Geophysical Research Abstracts
Vol. 12, EGU2010-14271, 2010
EGU General Assembly 2010

Observations of vegetation induced breezes and their impact on convection

Luis Garcia-Carreras (1), Douglas J. Parker (1), Christopher M. Taylor (2), Claire Reeves (3), and Jennifer Murphy (4)

(1) Institute for Climate and Atmospheric Science, University of Leeds, U.K. (eelgc@leeds.ac.uk), (2) Centre for Ecology and Hydrology, Wallingford, U.K., (3) School of Environmental Science, UEA, Norwich, U.K., (4) Department of Chemistry, University of Toronto, Canada

Aircraft observations over Benin during the early afternoon of 17 August 2006 are used to look at the impact of heterogeneities in vegetation cover, primarily between crop and forest/shrub, on the thermodynamic and dynamical properties of the planetary boundary layer (PBL). Isoprene, a biogenic organic compound emitted primarily by woody vegetation species, was measured and is used to link the vegetation patterns to the PBL properties.

The aircraft observations show the presence of a persistent mesoscale organization of the winds persisting over two hours, controlling the pattern of cumulus congestus cloud in the area. The mesoscale flows are closely linked to temperature anomalies that mirror the vegetation patterns at the surface. These results are consistent with the presence of higher Bowen ratios over forested areas, associated with higher evapotranspiration and isoprene emissions, producing negative PBL temperature anomalies over the forested area compared to adjacent cropland. The temperature gradients that thus arise at vegetation boundaries are then sufficient to initiate vegetation breezes. The relationships between PBL temperatures and isoprene, linking the land-surface to the PBL, and PBL temperatures and winds are very significant for length-scales above 10 and 8km respectively.

The convergence zones, and therefore clouds, associated with the land-induced mesoscale flows tend to occur on the southern edge of the warm temperature anomalies. This is attributed to the presence of a northerly synoptic flow, which strengthens the southerly parts of the mesoscale flow, as well as displacing the convergence zones southward.

A visible satellite climatology for the whole season shows an enhancement of cloud over the cropland during the early afternoon, consistent with the presence of land-induced flows. These results suggest that the presence of these flows have a climatological impact on the initiation of convection in the region.