MMM SEMINAR SERIES

Impacts of a Heterogeneous Ocean Surface on Atmospheric Marine Boundary Layers

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The ocean surface is populated by an abundance of long-lived structures over a wide range of scales. Of particular interest is the so-called submesoscale regime where the structures have horizontal length scales varying between 0.1 < L < 10 km. Submesoscale filaments, fronts, and vortices are found in imagery and fine resolution numerical solutions of the upper ocean. Taken together the structures form a horizontally heterogeneous “submesoscale soup". The possible impact of sharp horizontal gradients in buoyancy and currents at the ocean surface on the overlying atmospheric boundary layer (ABL) is largely unknown. To explore possible couplings, a database of large-eddy simulations of canonical ABLs with idealized SST gradients and circular oceanic eddy currents was generated. The simulations use meshes with nearly 10^{10} gridpoints which capture fine-scale ABL turbulence dynamics as well as motions at tens of kilometers. The work emphasizes the importance of ABL secondary circulations (SC) generated by the surface heterogeneity. The amplitude and scale of the SC vary with the orientation of the surface winds relative to SST isotherms, and in simulations with eddy currents the SC also surprisingly vary with atmospheric stability especially in cases of strong convection. Eddy currents generate a dipole pattern in the ABL surface momentum and temperature fluxes which can then impact the ABL motions depending on the combination of wind speed, convection, and eddy strength and radius.

Thursday, 20 October 2022, 2:00pm

Refreshments 1:45pm

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1022, Large Auditorium

Seminar will also be live webcast
https://operations.ucar.edu/live-mmm
Participants may ask questions during the seminar via Slido.