DYNAMICAL ANALYSIS OF PRECIPITATION AND TEMPERATURE CHANGE OVER ARID CENTRAL ASIA IN RECENT 50 YEARS

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1. INTRODUCTION

Arid central Asia is located from Caspian Sea in the west to the west of Northeast China in the east. It is also a transition belt between high and low latitude areas. Being the special geographic location, its arid climate has significant impacts on environmental change far beyond its borders [1]. In the last 100 years, global warming has drawn widespread attention in the world [2-4]. Arid central Asia has also shown a clear increase in air temperature based on global warming [5] . It is of great interest to better understand the climate change in this arid area.

2. DATA AND METHODOLOGY

In this paper, dynamical fields including vertical velocity and horizontal wind vector are analyzed by using NCAR/NCEP reanalysis data spanning 1948-2002. The monthly precipitation and surface air temperature data, from the Climate Research Unit and the Tyndall Center of the University of East Anglia, are used to divide the rainy and rainless years, and the higher and lower temperature years, which are called typical years. The arithmetical average and synthetical method are utilized to identify the typical years and to analyze their corresponding dynamical fields.

3. CENTRAL CONCLUSIONS

The results show that no matter in the rainy or rainless years, the sinking motion areas are located in the east part of arid central Asia in winter and in the west part in summer (Fig. 1, Fig. 2).

For precipitation, in winter, the dynamical structure of rainy years presents decreasing of the Ural pressure ridge and East Asian trough in association with the deepening of East European trough. In opposite, the Ural pressure ridge and East Asian trough has a stiffness condition and the meridional flow strengthening in the rainless years. In summer, the dynamical structure of rainy years presents the strengthening of East European pressure ridge and west Pacific subtropical ridge in association with the western-spread of subtropical ridge.

For temperature, in winter, the west part of arid central Asia is affected by south-west warm flow and the east part is affected by north-west flow in higher temperature years (Fig. 3). However, the whole area of arid central Asia is controlled by north-west flow in lower temperature years. In summer, the intensity and location of the west Pacific subtropical high pressure play an important role in determining the higher or lower temperature years. It would be higher temperature years when the subtropical high pressure strengthens and western-spreads, vise verse (Fig. 4).

4. REFERENCES

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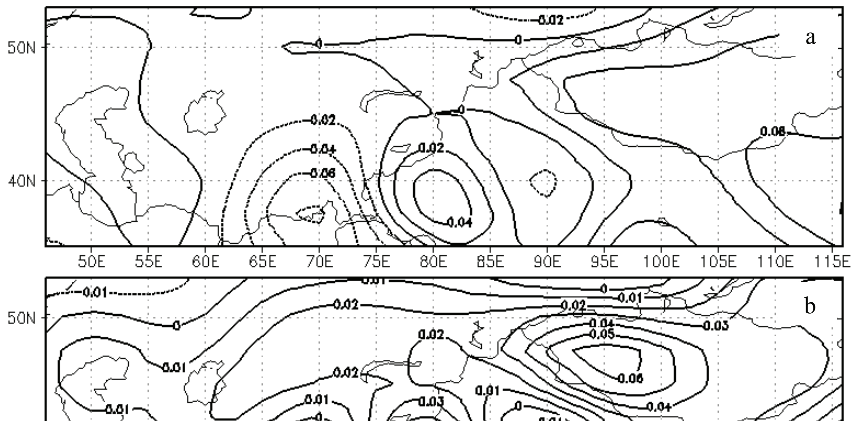

Fig. 1. vertical speed (Pa/s) at 500hPa in rainy years (a) and rainless years (b) in winter

(Dashed lines denote ascending motion areas; solid lines denote sinking motion areas.)

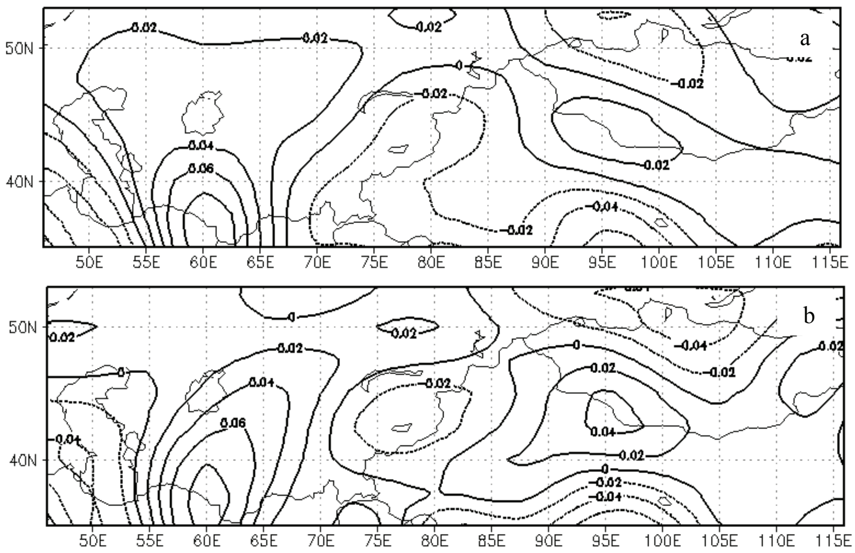

Fig. 2. vertical speed (Pa/s) at 500hPa in rainy years (a) and rainless years (b) in summer
(Dashed lines denote ascending motion areas; solid lines denote sinking motion areas.)

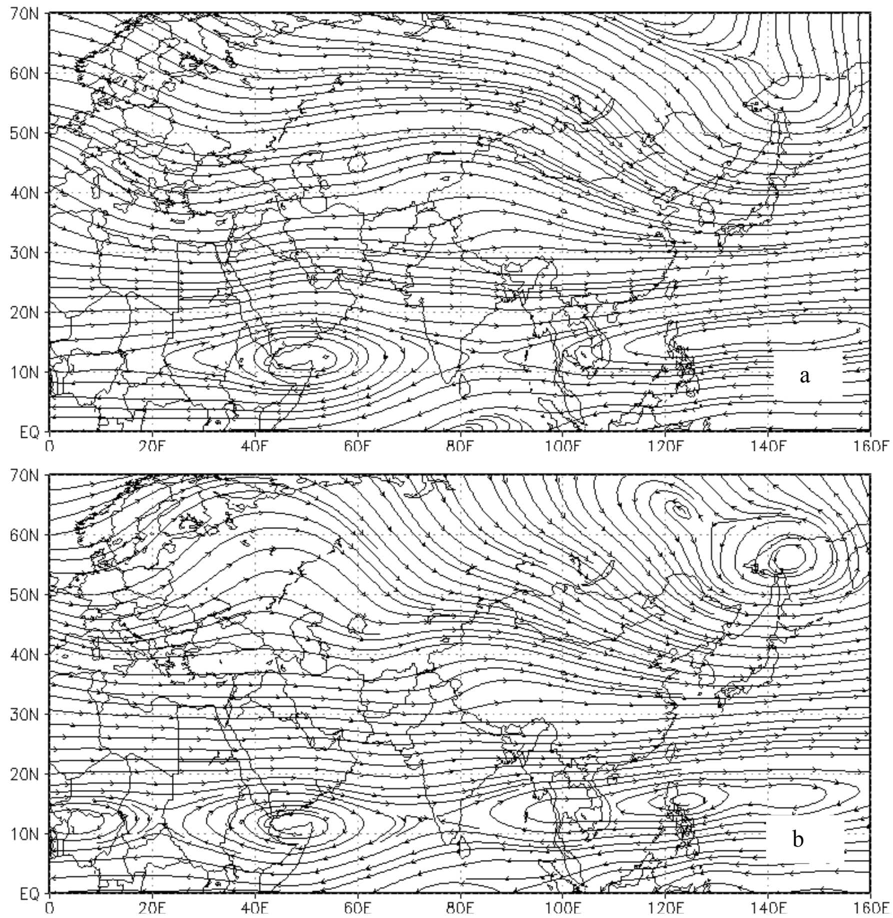

Fig. 3. General circulation at 500hPa in higher temperature years (a) and lower temperature years (b) in winter

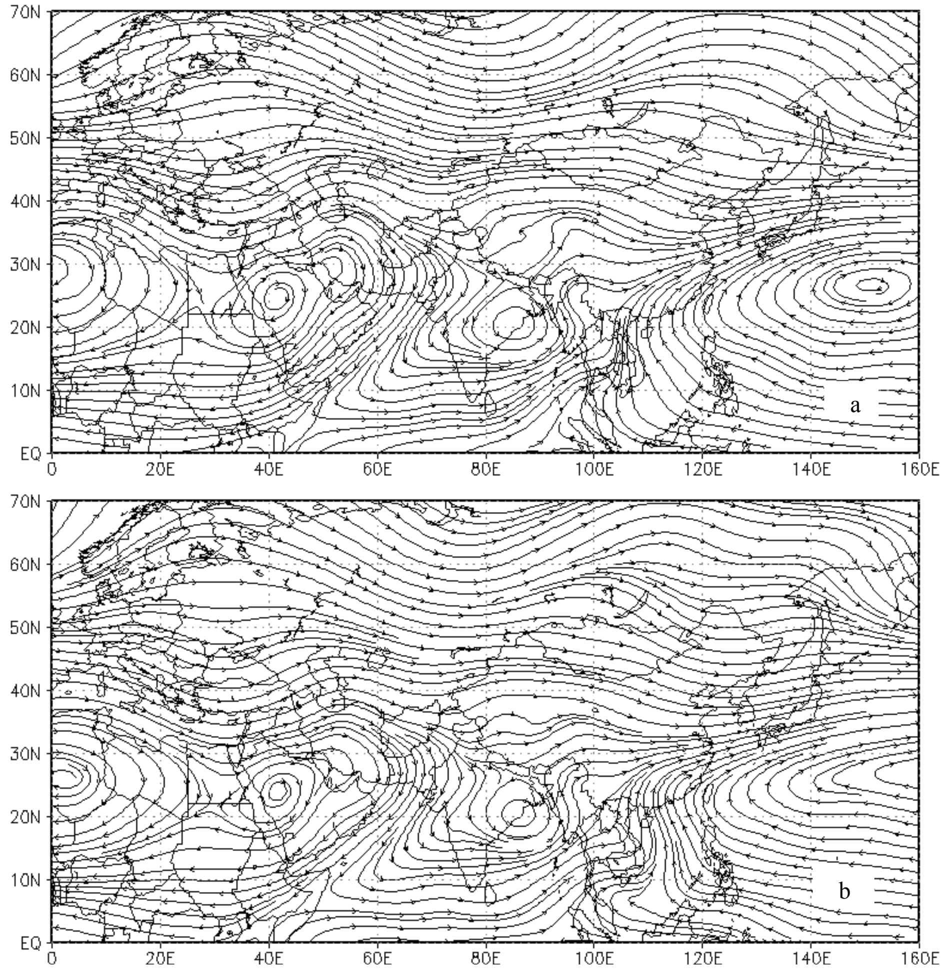

Fig. 4. General circulation at 500hPa in higher temperature years (a) and lower temperature years (b) in summer