The Seventh experiment

Estimate the mixing height of pollutants day and night

The Objective of the experiment:

Determine and calculate the pollutant mixing height (the specific layer height) during the whole day cycle using radiosound recordings during the dark night**.**

The Theoretical Part:

Mixing height (Hm) is defined as the height of the adjacent layer in contact with the ground surface During which pollutants or any components, whether emitted or drawn into them, are mixed Accordingly, the pollutants are dispersed vertically by convective or mechanical disturbance during a time gradient of about one hour [4] The height of the boundary layer (h) is between 500 m and 3000 m, and it is divided into a surface layer (10% of the height of the boundary layer and is close to the surface of the earth) and an equal convective layer called the mixed layer. At the top of the mixed layer we find the inversion layer, after this Layer The weather becomes hot as shown in Figure (3-11).

And because the surface of the earth changes its temperature faster than the air, so it suddenly affects the air above it, so its temperature in the surface layer will have different slopes than the dry adiabatic gradient rate, so the vertical temperature slopes will be different during the day and night, which will affect the stability of the layer . Where the surface layer and the large part of the mixed layer at night becomes stable when the temperature increases with altitude due to the radiative cooling of the earth.

At the top of the bounded layer, the temperature gradient is usually positive (meaning stable) and the turbulence is inert, and this is an inversion layer that is difficult to penetrate through, so it is considered as a ceiling for pollution. Therefore, most of the pollution emitted at ground level will spread approximately upwards up to 3 km from the atmosphere with Additional scattering into the free troposphere being a slow process.

The mixing height is shown in Figure 3-11. Curve A showing the steady state at dark and atmospheric during the night with no mixing. When the earth is heated due to solar radiation, the vertical section becomes like a B curve so that the mixing height is as small as 100 m, during this height turbulence and mixing occur. As time progresses, the mixing height increases as a result of the formation of the unstable layer near the ground, which becomes thicker. At midday or in the afternoon, the mixing height reaches the inversion layer of the atmospheric boundary layer as shown in Figure (3-11), then it starts decreasing when the sun goes down and returns as small as possible when it gets dark. Early and the rest of the times of the day, noting the increase in the height of confusion with time.

TheMaterials and Tools used

1. The T-Ø chart is blank.
2. Temperature data for different altitudes taken from radiosond records for the time 0000 GMT for Baghdad International Airport station, shown in Table(3-4).
3. Surface temperature data for four main monitoring times for the same station above and the date Figure (2-6).
4. rulers.

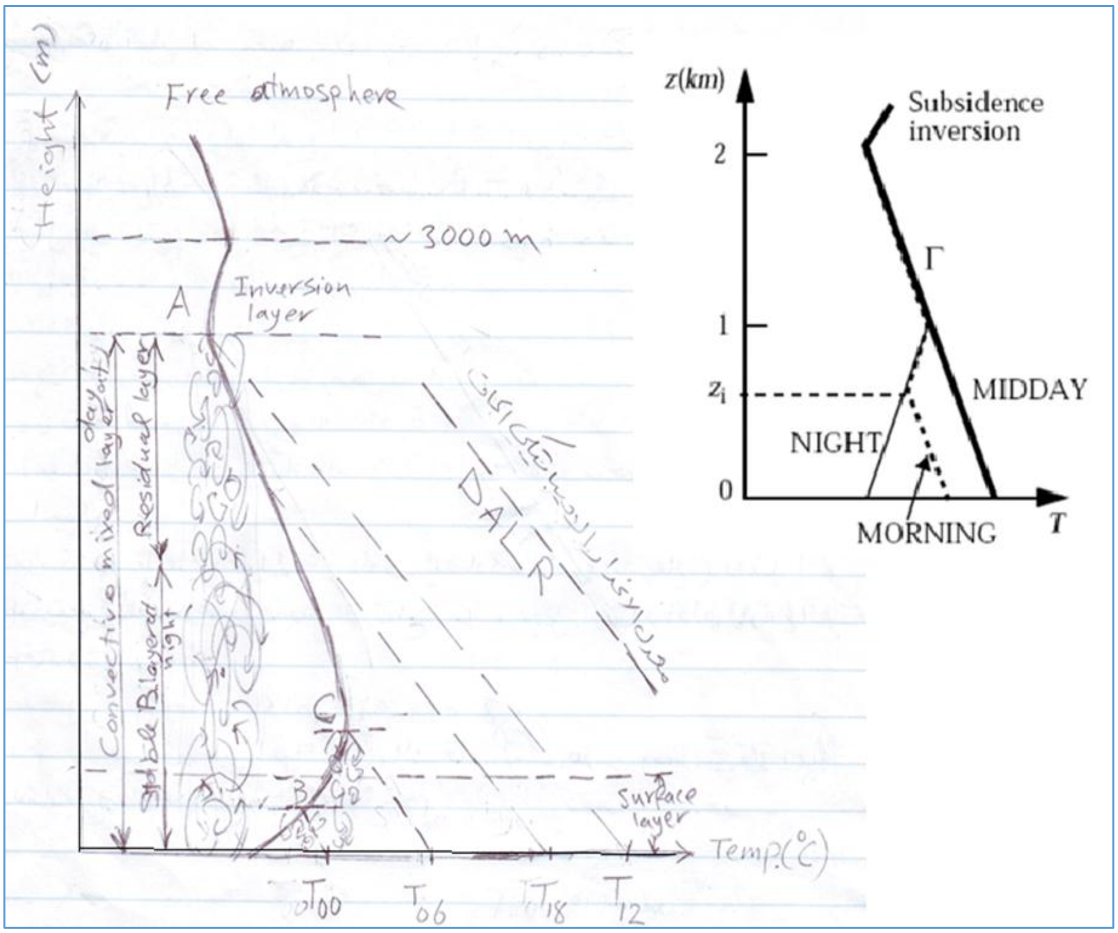


Figure (3-11): shows the variation in temperature with altitude during the day and at night, while determining the mixing height

.Table 3−4: Air temperature data with heights

2.2	2.0	1.8	1.5	1.2	1	0.8	0.6	0.4	0.2	0.01	Z (km)
−3	−1	0.4	1.2	1.8	2.1	2.4	3.1	4.3	3.5	3.0	T (°C)

The Method of Work

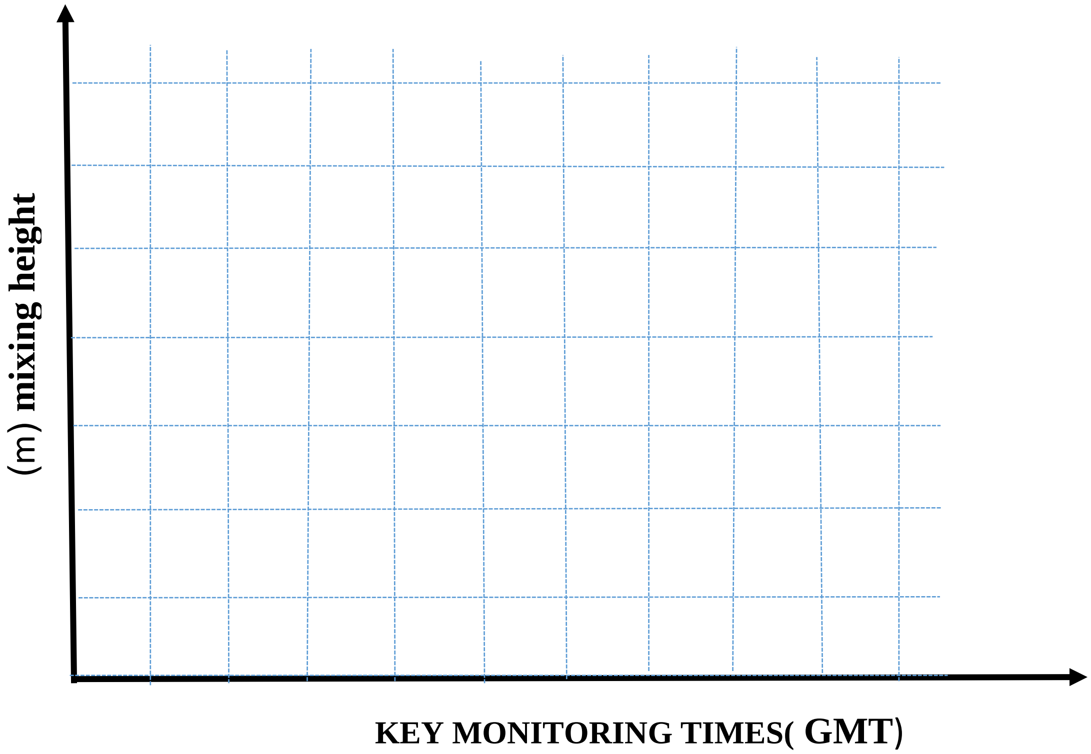
1. Fix the values of the radiosound, i.e. the temperature values according to the corresponding heights on the T-Ø curve, indicated by dark dots for all points.
2. Connect the values with lines connected and so you get the environmental temperature curve.
3. On the x axis, which is the temperature axis, and from zero altitude, the temperature values are fixed according to the times.
4. From the value of each surface temperature, go up with the dry adiabatic line (average of the dry adiabatic gradient) until it cuts the environmental temperature curve.
5. From the point of intersection, move towards the y-axis (the height axis) horizontally until it cuts the axis and determine the value of the height that represents the height of the mixture (the height of the selected layer), Hm.
6. Record the mixing height values in the table below.

00	18	12	00	(GMT)
5	18	25	6	T (°C)
				H_m (m)

7. Draw the graphic relationship between the time times on the x-axis and the values of Hm on the y-axis, then draw the best line.

Discussion

Q1/ Discuss the relationship of mixing height with observation times, especially after sunrise?



Q2/ Explain, through your results, the effect of temperature on the rise or fall of the mixing height values?

Q3/ Explain the relationship between temperature regressions with atmospheric stability and then with the values of mixing heights?

Q4/ What would you expect of your results if the data were taken from a station in the center of an urban city?

Q5/ Mention the most important chemical reactions that produce SO_2?

Good Luck

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