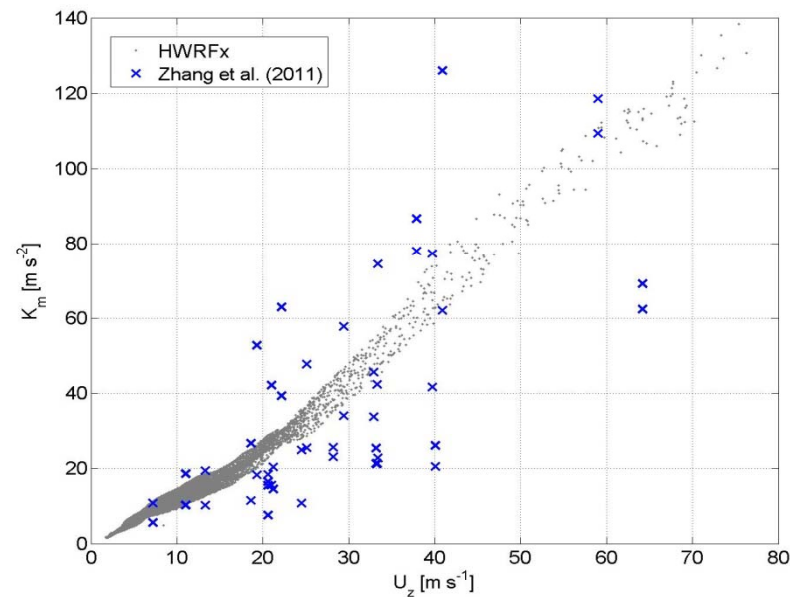
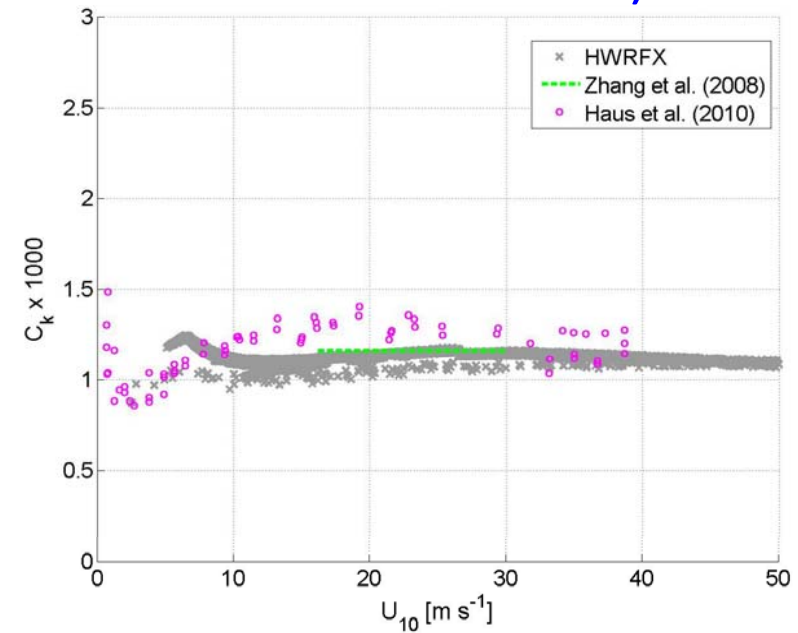
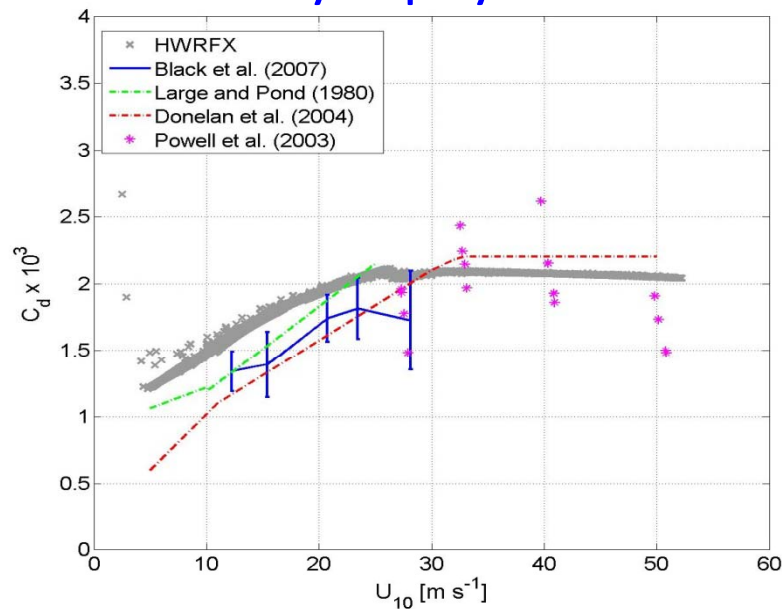
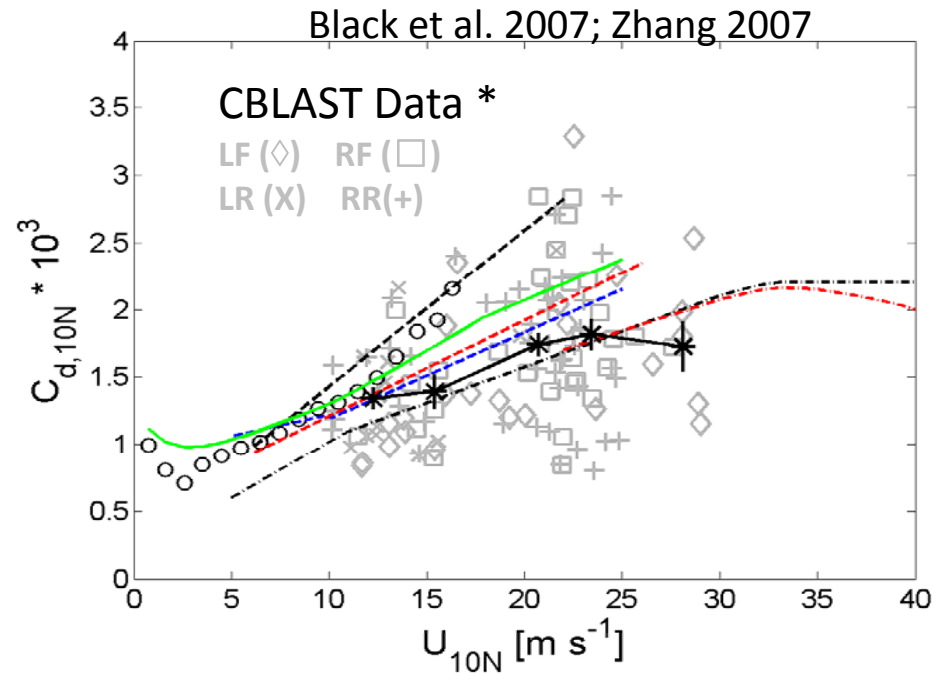


Observation based modification in the surface layer and boundary layer physics of HWRF (EMC-HRD Stream 1.5 version)



Jun Zhang
HRD modeling meeting
07/21/2011

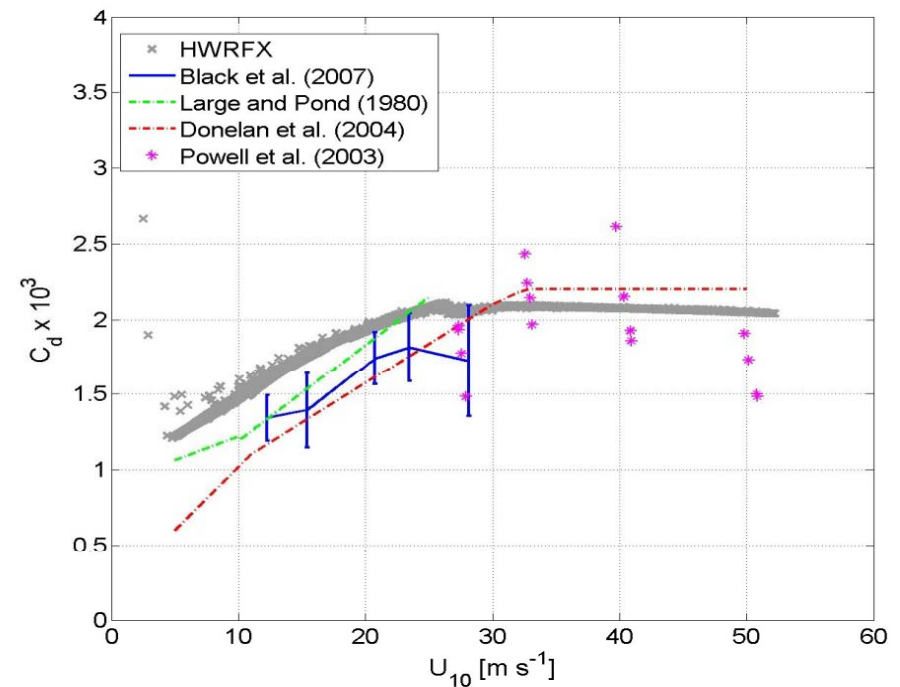


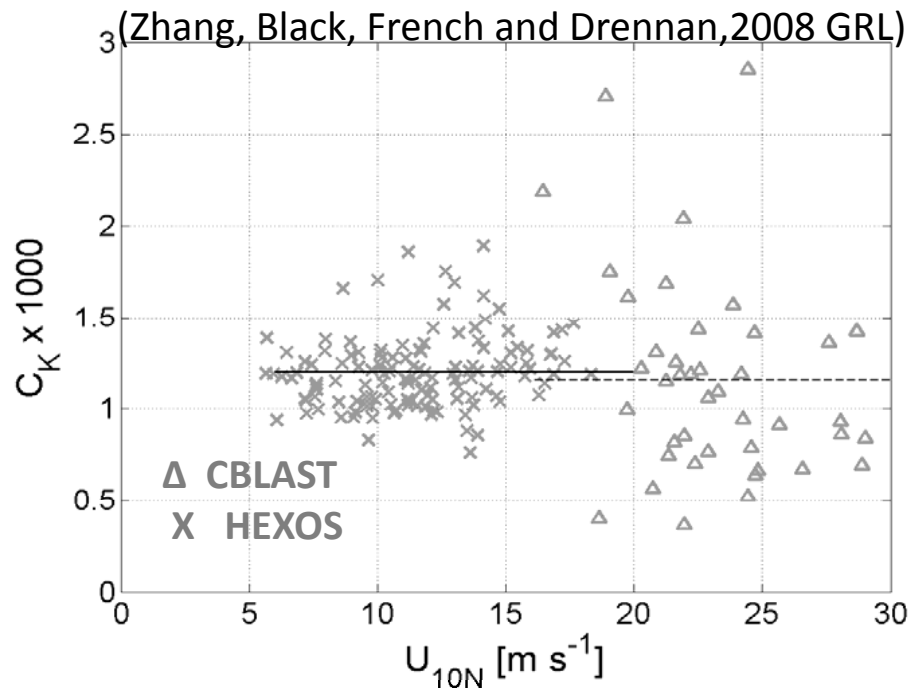
Smith (1992) -----
 Large and Pond (1980) -----
 Smith (1980) -----
 COARE 3.0 —
 CBLAST LOW (o) Edson et al. 2007
 Powell et al. (2003) -----
 Donelan et al. (2004) -----

Drag coefficients

$$\hat{\tau} = \rho u_*^2 = \rho(-\overline{w'u'\hat{i}} - \overline{w'v'\hat{j}})$$

$$C_{D10N} = |\tau| / (\rho U_{10N}^2)$$

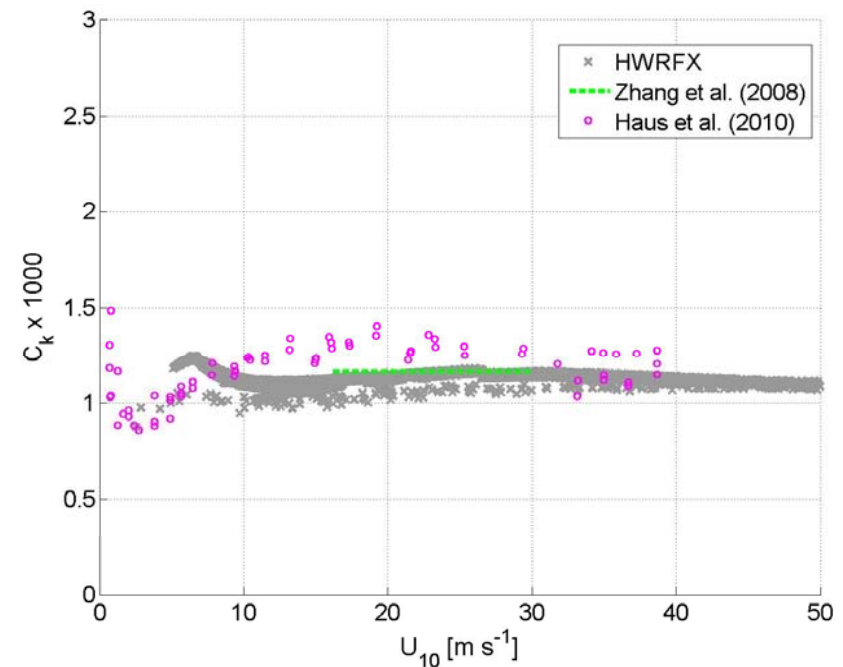
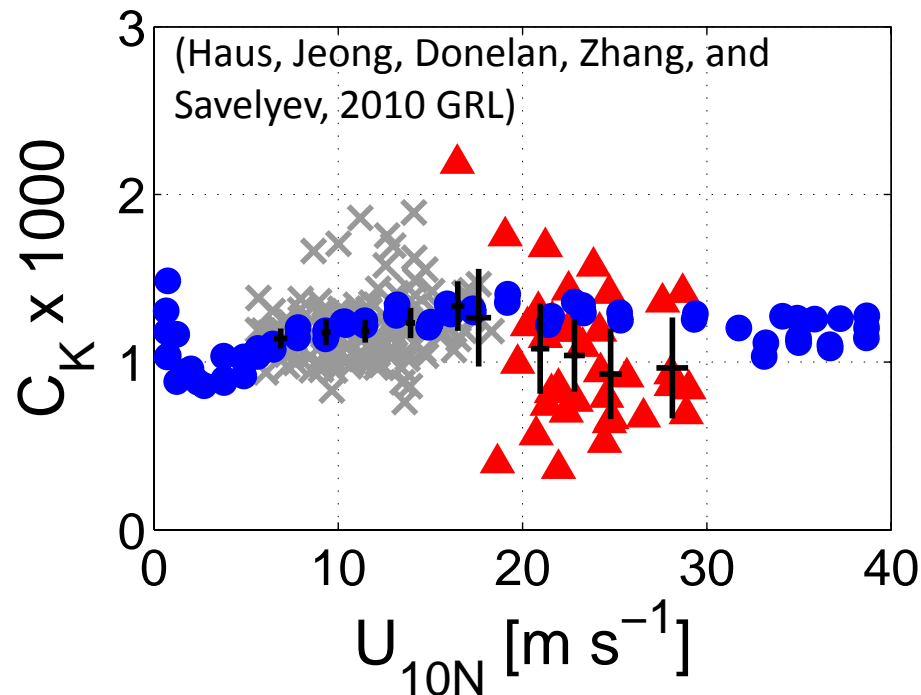


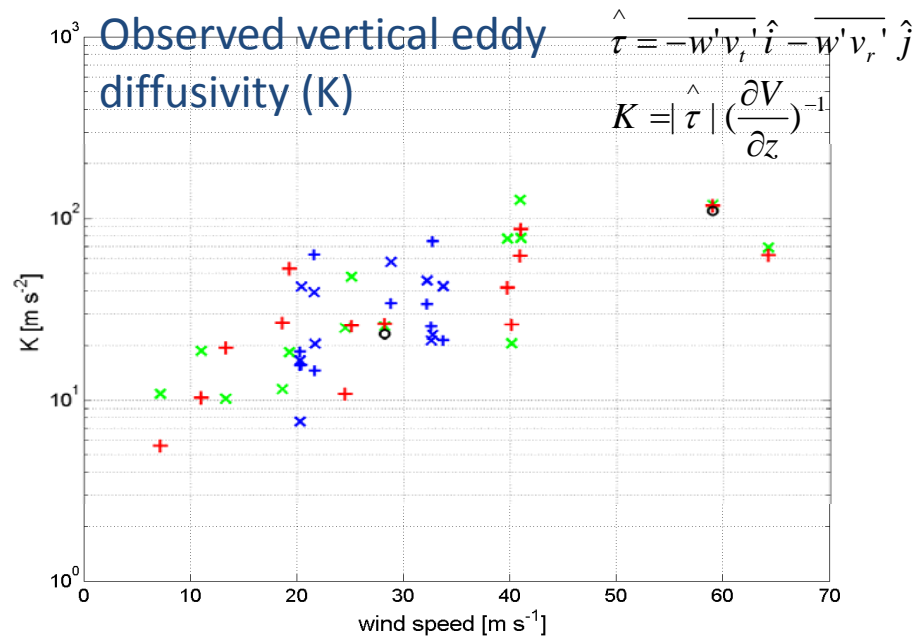


Exchange coefficients for enthalpy transfer

$$F_K = \rho \overline{k' w'}$$

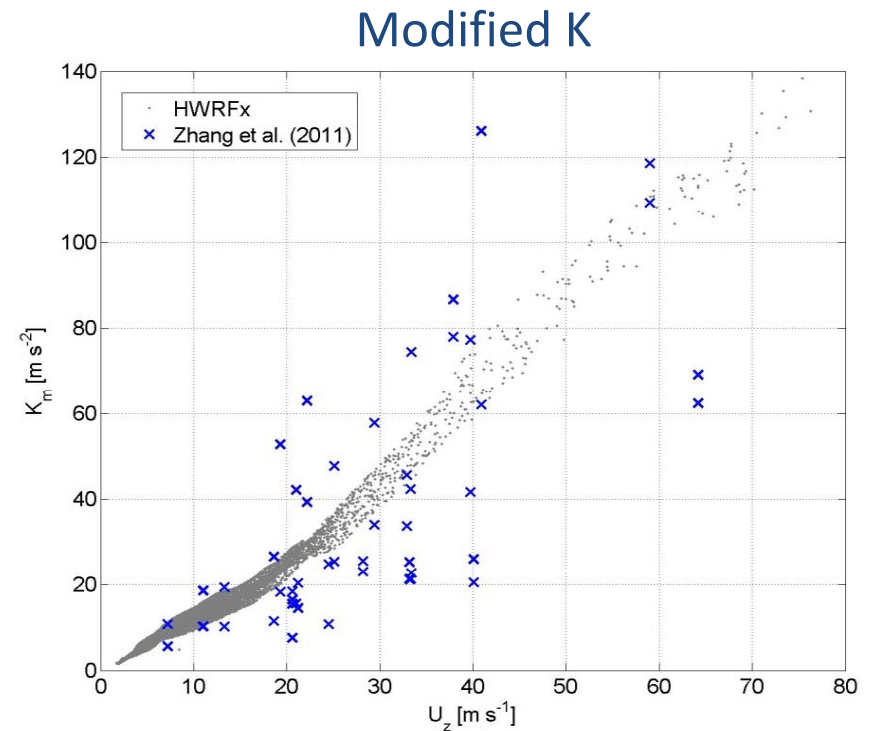
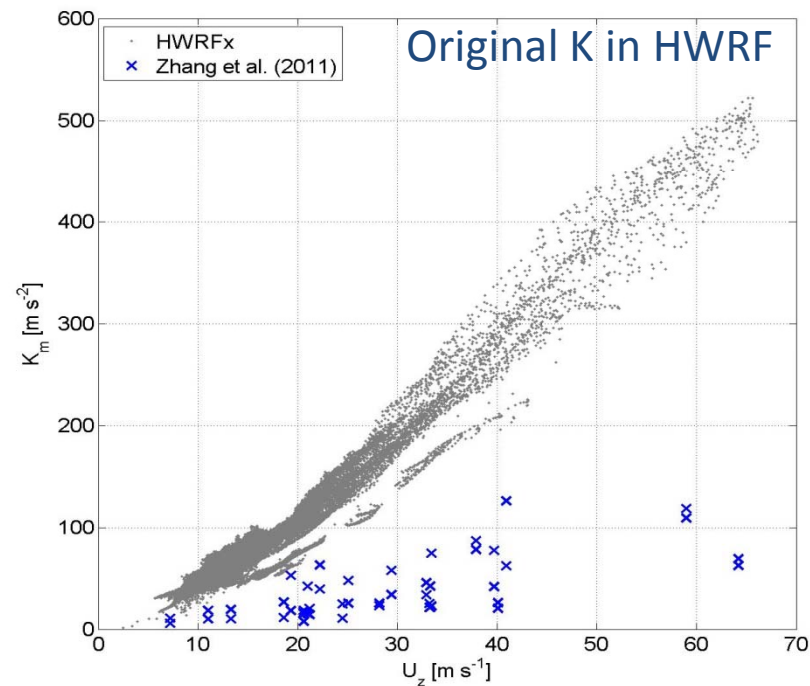
$$C_K = F_K / [\rho U_{10N} (k_0 - k_{10N})]$$





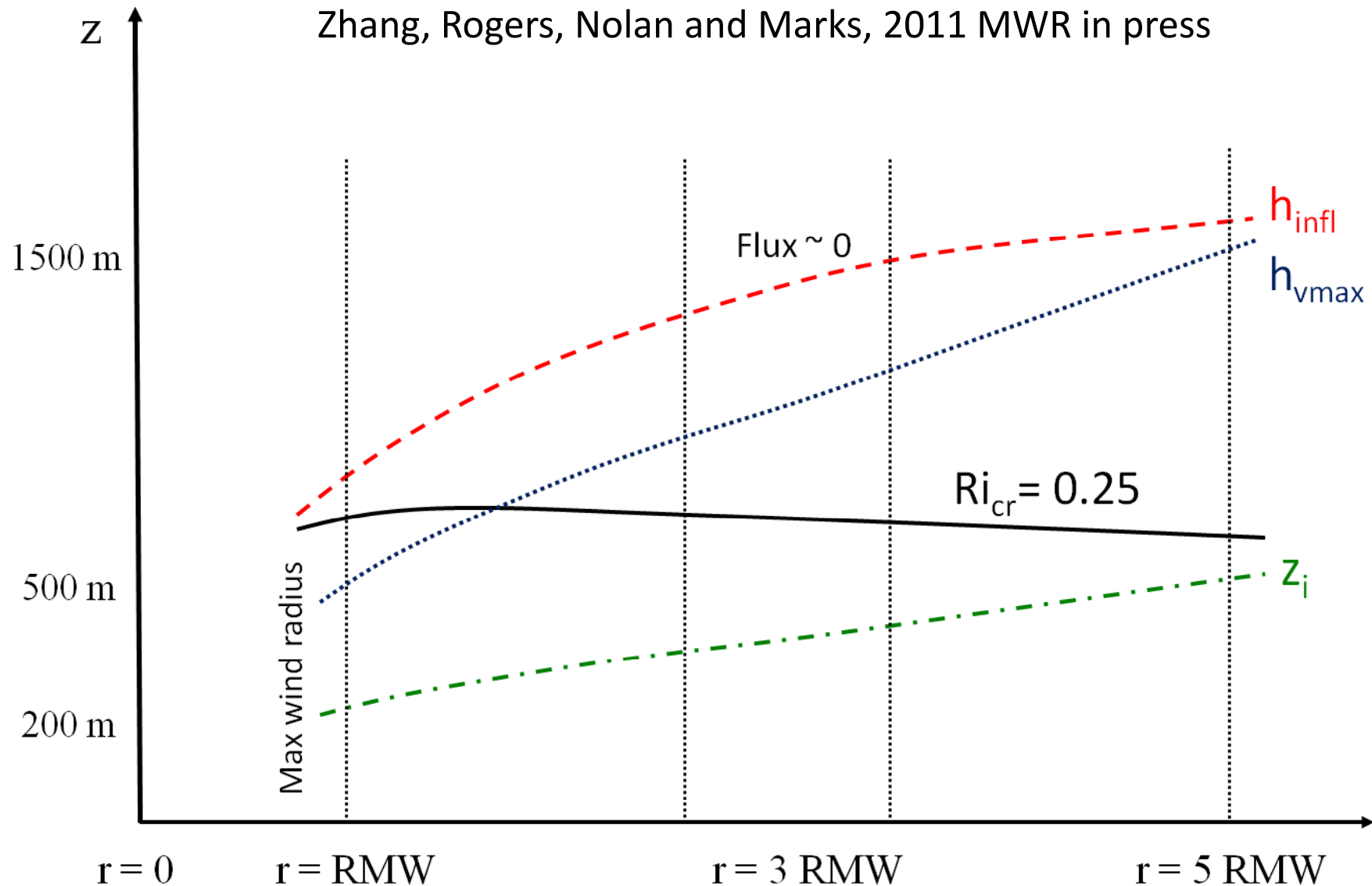
An Estimation of turbulent characteristics in the low level region of intense Hurricane Allen (1980) and Hugo (1989)

Zhang, J. A., F. D. Marks, M. T. Montgomery, and S. Lorsolo, 2011 MWR



A schematic diagram of the characteristic height scales of the hurricane boundary layer

Zhang, Rogers, Nolan and Marks, 2011 MWR in press



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Zhang, J. A., R. F. Rogers, D. S. Nolan, and F. D. Marks, 2011b: On the characteristic height scales of the hurricane boundary layer. *Mon. Wea. Rev.*, in press.