MMM SEMINAR SERIES

On the anomalous counterclockwise turning of the surface wind in the Plains of the U. S. during the warm season and "6 O'Clock Magic"

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Under synoptically quiescent conditions the low-level shear changes in the Plains of the U. S. during the warm season, as the surface wind undergoes a diurnal oscillation. This oscillation typically elongates the hodograph during the early evening hours, enhancing the threat of severe convective storms. The oscillation is a response to the Coriolis force (which rotates the wind in a clockwise direction), upslope and downslope pressure-gradient forces in response to the diurnal heating and cooling cycle near the ground, and to diurnal changes in vertical mixing in the boundary layer.

From analyses of long-term averaged winds from the Oklahoma and West Texas mesonets during the first half of the warm season we found that, unlike the clockwise turning with time common above the ground seen in many numerical studies and analytical models, the wind at anemometer level actually turns in a *counterclockwise* direction, "counter" to conventional wisdom.

Using ensemble forecasts from WRF during part of the warm season in 2016, we found evidence that the dynamics during the early evening boundary layer transition are responsible for the anomalous turning: As vertical mixing diminishes, the drag on the wind at anemometer level persists, leading to a rapid deceleration of the meridional component of the wind. The deceleration acts to turn the wind to the left rather than the right, as would be expected from the Coriolis force alone. Our findings were bolstered by extending a recent analytical model for the diurnal wind oscillation to a numerical model that includes the surface-layer effect through a semi-slip rather than through a no-slip lower boundary condition.

Thursday, 21 February 2019, 3:30 p.m.

Refreshments 3:15 PM!

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

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