

THE MEAN CIRCULATION FIELD ANALYSIS OF THE TIBETAN PLATEAU VORTEX MOVING OUT OF THE PLATEAU

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Abstract: By using the NCEP reanalysis data, the moving out of the Tibetan Plateau vortices activity characteristics in each month in summer from year 1998 to 2004 is analyzed. The main active time of the Tibetan Plateau vortex moving out of the Plateau is during May to August. This is different with the Plateau vortex active time over the Plateau, which is most often in May and less in August. Also this is different with the southwest vortex which moving out number is double in July than August. The characteristics of more Plateau vortex moving out of the Plateau on 500hPa are: Bengal gulf trough is leaning to north or Subtropical High is extending west clearly, southwest air flow can influence the east area of the Tibetan Plateau; Southwest air flow and northwest can encounter or trough or shear line is active in east of Plateau and with cold air advection invasion. The characteristics of more Plateau vortex moving out of the Plateau on 500hPa are: The South Asia High clearly extends to east and be stronger; The west wind is stronger; The east area of Plateau is controlled northwest air flow before the South Asia High.

Keywords: *The Plateau vortex, moving out of the Plateau, mean circulation field.*

1. INTRODUCTION

The Tibetan Plateau is located in South Asia, covering more than one quarter of China, with an average altitude above 4 kilometres. It is the highest plateau, with the most complex topography, in the world, and it influences the atmospheric circulation over China, Asia and even the Northern Hemisphere, and hence affects the formation and evolution of the weather and climate in these areas (Flohn, 1968; Hahn and Manabe, 1975; Yeh and Gao, 1979; Zhang et al., 1988; Zhang et al, 2001). The Tibetan Plateau vortex is a important weather system which leads to the storm rain and severe rain and other meteorological disasters in wide areas of China in summer and many meteorologists have a lot of interesting. Yeh and Gao pointed out that the Tibetan Plateau shallow weather systems in boundary layer will move out of the Plateau when there is advantageous condition in the up level air (Yeh and Gao, 1979). Li pointed out that the vortex will move out of the Plateau under specifically steering conditions (Li, 2002). All above had gotten more knowledge of the Tibetan Plateau, but there is no mean circulation field analysis of the Plateau vortices. The article analyzed the mean circulation field of the Tibetan Plateau vortex of different year, different month and get the climatic background of the Plateau vortex moving out of the Plateau.

2. DATA AND METHOD

The NCEP (National Centers for Environmental Prediction) reanalysis data of year 1998 to 2004, four times daily and with 2.5X2.5 degree of spatial resolution data is used.

We had inspected all the Tibetan Plateau vortex process in each month of May to September from year 1998 to 2004 and activities of the Plateau vortex had been gotten.

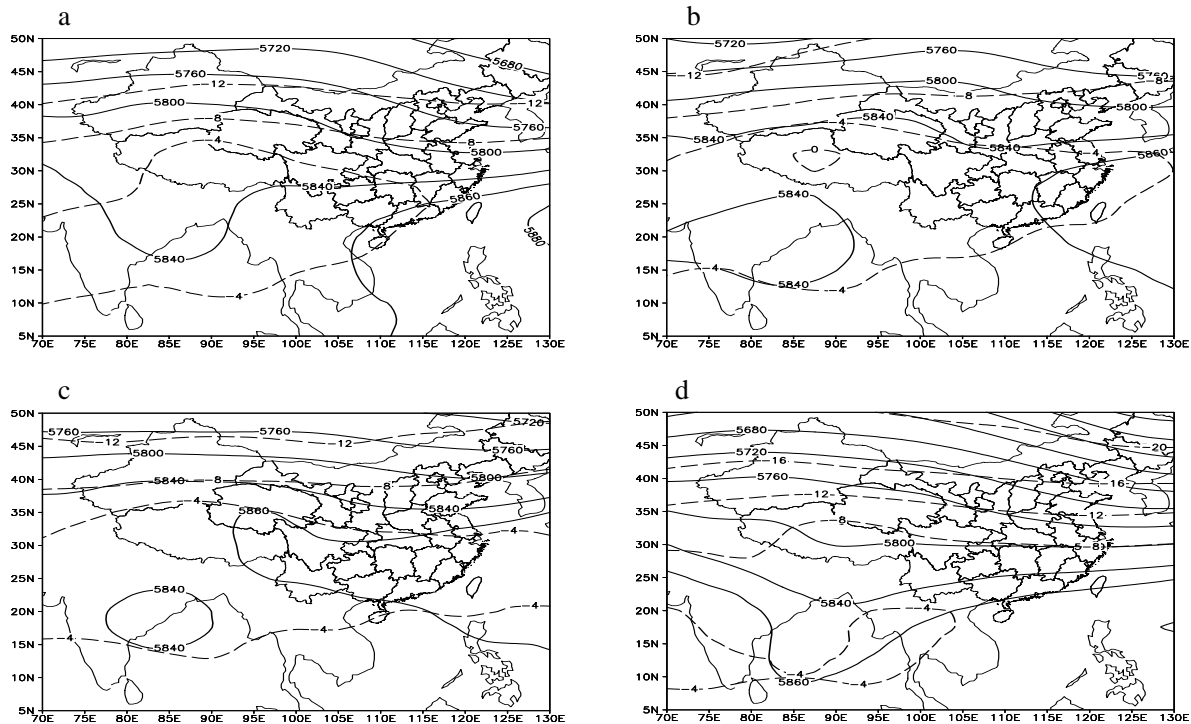
2. TABLE AND FIGURES

The Plateau vortex moving out of the Plateau means that the vortex generated over the Tibetan Plateau on 500hPa and then moved out the Plateau with closed circles on 500hPa or with cyclonic wind more than 3 stations. The Plateau vortex moving out of the Plateau is different with the Southwest vortex in China which is on the 700hPa level.

Table 1: The occurrence times of vortex moving out the Tibetan Plateau in each month

	May	June	July	August	September	Total
1998	0	2	4	4	2	12
1999	1	5	3	2	1	12
2000	1	0	2	0	0	3
2001	1	2	0	3	1	7
2002	1	1	2	2	0	6
2003	0	3	1	3	3	10
2004	1	1	1	0	0	3
Total	5	14	13	14	7	53

From Table 1 we can see that the most often occurrences of the Plateau vortex moving out of the Plateau are in year 1998 and 1999 and the least occurrences are in year 2000 and 2003. There are severe flood in Changjiang river valley, flood in southwest area in China and flood in Huanghui river valley in year 1998, 1999 and 2003, which is caused by the Plateau vortex moving out of the Plateau. All this demonstrates that the Plateau vortex is the important weather system which influences the summer rain in wide region of China.



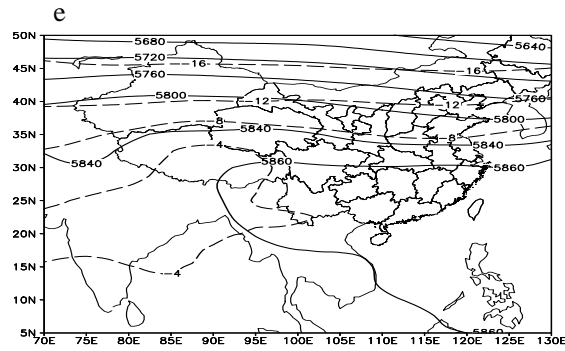


Figure 1: The average geopotential height and temperature field at 500hPa of May, June, July and September from year 1998 to 2004 (Solid line for geopotential height and long dash for temperature).

(a) June (b)July (c)August (d) May (e)September

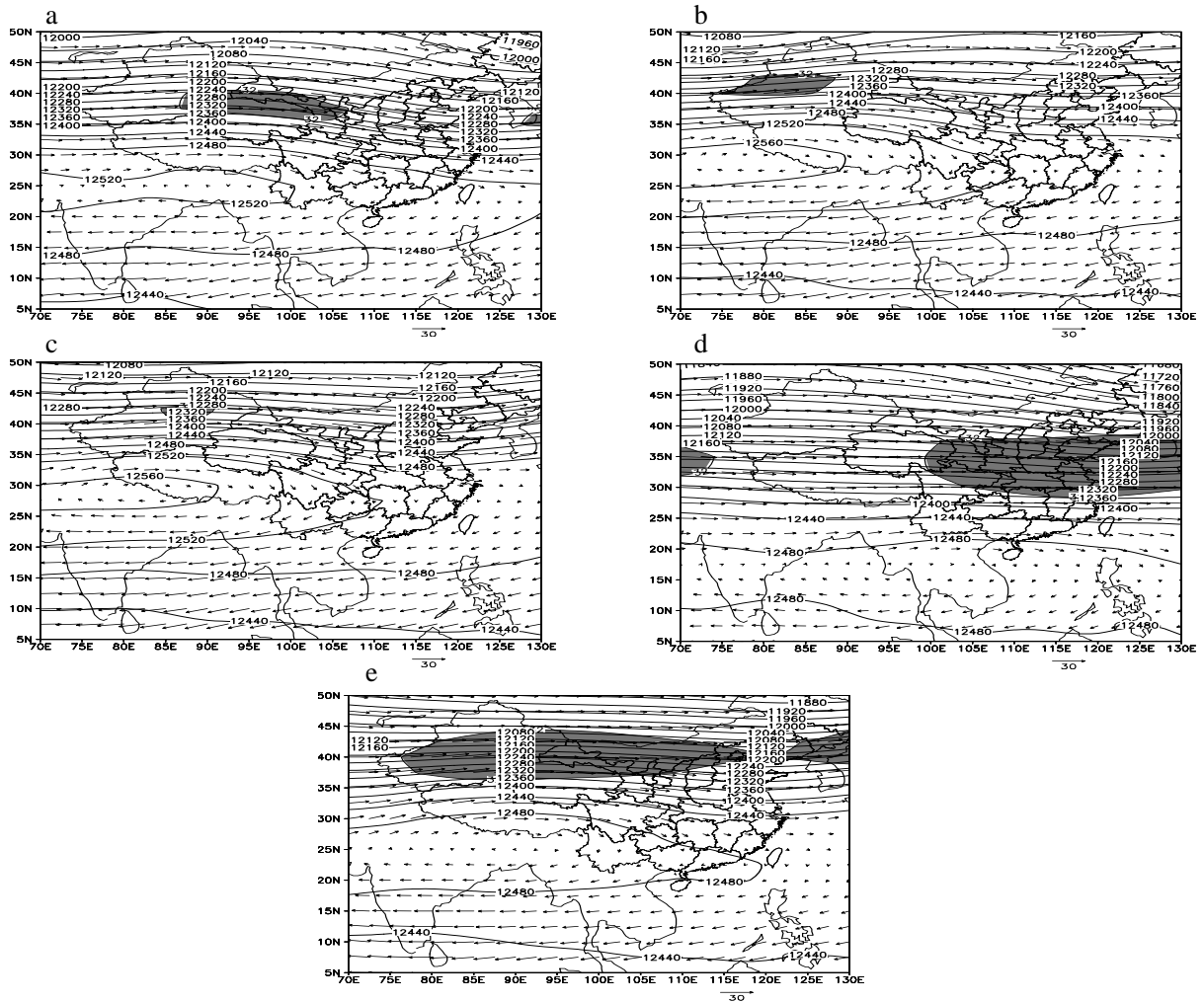


Figure 2: The average wind field of May, June, July and September at 200hPa from year 1998 to 2004 (Shaded area for wind speed more than 30m/s).

(a) June (b)July (c)August (d) May (e)September

3. SUMMARY

By analyzing the active times of the Plateau vortex moving out of the Plateau in May to September from year 1998 to 2004 and analyzing the more Plateau vortex moving out of the Plateau June to August average geopotential height, temperature, wind field on 500hPa and 200hPa, and less Plateau vortex moving out of the Plateau in May and September, we get following results:

(1) The main active time of the Tibetan Plateau vortex moving out of the Plateau is during May to August and numbers in each month is almost equal. This is different with the Plateau vortex active time over the Plateau, which is most often in May and less in August. Also this is different with the southwest vortex which moving out number is double in July than August.

(2) The characteristics of more Plateau vortex moving out of the Plateau on 500hPa are: Bengal gulf trough is leaning to north or Subtropical High is extending west clearly, southwest air flow can influence the east area of the Tibetan Plateau; Southwest air flow and northwest can encounter or trough or shear line is active in east of Plateau and with cold air advection invasion.

(3) The characteristics of more Plateau vortex moving out of the Plateau on 500hPa are: The South Asia High clearly extends to east and be stronger; The west wind is stronger; The east area of Plateau is controlled westnorth air flow before the South Asia High.

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