Procedure of cyclone detection

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Consider a domain of low pressure bounded by closed isobars and centered at a node of the regular grid. Then the depth of the cyclonic eddy is found as the absolute value of the drop of pressure between the center of the domain and the last closed isobar (we analyze isolines with steps of 1 hPa). In the case where the center of the eddy does not coincide with a node of the grid, the center is specified as the geometric center of the figure located inside the isobar nearest to the node and such that the pressure on this line differs from the pressure at the node by 1 hPa. The relative frequency is defined as the ratio of the number of centers of cyclonic formations detected in a given square per period of time to the total number of analyzed cases (i.e., to the number of days for each period of time). The area of a cyclonic eddy is defined as the area bounded by the last closed isobar.

The technique includes the following equations:

$$f_h = \int x \in S_i \, f(x) ds,$$

$$l_h = \int x \in S_i l(x) ds,$$

where f_h, l_h – coordinates of the cyclone centre, S_i – area of the figure limited by the first isobar contour (see Fig. 1).

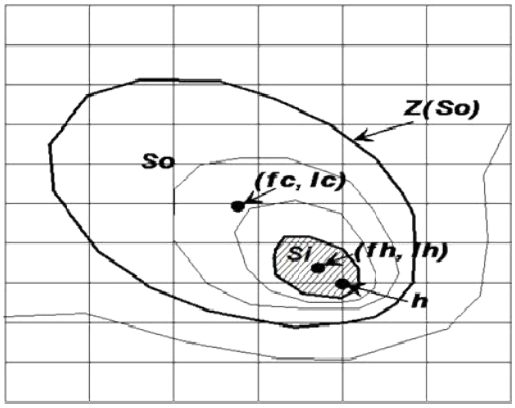

Figure 1. Isobar contour chart, f_h, l_h – coordinates of the cyclone centre (minimum depth point); f_c, l_c – coordinates of the geometrical cyclone centre

Depth (D) at the even greed square is

$$D = |h - Z(S_0)|,$$

where $Z(S_0)$ – the last exclusive contour, S_0 – area of the figure limited by the last isobar contour, h – the nearest to the minimum depth point grid junction. Area (A) limited by the last exclusive contour, volume (V) and intensity (I) are accordingly:

$$A = \int x \in S_0 ds.$$

$$V = \int x S_0 (Z(x) - Z(S_0)) ds,$$

$$I = \frac{V}{A}.$$