Lab No( )

Vertical Kinematic Eddy Heat Flux

Tools:

1- Wind speed device (fast response Anemometer).

2- Information output(electronic calculator+ printer).

3- stopwatch.

4- automatic weather station.

Theoretical part :

Flux is defined as the transfer of a quantum amount per unit area during a specific time.

In the boundary layer, the flux is often associated with mass, temperature, humidity, moments, and pollution, Therefore, the Heat Flux ($\tilde{Q}H$) is the transfer of a certain amount of heat per unit area during a specific time (one joule) per square meter per second and its unit is (J/(m^2.s)).

And due to the difficulty of measuring quantitative quantities in the atmosphere while being able to measure the different atmospheric elements (humidity, temperature, pressure ....) the flux formulas should be converted into abstract kinematic form to become (heat flux movement) (QH) and it is given by the equation:

$$QH = \frac{\tilde{Q}H}{\rho_{air} Cp_{air}} \dots \dots \dots (1)$$

ρ: air density,Cp , Heat capacity at constant pressure of air.

The movement of fluids leads to the transfer of quantitative quantities across a specific area and during time .

The movement in fluids (flow) consists of two main parts: rate and turbulence. It has been proven that turbulence transfers quantitative amounts as well. For example, it transfers amounts of heat to and from the surface of the earth in the boundary layer, especially in the surface layer.

The vertical movement of the eddy heat flux responsible for heat transfer can be calculated as follows:

$$H = \overline{\grave{w}\grave{\theta}} \dots\dots\dots (2)$$

The direction of the transfer of heat quantities can be known through the output signal. If it is $+\overline{\grave{w}\grave{\theta}}$, the eddy turbulence leads to the transfer of the amount of heat to the top, but if it is _ $\overline{\grave{w}\grave{\theta}}$ the eddy turbulence leads to the transfer of the amount of heat to the bottom.

methodology

1- Recording the value of atmospheric pressure (p) by monitoring the automatic station installed above the building of the Department of Atmospheric Sciences.

2- recording (10 observation) every second from a fast response Anemometer device (ultrasonic) .

3- Complete the requirements for the following table:

Time	w_i	$\grave{w} = w_i - \overline{w}$	$\theta_i = T\left(\frac{1000}{P}\right)^{0.286}$	$\grave{\theta} = \theta_i - \overline{\theta}$	$\grave{w}\grave{\theta}$
1					
10					
	Σw_i=		$\Sigma\theta_i$=		$\Sigma\grave{w}\grave{\theta} =$
	$\overline{w_i}$=		$\overline{\theta_i}$=		$\overline{\grave{w}\grave{\theta}} = H$

Where the value of the heat flux H is extracted from the end of the table.

4- Repeat the process every hour.

5- Determine the direction of movement of the amount of heat in the surface layer.