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SURFACE LEVEL WIND GUSTS AND TURBULENCE IN THE ALCÂNTARA LAUNCH CENTER, BRAZIL

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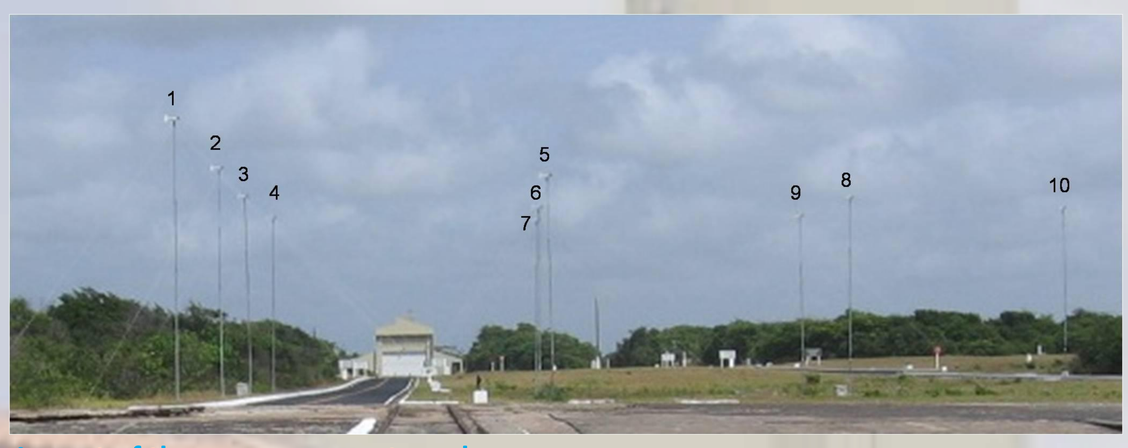
INTRODUCTION

Brazilian rockets are launched from Alcântara Launch Center (ALC), whose location close to equator is privileged for launching of geosynchronous satellites. The geographic and topographic features around make the ALC a special case from the micrometeorological point of view as it locates in the Atlantic Ocean sea cost nearby a cliff about 40-m high. Surface winds and turbulence in the atmospheric boundary layer governs the forces experienced by rockets in the first few seconds of the flight. Following Kingwell et al. (1991), the wind factors influencing the rocket launch are, among others, flight trajectory, vehicle controllability, structural loadings on vehicle and towers, and human and environmental protection.

The cliff surrounding the ALC.



Layout of the aerovane mast mesh.

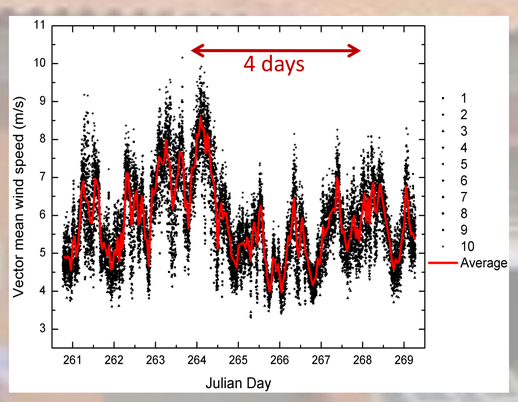
DATA

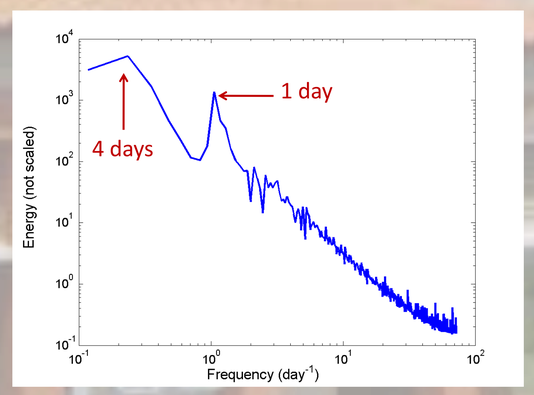
The data presented here were collected during the *Murici II Campaign,* in September 2008 from 16 to 25. Ten aerovanes were deployed in a triangular arrangement. Variable were computed as in the table (side).

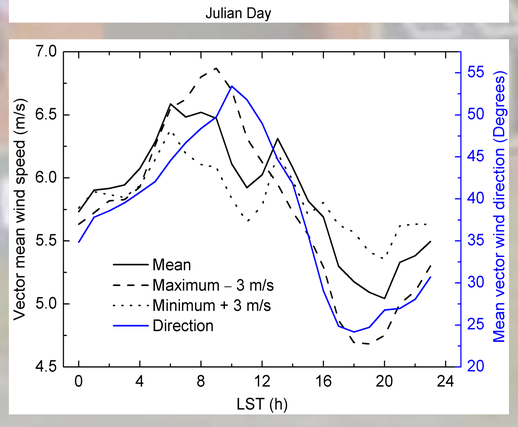
$V_S = \frac{1}{N}\sum_n S_n$	Scalar mean wind speed (S_n, observed)
$\bar{u} = \frac{1}{N}\sum_n -S_n \sin\theta_n$	Zonal mean wind component
$\bar{v} = \frac{1}{N}\sum_n -S_n \cos\theta_n$	Meridional mean wind component
$\bar{\theta} = \tan^{-1}\frac{\bar{u}}{\bar{v}}$	Vector mean wind direction
$V_R = (\bar{u}^2 + \bar{v}^2)^{1/2}$	Vector mean wind speed
$I = \frac{\sigma_u}{S_n}$	Turbulence intensity
$G_n = \frac{S_{pn}}{V_S}$	Gust factor, S_{pn} is a 10-min peak velocity
$A_n = S_{pn} - V_S$	Amplitude factor

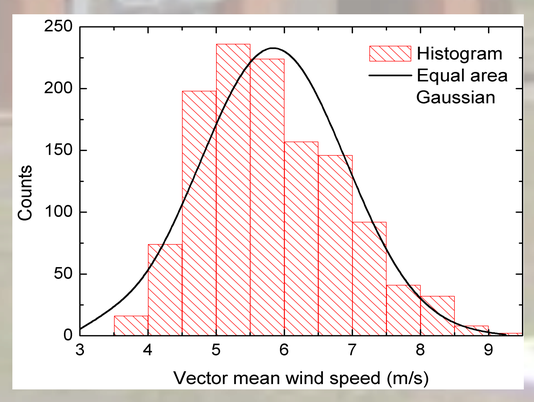
RESULTS

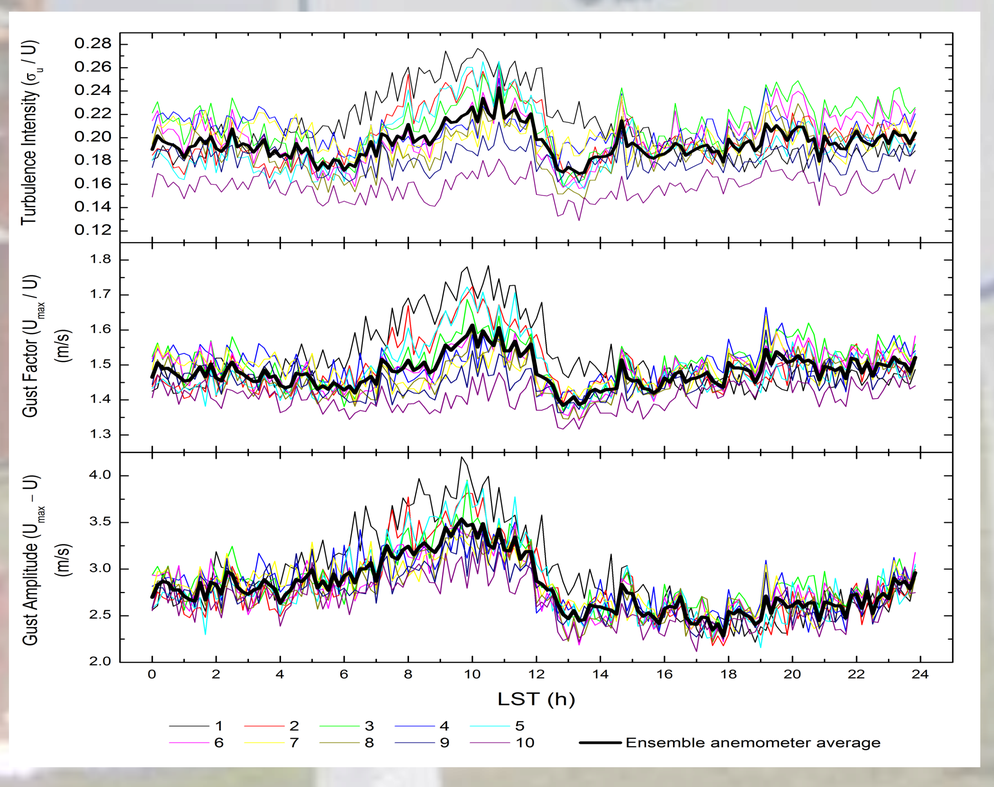
- Time series presented a strong diurnal pattern (expected), but also a longer time scale is noticed and revealed in the spectrum. A synoptic-scale system might be acting;
- Some higher-frequency variability from mast-to-mast, but not clear in the crosscorrelation;
- Wind speed and wind direction present an asymmetric distribution about the mean value;
- Turbulence and gust parameters follow the diurnal cycle observed for wind speed.











CONCLUSION

ALC represents a special case from the micrometeorological point of view. Wind speed, wind direction, turbulence intensity, gust factor, and gust amplitude all present a marked diurnal cycle. Finally, the characterization of wind behavior and turbulence within the surface boundary layer is an important point to guarantee the safety during rocket launchings from ALC.

FUTURE WORK

From meteorological point of view, the study of the observed variability with scales other than the diurnal cycle will be important to better understand the flow regime in the surface boundary layer of the ALC. This future work will count on a mini-sodar able to generate wind profile up to 200 m with 10-m resolution. Also, data from other masts are available and will be analyzed.

ACKNOWLEDGEMENTS

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