Introduction of Anticyclone Identification and Tracking Algorithm

Based on a cyclone identification and tracking algorithm modified by Zhang et al. (2004) following Serreze (1995) and Serreze et al. (1997), we examined 6-hourly sea level pressure (SLP) data and developed the following empirical criteria for the identification and tracking of anticyclones:

1. If the SLP at one grid point is greater than its eight surrounding grid points, an anticyclone candidate is identified with its center at this grid point.

2. The maximum SLP gradient between the center of the anticyclone candidate and its eight surrounding grid points is required to be at least -0.15 hPa (100 km)$^{-1}$, where the SLP values at the eight surrounding grid points are representative of spatially smoothed values of their nine surrounding grid points, respectively.

3. The maximum SLP gradient between the four surrounding points of the anticyclone candidate and their outside adjacent grid points must be positive inward.
(4) If anticyclone candidates appear within a radius of 1200 km at the same time, they are considered to be one anticyclone.

(5) The anticyclone track is defined as the trajectory of anticyclone centers. If an anticyclone’s location is within a radius of 1280 km of an anticyclone’s location at the previous 6-h time, this location is considered to be a new location of the existing anticyclone. Otherwise, a new anticyclone is generated. If a candidate’s lifetime is shorter than 12 h, it is removed from the anticyclone candidates.

The output of the algorithm was verified against randomly selected 6-hourly weather charts, showing that the algorithm realistically captures the anticyclones in weather observations. Climatology of the winter anticyclone center density is illustrated in Figure 2d, which demonstrates physically consistent spatial structure with the winter climatological sea level pressures over the Eurasian continent. The maximum anticyclone counts occur in the area of the Siberian high (Figure 2 a and d).