GEF2200 Atmosfærefysikk 2014

Oppgavesett 11: Oppgaver til 26/5-2014
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WH06 9.10
Se oppgavetekst i læreboka.

RS 2.5
Let c be a constant and $A = \overline{A} + A'$, $B = \overline{B} + B'$ and $E = \overline{E} + E'$. Expand the following terms into mean and turbulent parts, and apply Reynold's averaging rules to simplify your expressions as much as possible

    a. $\overline{cAB} =$?

    b. $\overline{ABE} =$?

RS 2.3
Given the data in problem RS 2.2, find the biased deviation for w and θ, and find the linear correlation coefficient between w and θ.

RS 2.4
Using your results from RS 2.2 and RS 2.3, is the data characteristic of a stable, neutral or unstable boundary layer?

RS 2.9
Given the typical variation of wind speed with height within the surface layer, and using a development similar to that in section 2.7 (Eddy flux):

- Determine whether the net kinematic momentum flux $\overline{u'w'}$ is positive, negative or zero within the surface layer.

- Does your answer mean the momentum is being transported up or down, on the average?

- This momentum that is transported up or down, where does it go or where does it come from? How would that alter the mean state of the atmosphere?

index	w	θ	w'	θ'	w'^2	θ'^2	$w\theta$	$w'\theta'$
0	0.5	295	0.4	1	0.16	1	147.5	0.4
1	-0.5	293	-0.6	-1	0.36	1	-146.5	0.6
2	1.0	295	0.9	1	0.81	1	295.0	0.9
3	0.8	298	0.7	4	0.49	16	238.4	2.8
4	0.9	292	0.8	-2	0.64	4	262.8	-1.6
5	-0.2	294	-0.3	0	0.09	0	-58.8	0.0
6	-0.5	292	-0.6	-2	0.36	4	-146.0	1.2
7	0.0	289	-0.1	-5	0.01	25	0.0	0.5
8	-0.9	293	-1.0	-1	1.00	1	-263.7	1.0
9	-0.1	299	-0.2	5	0.04	25	-29.9	-1.0
mean	0.1	294.0	0.0	0.0	0.396	7.8	29.88	0.48

Table 1: Instantaneous measurements of potential temperature and vertical velocity.

RS 2.2

Given the instantaneous measurements of potential temperature (θ) and vertical velocity (w) in Table 1, fill in all the remaining blanks in the table. Also verify the equality

$$\overline{w\theta} = \overline{w}\,\overline{\theta} + \overline{w'\theta'} \tag{1}$$