Introduction:-

Extreme weather events such as strong winds, high temperatures, and heavy rainfall can cause major devastation. Evaluation of wind performance is still in its initial stages. An informative graphical display of improvised hourly wind velocity measurement helps in understanding how this costly event can be modeled and predicted. Uninterrupted wind for 6 hours is called **Episodes**.

- ✓ **Wind episodes** are defined as periods of uninterrupted wind separated by occasions of zero wind speed. Graphs provide useful supplements to standard frequency-based displays providing an appropriate basis for data enhancement, fitting statistical models that can be used for measuring and forecasting. We illustrate these concepts using sample data from Indian weather stations. **The data were obtained from the NREL website in the USA for 9 Indian weather stations.** http://www.nrel.gov/international/ra_india.html

Objective:-

- To analyze wind speeds, wind direction, develop **Episode based graphs and time series graphs** to measure **hourly wind velocity**.
- Develop a statistical model for predicting wind velocity and evaluate **extreme weather events.**

Methodology:-

We fit linear regression model for analyzing wind velocity. The Measured variables **Wind speed, wind direction with continuities, discontinuities**, is regressed on predictor variables wind direction, days, months, and 5 day periods. **Graphs of Wind episodes, Time series** are plotted; Model error analysis is performed by extracting the residuals from the model. Quantile graphs of the model, auto correlation function graphs, and partial auto correlation function graphs on the model residuals are plotted. The **coefficients, standard errors, crude mean, adjusted mean** are calculated.

The graphs of the wind direction, hours, and 5 day periods on the mean of the wind speed are plotted. Graphs plotted illustrate there were **confounding factors** of zero and nonzero wind speed, when we observe the crude mean, adjusted mean on the mean of the wind speed.

We fit logistic regression model to analyze zero, non zero wind speed, **Evaluate wind speed** on hourly, and 5 day periods. There was confounding effect of zero and nonzero wind speed.

Conclusion:-

We developed a novel graphical method of displaying wind velocity as an episode based time series using hourly observations. A statistical model was fitted for wind speed. The result illustrates wind velocity can be analyzed on mean wind speed, wind direction, hours and 5 day periods.

The model had an adjusted r-squared of 27% but the errors contained substantial serial correlation, some departure from normality.

Further research will involve using **arima model for** extensive hourly wind velocity measurements and forecasting.

5 days = 1 period. 365 days = 73 periods (5*73)

Reference:-

http://www.nrel.gov/international/ra_india.html