UNIVERSITY Of MUSTANSIRIYAH

COLLAGE OF SCIENCE

DEPARTMENT OF ATMOSPHERIC SCIENCE

FORECASTING -LAB

(THIRD GRADE)

LUCTURERS

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Experiment No.1

Part (2)

Experiment Name: Calculate pressure gradient and intensity of pressure system

The aim of the experiment:

Using surface map analysis in calculating pressure gradient and the intensity of by Finite-difference method.

Theory:

Pressure gradient is the change of pressure with distance, As shown in the figure:

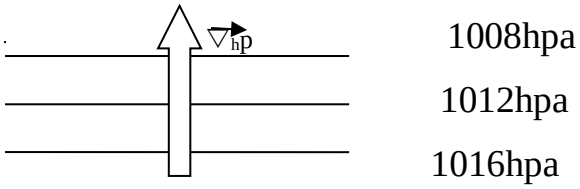

Figure1-pressure gradient and direction.

Symbolizes of pressure gradient by $\overrightarrow{\nabla P}$, we see decreasing with distance rapidly along arrow in the vertical direction on equal pressure lines.

There is a force from high to low pressure. on weather maps, this force is at right angles to the height contours or isobars, directly from high pressure to low.

The amount of horizontal gradient can be calculated by relationship:

$$\overrightarrow{\nabla_h P} = \frac{\partial p}{\partial x} i + \frac{\partial p}{\partial y} j \quad \ldots\ldots\ldots\ldots 1$$

Where:(i, j) the vector of the unit along axes X, Y respectively.

Either, the amount of vector is calculated in relation:

$$\overrightarrow{\nabla_h P} = \sqrt{\left(\frac{\partial P}{\partial X} I\right)^2} + \sqrt{\left(\frac{\partial p}{\partial y} j\right)^2} \quad \ldots\ldots\ldots\ldots\ldots 2$$

The compounds of the gradient pressure vector and resultant are shown as figure:

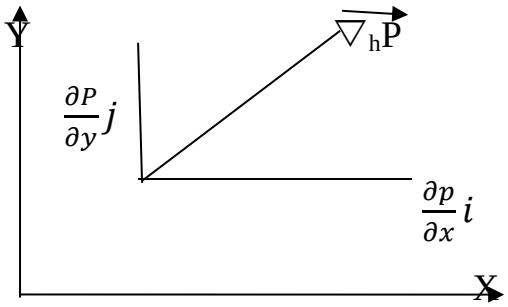

Fig 2: the compounds of the horizontal gradient pressure.

If the value of gradient is increasing the gradient called (upward gradient vector+ $\overrightarrow{\nabla_h p}$), if the value is decreasing the gradient called (downward gradient vector -$\overrightarrow{\nabla_h p}$).

Great point of gradient showing divergence and low point of gradient showing convergent. Partial derivative of atmospheric pressure is calculated by grid point explain by figure 2, which falls on the weather map to calculate gradient. The grid is characterized by constant dimension and usually taken from (250-1000)km. whenever the smaller grid dimension, the better accuracy of the component. This method is called (Finite-difference method)

$$\frac{\partial p}{\partial x} \simeq \frac{\triangle p}{\triangle x} = \frac{p1 - p3}{2\triangle x}$$

$$\frac{\partial p}{\partial y} \simeq \frac{\triangle p}{\triangle y} = \frac{p2 - p4}{2\triangle y}$$

Tools: grid point, surface pressure map.

Methodology:

Step1: calculate of pressure gradient to X- axis in each selected points on grid point and record your result in table.

Step2: repeat previous step for Y- axis for the selected points.

Step3: Full the table with calculating values of the horizontal pressure gradient for the selected points, and record on the grid point.

Step4: pass dash lines for equal values of gradient which, will be vertical on the equal lines of pressure so that the direction of the negative gradient towards the center of the low pressure and the direction of positive gradient toward the center of high pressure.

Step5: calculate the absolute value of horizontal pressure gradient values for selected points on the grid point using equation (2), and record your results in the table below.

No. of point	$\frac{\partial p}{\partial x}(\frac{hpa}{km})$	$\frac{\partial p}{\partial y}(\frac{hpa}{km}$	$\nabla_h p$(hpa/km)	$\angle\nabla_h p$(hpa/km)
0				
1				
2				
3				
4				
5				
6				
7				
8				

discussion

1- Determine the location of lower pressure gradient?
2- Determine the kind of pressure system at the region of maximum and minimum pressure gradient?