

Drivers of Extreme Wind Events in Mexico for Wind Power Applications

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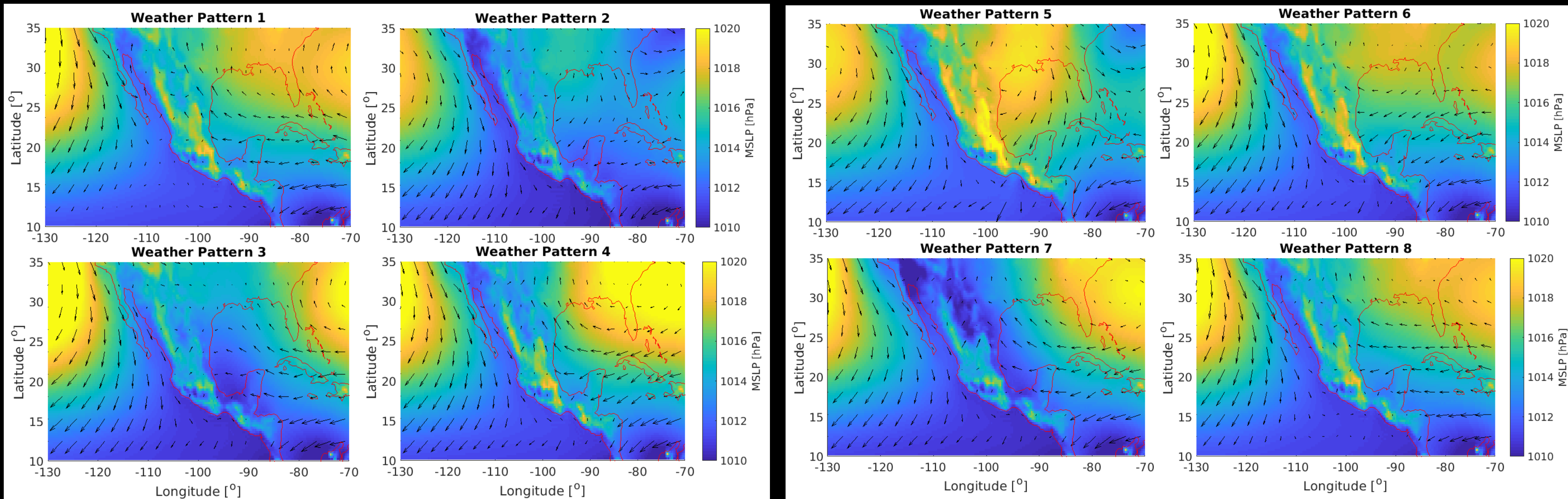


Introduction & Methodology

- In this presentation, we investigate the drivers of the strongest and weakest winds across Mexico.
- Data used is ECMWF ERA-5 500hPa geopotential height, surface winds & mean sea-level pressure. We bias-correct this using anemometric observations across Mexico.
- We use an Empirical Orthogonal Function (EOF) analysis to find the principal components associated with 500hPa geopotential height patterns over Mexico and then apply k-mean clustering to these. This height is used as it is above the influence of the orography of central Mexico.
- Aim is to provide weather patterns that provide the best and worst wind power generation across sites of interest in Mexico. Here we briefly provide some of our key results.
- Keep an eye out for our full results in the upcoming publication of the same name or email us for more details.

Weather Patterns

- Clustering applied on 500 hPa geopotential height.
- Composite all times in each cluster to provide the 8 key weather patterns.
- Colour bar shows mean sea-level pressure whereas vectors represent wind velocities.



Extreme Wind Events

- We find the top/bottom 5% of winds at eight anemometric stations spread across Mexico.
- We then explore which of the weather patterns (WP) from the last slide these fit into.
- Vast majority of low wind events at stations from WP 1 & 8, which mostly occur in Summer.
- High wind events more station dependent. In Chiapas & Oaxaca in the South (CI01 & OA01), most events in WP5. On the countries East coast (TM02, VZ02, YC01), most are in WP 4 or 6.
- Baja California Sur (BCS1) have the strongest & weakest events in the reverse of all other stations. This area could be utilised to keep wind energy production going during settled periods mostly during the Summer months.

