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MMM SEMINAR *NCAR*

High Resolution Simulations of Marine Atmospheric Boundary Layers Forced by Winds, Heating and Surface Waves

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Winds, convection, and surface waves combine in complex ways to drive momentum and scalar transport in the marine atmospheric boundary layer. In this work we examine marine boundary layers forced by varying winds, weak amounts of surface heating and large surface waves. A newly developed large-eddy simulation model with the ability to resolve a spectrum of surface waves at its lower boundary is used to investigate this boundary-layer regime. The high resolution simulations, utilizing 1024x1024x512 gridpoints, illustrate intriguing coupling across scales as wave impacted surface layer turbulence transitions into larger-scale shear-convective rolls with increasing distance from the surface. Also, we find that in the regime with swell, low-winds and small amounts of surface heating, wave-induced vertical velocity and pressure signals are readily observed well above the standard reference height, z = 10m. However, as the winds increase these wave-induced signals become increasingly buried in high levels of turbulence and the wave-induced motions are detectable mainly in the lower levels of the surface layer. At the boundary-layer top, the simulations reveal large engulfment events and highlight the dramatic changes in boundary-layer entrainment as the large-scale winds increase from 5 to 25 m/s under weak surface heating.

This work utilized computational resources provided by the Computational Information Systems Laboratory (CISL) through NCAR's strategic capability program.

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This seminar will be recorded and available via webcast at:
http://www.fin.ucar.edu/it/mms/fl-live.htm

Thursday, 15 May 2014, 3:30 PM
Refreshments 3:15 PM
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