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Statistical downscaling of Eta-HadCM3 climate model for near surface wind assessment in Brazil

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Regional impacts of climate change are subject of extensive research, which usually adopts physical or statistical approach to downscale the outputs from GCM`s. Near surface winds, in particular, are difficult to be predicted even in short-term timeframe, mainly due to microscale circulations associated with surface heterogeneity and turbulence inside the atmospheric boundary layer (ABL). However, the prediction of its future trends would be valuable information for airports, agriculture and mainly for wind energy development, since wind farm projects have at least 20 years of operational perspective. This study aims to model the local effect of Eta-HadCM3 outputs over daily means of 10m wind fields using an artificial neural network (ANN) approach. The type of network developed is a Multilayer Perceptron (MLP) with one hidden layer, which is capable to represent any continuous function associated with physical processes, including the non-linear ones typically found in the ABL. The predictors for the neural network were selected from the outputs of Eta-HadCM3 scenario A1B, which is a nesting of Eta/CPTEC 40km grid mesoscale model into the HadCM3 introduced by IPCC. The selection criteria were based on cluster and correlation analysis between the possible predictors and desired outputs of the ANN. The observed 10m wind daily means were obtained from INMET stations for the period 1960 to 1990, matching the Eta-HadCM3 baseline, in a total of 20 stations distributed between northeastern and southern Brazil. After a quality control process to screen bad data from the data-sets, the ground data was used to train and validate the ANN model for each station. Climate predictions are being downscaled from the Eta-HadCM3 2010-2040 timeframe, and although the study is still ongoing, preliminary results indicate that a slight increase of near surface wind is expected in both southern and northeastern regions of Brazil.

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