PLEASE POST

MMM SEMINAR *NCAR*

A Simple Analytical Model of the U.S. Great Plains LLJ and Diurnal Wind Oscillations over Eastern China

Yu Du

Peking University, Beijing, China
National Center for Atmospheric Research, Boulder, Colorado

A simple analytical model including both diurnal thermal forcing over sloping terrain (the 'Holton' mechanism) and diurnally varying boundary-layer friction (the 'Blackadar' mechanism) is developed to account for the observed amplitude and phase of the LLJ over the Great Plains of the U.S. and to understand better the role of each mechanism. The present model indicates that for the pure Holton mechanism (time-independent friction coefficient) the maximum southerly wind speed $v_{\max}$ occurs between sunset and midnight which is earlier than the observed after-midnight maximum. For the pure Blackadar mechanism (time-independent thermal forcing), the present model shows that $v_{\max}$ generally occurs later (closer to sunrise) than observed and has a strong latitudinal dependence. For both mechanisms combined, the present model indicates that $v_{\max}$ occurs near the observed time which lies between the time obtained in the pure Holton mechanism and the time obtained in the pure Blackadar mechanism; furthermore $v_{\max}$ (and closer to that observed) than in each one considered individually. The amplitude and phase of the LLJ as a function of latitude can be obtained by the combined model by allowing for the observed latitude-dependent mean and diurnally varying thermal forcing.

The simple 1-D model is also used to explain important features of the WRF-simulated diurnal boundary-layer winds for different locations of eastern China. For example, in northeastern China, at a similar latitude, the maximum velocity parallel to the coastline at a longitude over the ocean occurs earlier than the maximum velocity parallel to the inland chain of coastline-parallel mountains at a longitude over land. This difference can be identified with the well-known Blackadar effect over the land. Off the east coast of China, the diurnal winds for different latitudes over the ocean vary in both phase and amplitude, consistent with expectations based on the simple 1-D model.

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

Thursday, 9 October 2014, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg 2 Main Auditorium, Room 1022

MMM SEMINAR COORDINATORS:
Rich Rotunno, 303.497.8904, rotunno@ucar.edu
Chris Snyder, 303.497.8966, chriss@ucar.edu
http://www.mmm.
ucar.edu/sem/seminars.html