Synthetic wind speed time series with Markov and ARMA models: comparison for different use cases

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Abstract—The impact of stochastic available generation of wind power on system operation and planning gained rising importance due to the increasing amount of wind power plants. Many models used for synthetic wind speed time series are based on ARMA-GARCH processes or Markov chains. These two approaches are compared regarding their feasibility to depict the statistical properties of the original wind speed distributions and their time series characteristics. Several data sets from different locations with different characteristics are considered. It can be shown that the ARMA-GARCH model can depict the wind speed series more applicable especially for covering the observed autocorrelations and inter-annual trends.

Index Terms -- Wind speed, synthetic time series, ARMA-GARCH processes, Markov chains, time series analysis, diurnal trends.