ABSTRACT

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This work presents the results about the use of adaptive filters in the frequency domain. This is done using the RLS (Recursive Least Squares) algorithm and the two-dimensional DCT (Discrete Cosine Transform), respectively, with the objective to reduce deviations in climatic forecasts. The differences between the climatic variables observed in the atmosphere and those predicted by a numerical model tend to increase with the integration time due to errors and simplifications in the equations. The Eta regional atmospheric model is used by CPTEC / INPE for numerical climate prediction calculations, which contains errors. This dissertation adopts the use of adaptive filtering and digital signal and image processing techniques to reduce Eta model weather forecasts to improve these predictions. Errors are calculated from the NCEP reanalysis data. The climatic variables used in this work are the zonal and meridional components of the wind, geopotential height and specific humidity, analyzed in twenty atmospheric pressure levels and in the spatial resolution of 40 km. The experimental results indicate that the adaptive filters of order ($N = 4$) are able to reduce the prediction errors, which are evaluated using the mean square error and the maximum error.

Keywords: Adaptive filters; DCT-2D; Algorithm RLS; Climatic forecasts.