

**METR 4433 – Mesoscale Meteorology
Spring 2001**

**Problem Set #1
Scales and PBL**

Distributed Friday February 9, 2001
Due 5pm, Wednesday February 21, 2001

1. Using the three momentum equations, perform a scale analysis for a supercell thunderstorm and describe the main characteristics of motion at this scale.
2. Given the following instantaneous measurement of potential temperature (θ) and vertical velocity (w) in this table, fill in all the remaining blanks in the table. Also verify with the answers from the above that $\overline{w\theta} = \overline{w}\overline{\theta} + \overline{w'\theta'}$.

Measurement			Calculations					
Index	w	θ	w'	θ'	$(w')^2$	$(\theta')^2$	w θ	w' θ'
1	0.5	295						
2	-0.5	293						
3	1.0	295						
4	0.8	298						
5	0.9	292						
6	-0.2	294						
7	-0.4	292						
8	0.1	289						
9	-0.9	293						
10	-0.1	299						
Average								

Based on the turbulent flux your obtain, is the data characteristic of a stable, neutral or unstable boundary layer? (Hint, think of the net heat transport in an unstable boundary layer – should the net transport be upward or downward?).

3. Problem 5.5 on page 139 of Holton.
4. Problem 5.10 on page 140 of Holton.