

Using a Network of Boundary Layer Profilers to Characterize the Atmosphere at a Major Spaceport

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Study Summary

Spacelift operations at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS) are highly sensitive to local weather conditions. Due to the complex land-water interfaces and their strong influence on local mesoscale circulations, a network of 5 915-MHz profilers was installed over the KSC/CCAFS area to compliment other sensors already in place. This poster presents one case showing the utility of the 915-MHz profiler network in identifying characteristics of sea/land breezes and low-level jets.

10-11 May 2000 Sea- / Land-Breeze / Low-level Jet Event

This typical case study shows 3 phenomena that occurred in sequence over a 12-hour period: a sea breeze passage, low-level jet formation/dissipation, and land-breeze onset. Each has a distinct effect on operations at KSC/CCAFS. Sea breezes influence the high temperature, relative humidity, wind speeds and directions, and rain/thunderstorm formation. Land-breezes influence the minimum temperature and wind speeds and directions. All operations on KSC/CCAFS have specific thresholds for these variables that can not be exceeded. The relatively short-lived and strong low-level jets could have an adverse effect on toxic dispersion, launches or Space Shuttle landings. As can be seen in the images below, the 915-MHz profilers provide a means for observing the formation, strength, and dissipation of these phenomena.

Key and Conventions:

In the time-height cross-sections:

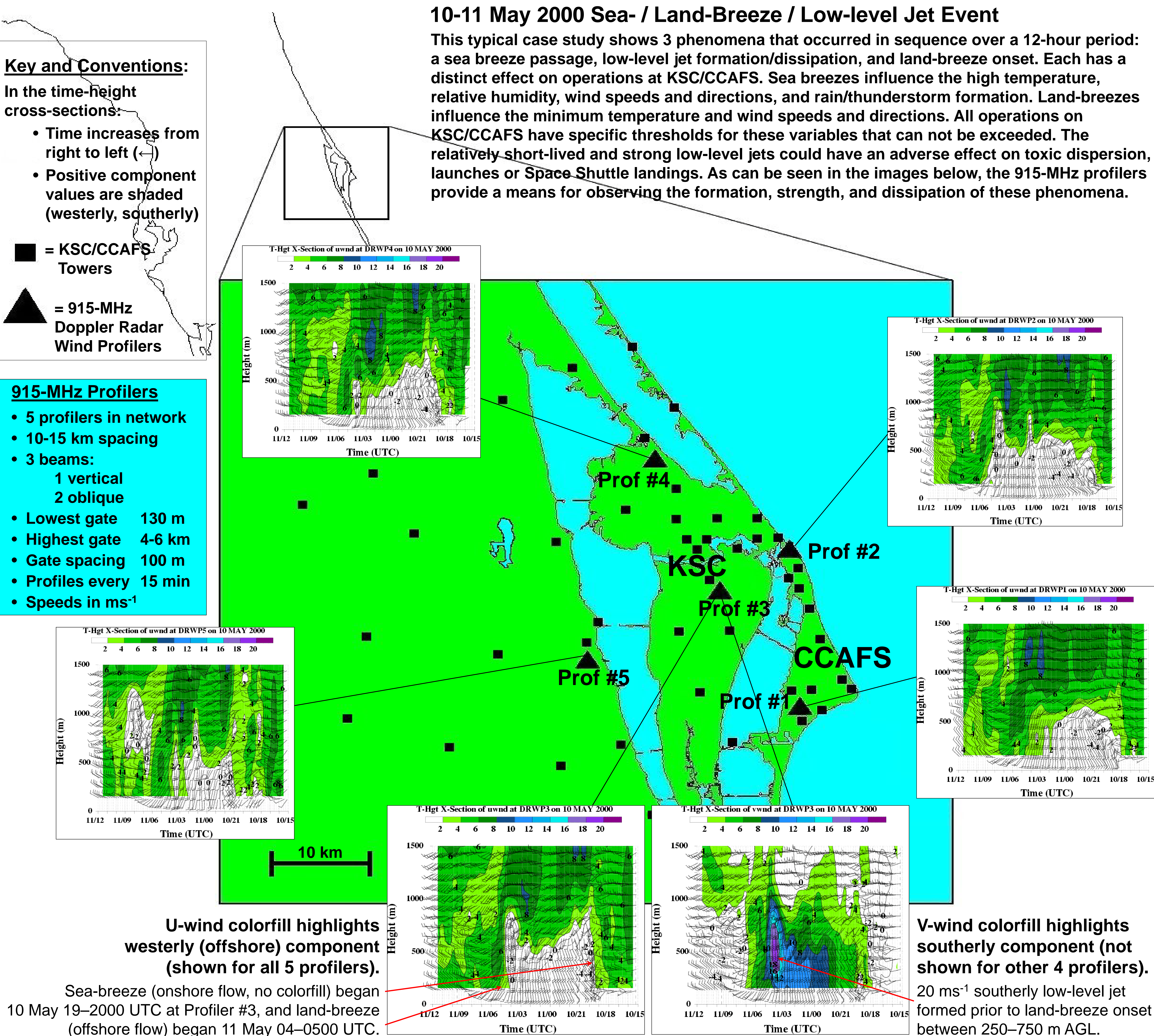
- Time increases from right to left (←)
- Positive component values are shaded (westerly, southerly)

■ = KSC/CCAFS Towers

▲ = 915-MHz Doppler Radar Wind Profilers

915-MHz Profilers

- 5 profilers in network
- 10-15 km spacing
- 3 beams:
 - 1 vertical
 - 2 oblique
- Lowest gate 130 m
- Highest gate 4-6 km
- Gate spacing 100 m
- Profiles every 15 min
- Speeds in ms^{-1}



U-wind colorfill highlights westerly (offshore) component (shown for all 5 profilers).

Sea-breeze (onshore flow, no colorfill) began 10 May 19–2000 UTC at Profiler #3, and land-breeze (offshore flow) began 11 May 04–0500 UTC.

V-wind colorfill highlights southerly component (not shown for other 4 profilers).

20 ms^{-1} southerly low-level jet formed prior to land-breeze onset between 250–750 m AGL.