



Analysis of the atmospheric flow in a coastal area in northeast Brazil using in situ (windtower) and remote sensing (SODAR) wind data

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The coastal area in the northeast Brazil receives the trade winds coupled with the sea breeze circulation. In addition, there is also a topographic barrier (cliff) around 40-50 m that make the wind profile very turbulent. The spatial winds variations have been investigated using data (10 min average) from an 70 m tower (6 levels of aerovane wind measurements), a set of 12 masts (1 aerovane at 10 m height) and a minisodar (ASC model 400 - 4500 MHz) colocated nearby (less than 50 m of distance) for a period of 60 days during the dry season (the period with the strongest winds). The surface winds (both in situ and ground base remote sensing measurements) followed the Monin-Obukhov Theory and logarithmic wind profile as the atmospheric stability is mostly neutral due to the high winds (typically between 8-10 m/s). An intercomparison between the tower and minisodar at 70 m height showed differences less than 0.5 m/s for the windspeed and 3 degrees for the direction (considering more than 6000 pairs of values) and there is no systematic bias associated with daytime/nighttime conditions. The daily cycle of the windprofile up to 200 m (measurements derived from the minisodar) was studied combining 6 h profiles (0-6, 6-12, 12-18 and 18-24 Local Time (GMT-3 hours)). The presence of the sea breeze can be observed for the afternoon times (profile 12-18 LT) as there is a reduction of the windspeed (around 2.0 m/s) from the levels 100-180 m. The direction did not change as the trade winds are the major synoptic system and it is very persistent. The meridional component (perpendicular to the shoreline coast) presented the largest differences with positive and negative fluctuations depending on the time of the day (daytime or nighttime conditions). The vertical velocity presented values lower than 1.0 m/s and there is a vertical dependency of the turbulence intensity (stronger close to the surface). The set of 12 masts correlated very well with the windtower, showing that the spatial variation of the wind flow is small. This is an ongoing project (sponsor by CNPq/Brazil) that merges observational data, numerical simulations (using LES and/or CFD) and wind tunnel essays in order to analyzed the spatial variation of the atmospheric flow at the Alcantara Launching Center, which is the major range space from Brazil.