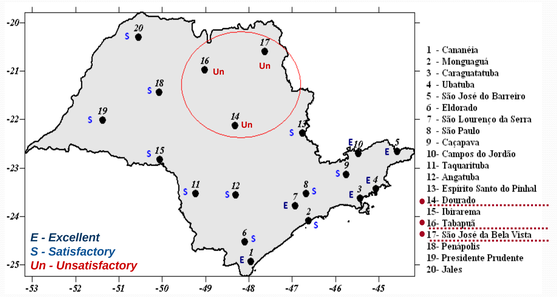


Figure 4 – Annual model bias (mm.day^{-1}), for the period 1986 to 1990, calculated from the Eta/CPTEC model: a) before the correction; b) after the corrections; and c) after the corrections except the stations Dourado, Tabapuã and São José da Bela Vista.

•Performance of the method



CONCLUSIONS

In general, it was noticed that the method satisfactorily adjusted the simulations to the stations in most of the State, in particular near the coast where largest model bias occurred. In the stations where the method did not perform satisfactorily the values of the simulated precipitation were generally similar to the observations, so model errors were small, the stations with unsatisfactory behavior were located in central north of São Paulo state. These corrections will be applied to simulations of future climate change scenarios to support vulnerability studies.

Acknowledgments

The authors thank the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq) for scholarship, the UNDP Project BRA/05/G31, the FCO GOF-Dangerous Climate Change DCC project from the UK and the Associação dos Pesquisadores do Experimento de Grande Escala da Biosfera - Atmosfera na Amazônia (APLBA). This work is part of the project Downscaling de cenários futuros para o Estado de São Paulo (CNPq - 382.932/08-0).