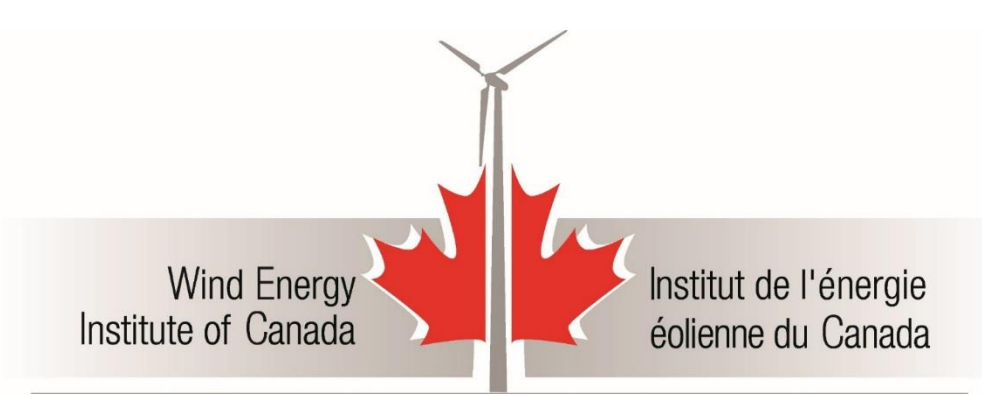


HISTORIC CLIMATE DATA FROM 1987 – 2017/20

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Background

The Wind Energy Institute of Canada (WEICan) has been collecting meteorological data since 1987. This data provides a unique opportunity to see long-term climate trends at North Cape, PE.

Introduction

According to the Intergovernmental Panel on Climate Change & UPEI's Climate Lab, Prince Edward Island can expect to experience changes in the climate such as warmer temperatures, more rain, & less snow. With WEICan's data, it is possible to analyze changes seen at North Cape since 1987.

3 main studies were performed: long term changes in wind speeds, long term changes in temperatures, and an investigation of wind speeds before and after the installation of the Vestas V47 Wind Turbines in 2001.

Methodology

The original meteorological tower built in 1987 was located near the replacement tower that was built in 2005. With comparable sensors, researchers confirmed that it was possible to combine the datasets from these two towers into one large dataset. This 1987-2017/2020 dataset was cleaned to eliminate erroneous data and summarized into daily, monthly, and annual averages. Where possible, error bars are displayed, showing standard deviations.

Results/Discussion

1. Long-Term Wind Speed Change:

Wind speeds at North Cape are seasonal by nature, being higher in the winter than the summer (1). Investigation of seasonal winds showed that since 1987, summer wind speeds have decreased by almost 0.8 m/s. No season has experienced an increase in wind speeds (2). This result has been seen by other climate researchers, and is referred to as global terrestrial stilling. The most recent science on this phenomenon suggests that since 2010, there has been a global reversal in stilling. This is seen in WEICan's data as well - with a slight increase measured since the beginning of the decade (7,8).

2. Wind Change, Before & After Vestas V47 Installation:

Eight Vestas V47 turbines were installed at North Cape in 2001, in proximity to WEICan's met tower. Our data showed that wind speeds had decreased 8.7% downwind of the turbines. In other directions, there was a slight increase of 3.4% for the same time range. (3). As the interannual variability of wind speeds is high, it is not possible to confirm if these changes were caused directly as a result of the V47 turbines.

3. Long Term Temperature Change:

The most reported measure of the changing climate is that of temperature. Higher latitudes are experiencing more extreme changes & at a faster rate. At North Cape, the decadal average temperature since 1987 has increased 1 degree, ending in 2017 (4). Winters are experiencing less cold days, and summers are becoming warmer (5,6).

Conclusions

Wind speeds appear to be stabilizing since 2010, but the magnitude of temperature change is concerning, especially as this analysis was only begun in 1987. One can expect these trends to continue, as global emissions of CO₂ have increased by nearly 1 billion tons. Nationally, Canada has increased total GHG emissions by 14 megatons of CO_{2e} since 2017. Although primarily focused on wind energy research, WEICan hopes to support climate researchers provincially, nationally, and internationally. With our historic suite of weather instrumentation and a new multi-tower climate monitoring facility, we are well positioned to play an important role in future studies of climate change.

