**Motivation and Background**

As the renewable energy industry continues to grow, so does the requirement for streamlined and optimal decision-making tools for siting wind and solar farms. Renewable energy technologies, such as wind turbines and solar panels, have the potential to provide clean and diverse energy sources to humanity, enabling the transition away from fossil fuels. The development and expansion of renewable energy sources are crucial for mitigating the effects of climate change and achieving sustainability goals. Effective siting can maximize the potential of renewable energy generation while minimizing environmental impacts.

**Optimal networks of wind and solar farm placement** is based on the long term wind and cloud correlation made possible with these databases.

**Objectives**

The objective of this research is to develop a capability that can utilize the placement of wind and solar farms to improve the performance of existing wind and solar systems, thereby increasing their efficiency and reducing costs. To achieve this, we require high-resolution, validated wind and solar data sets.

**Data Sets Used**

**Clouds**

To optimize the placement of wind and solar farms, it is crucial to have a time series of wind and cloud data. For this purpose, we have developed a fifteen-year cloud climatology based on NOAA's geostationary operational environmental satellites. The cloud database has been validated over the entire United States and the state of Hawaii. The cloud data has been made available for use by the research community.

**Scoring Methodology**

Scoring methods aim to evaluate the performance of wind and solar farms. The scoring method analyzed the frequency of events and how it affects the overall performance of the farm. The method uses metrics such as the frequency of power generation, the frequency of cloud cover, and the frequency of wind speed to determine the overall performance of the farm. The method also considers the frequency of cloud cover over the farm to ensure that the site is not affected by clouds.

**Winds**

The wind weather information is collected using the Weather Forecasting and Research (WRF) mesoscale model. This model is designed to predict high-resolution wind data for locations across the United States and beyond. The model uses data from various sources, such as satellite data and ground-based observations. The Weather Forecasting and Research (WRF) mesoscale model is a powerful tool for predicting wind patterns and can be used to optimize wind farm placement.

**A Case Study (Wind)**

A study was performed to test the optimal placement of two solar farms on the Central and Southern-Petroleum Plains of Florida. The study was compared to an existing set of wind farms, two of which are proposed currently (2009). The results demonstrate that the optimal placement of wind farms can significantly enhance their performance.

**A Case Study (Solar)**

The mean frequency of occurrence of cloud cover from Florida (1999–2009). The site selection is mainly influenced by the strong minimum in cloud cover along the west coast of Florida.