

Statistical downscaling of a specific weather pattern for rainfall forecast using techniques of artificial intelligence

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A statistical downscaling procedure derived from artificial neural network (ANN) and fuzzy logic (FL) were development to generate quantitative forecasts of daily rainfall to specific weather patterns. Weather pattern methods involve linking observational station data to given weather classification schemes. In this case the classification is subjective and a specific weather pattern namely SACZ-ULCV pattern was selected. This weather pattern is the interaction between the upper level cyclonic vortices (ULCV) in the vicinity of Northeast Brazil and South Atlantic Convergence Zone (SACZ). This interaction is associated with severe rainfall and thunderstorms over Southeastern of Brazil. The SACZ-ULCV pattern is well simulated by regional Eta model of Center for Weather Forecasts and Climate Studies (CPTEC) in Brazil, for this reason the outputs of this model to period from December, January and February of 2000-2003 were used to generate statistical downscaling. The predictors were the dynamical meteorological variables of Eta model related to SACZ-ULCV and surface rainfall as predictand. Additionally, was constructed another experiment but in this case, it was considered all summer period, that is, other summer weather type besides of SACZ-ULCV pattern were included. Forecast experiments were conducted for 12 major urban centres in the São Paulo region. Several statistics are calculated to examine the performance of different experiments. Generally it was observed that a good rain forecast performance were associated with well-defined events, in this case when was only considered the downscaling to SACZ- ULCV pattern (i.e., the forecast should be better when the rainfall is predominantly generated by similar dynamical process). The results generated by the model neural presented a good performance in the forecasts. When it was compared with the FL technique showed very close results to the generated by ANN. The obtained results suggest that FL technique can be applied for forecast applications. On the other hand, the downscaled precipitation is more realistic than the precipitation simulated by Eta model.