WIND AND TURBULENCE INTENSITY VARIATIONS AT THE WEICAN NORTH CAPE SITE

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Experimental Setup

Six 10m automatic meteorological observation stations (masts) were installed, with each mast measuring:

- 10m horizontal wind vector*
- 2m air temperature
- relative humidity

**ADDITIONAL MEASUREMENTS**

**Mast 3**
- 1m, 2m and 4m air temperature
- ground temperature (~ 5cm depth)

**Mast 4**
- 0.5m and 1m wind speed*

**Mast 5, 6**
- air pressure
- precipitation amount

*with associated statistics
North Cape, PEI
Mast Locations
Some Photos...

The Turbines

Mast 4
Wind Speed Ratio
Turbulence Intensity: $\sigma/U$
Wind Speed Ratio as a Function of Distance Inland; Wind Speeds >= 3m/s; Bin Width = 30

Wind Speed Ratio (Normalized by Average Wind Speed over all Masts)

Distance Inland (m)
TI as a Function of Distance Inland; Wind Speeds >= 3m/s; Bin Width = 30
Wind Speed with Height vs Wind Direction; Bin Width = 2

Mast 4
Roughness Length

- Mast 3 and Mast 4 which are located along the cliff measured the temperature and wind speed respectively at several levels.

- Assuming a logarithmic wind profile for $U(z)$ allowed the roughness length ($z_0$) to be inferred using linear regression on cases of near neutral stratification defined as $|T(10m) - T(1m)| \leq 0.5^\circ C$.

\[
U(z) = \frac{u_*}{\kappa} \ln \frac{z}{z_0}
\]
Roughness Length vs Wind Direction; Avg Wind Speed $\geq 3\text{m/s}$; $|T(10\text{m})-T(1\text{m})| \leq 0.5\text{K}$; $r^2 \geq 0.95$
Questions?