Importance of Boundary Layer Processes for Surface Fluxes

Previous work has shown the importance of turbulent mixing within the planetary boundary layer (PBL) and entrainment at the top of this layer. In addition to the impact of surface flux dilution by a deeper mixing layer, the modification to the vegetative environment at the land surface by PBL processes greatly impacts the vegetative response. Plants adapt to warmer, drier conditions by adjusting fluxes of carbon and water vapor in order to minimize transpiration while maximizing carbon assimilation, shifting the Bowen ratio. However, a lot of work remains to be done in order to better simulate PBL processes and depth. Relatively few observations exist of PBL depth and even fewer exist of the processes at the PBL top.

PBL depth can be estimated using the backscatter from the LIDAR onboard the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite. Using an automated method, millions of estimates can be derived to which model results can be compared. This method evaluates the maximum vertical variance of the backscatter in order to identify backscatter features correlated with the PBL and helps to identify the vertical extent of turbulent mixing. This analysis sheds some light on the spatial heterogeneity of boundary layer processes. The derived depths are shallower over water than over land and show a local minimum along the Mississippi River valley. Deeper features are found over the desert Southwest and deeper than expected values are retrieved over the Boreal forests.

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10:00 a.m.
Room AOSS 351