FEATURES OF THE WATER VAPOR TRANSPORT AND PRECIPITATION VARIATION OF THE TIBETAN PLATEAU AND ITS SURRDINGS

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Abstract：Climatological features are investigated for large–scale water vapor transport over the Tibetan Plateau and its surroundings based on the vertically integrated water vapor flux from 1980 to 1997.It is found that in winter and spring, the moisture of the region is mainly from the middle-latitude westerly water transport, in summer (July), the moisture comes from the Bay of Bengle and the South China Sea, and in autumn the water vapor is from the west Pacific Ocean. The abnormal progression and retreat of the moisture with southlies will affect the occurrence of floods and droughts. Sichuan and Chongqing Basin, as a transferring station on the water transport way from the South China Sea and the west Pacific Ocean to Northwest and North China in summer and autumn, plays a great role on the water budget of the areas around. The precipitation of Sichuan and Chongqing Basin had been decreased from the year of 1951 to 2000 and the decrease trend is the most obvious between 1990 and 1997. There is an evident difference of precipitation in the eastern and western part of Sichuan and Chongqing Basin. The precipitation in the western part had been decreased in 50 years, and contrary to the western part, the precipitation in the eastern part showed an increased tendency. The weakness of northward and westward march of the water vapor transport with summer moonsoon has an important influence on the variation of precipitation in the region.

Keywords: *Water Vapor Transport, Precipitation, the Tibetan Plateau*

1. INTRODUCTION

In many parts of the world, water already is a scarce resource, and this situation seems certain to worsen as demand increases and water quality deteriorates, even in the absence of climate change. Moreover, most major impacts of climate variability and climate change on water resource are very uncertain. Especially ,Sichuan and Chongqing Basin lies on the eastern side of the Plateau ,and is influenced by many kinds of monsoon, such as tropic monsoon, subtropical monsoon and Qinghai-Xizang Plateau Monsoon, so its climate is complex and especial(Yuhua Xu 2001;Wenxiu Chen et al. 2001). At the same time, this region，as a transferring station on the water transport way from the South China Sea and the west Pacific Ocean to Northwest and North china in summer and autumn, plays a great role on the water budget of the areas around(Xiangde Xu et al. 2002). Therefore it is important to study the Features of the Water Vapor Transport and Precipitation variation of the Tibetan Plateau and Its Surroundings.

2. DATA AND METHODS

Rainfall observation representative stations data of 1951-2000 in Sichuan and Chongqing basin and NCEP/NCAR daily reanalysis data from 1980 to 1997 are used in this article. Also the wavelet and composed analysis methods are adopted.

3. RESULTS

3.1 Features of water vapour transport over the Tibetan Plateau and its surroundings

In winter (January) the moisture of the region is mainly from the middle-latitude westerly water transport; in summer (July) the moisture comes from the Bay of Bengle and the South China Sea (Fig.1); The progression and retreat features of the moisture with southlies from low latitudes over the region are slow (Fig.2)

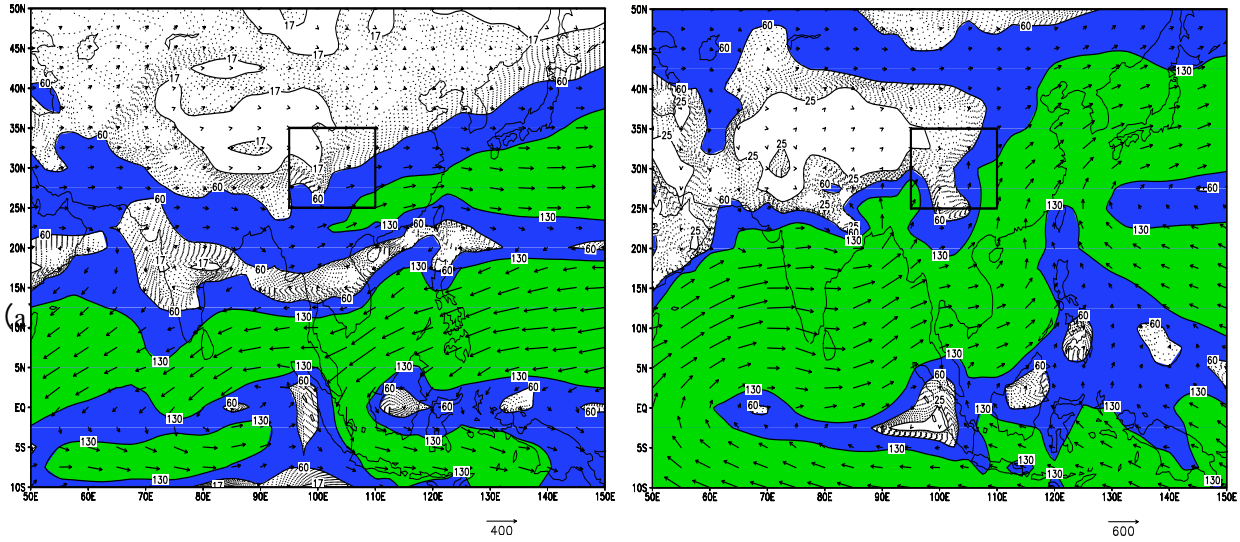

Figure 1： Distribution of vertically integrated water vapor flux vectors in 1980–1997, unit: $kg.m^{-1}.s^{-1}$ left: January；Right: July (the areas of dotted-line, light-shaded, heavy-shaded denote the transport ≧17（25 in July ）, 60, 130, respectively.)

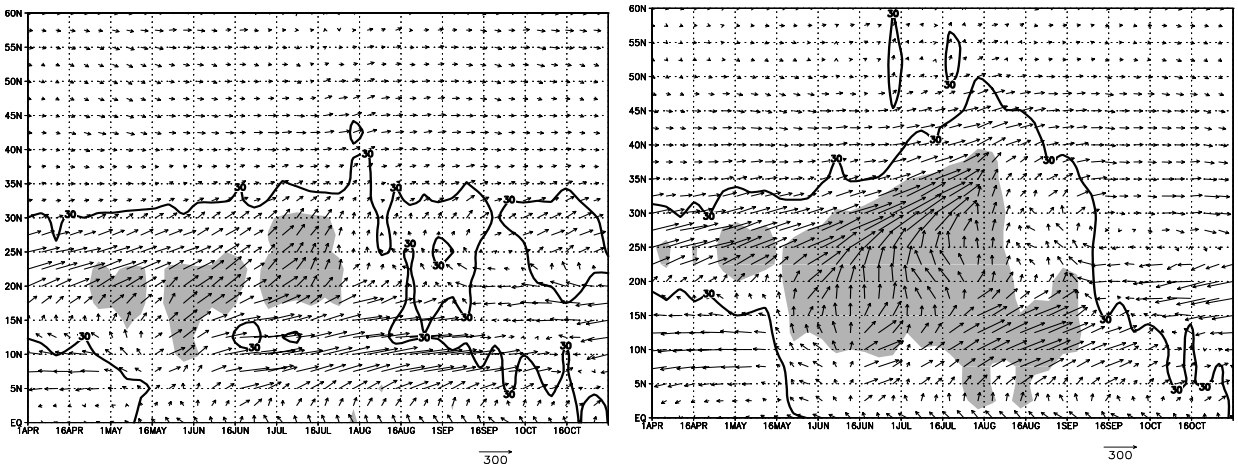

Figure 2： Time-latitude section of vertically integrated water vapor flux vectors along left: 100～110°E，right:110～130°E from April to November． (Solid lines denote the moisture with southlies from low latitudes，the shaded areas the Water Vapor Transport ≥80) units：$kg.m^{-1}.s^{-1}$

3.2 Precipitation variation of Sichuan and Chongqing Basin on the Eastern Side of the Plateau

It is clear that the seasonal defference of precipitation is obvious in Sichuan and Chongqing Basin; From

the year of 1951 to 2000, the precipitation in Sichuan and Chongqing Basin had been decreased and the decrease trend is the most obvious between 1990 and 1997(Fig.3). There is an evident difference of precipitation in the eastern and western part of Sichuan and Chongqing Basin. The precipitation in the western part (Chengdu) had been decreased in 50 years, and contrary to the western part, the eastern part (Chongqing) showed an increased tendency (Fig.4). The weakness of northward and westward march of the water vapor transport with summer moonsoon has an important influence on the variation of precipitation in the region, and the variation of the precipitation further affects the change of the water resource in the basin (Fig.5).

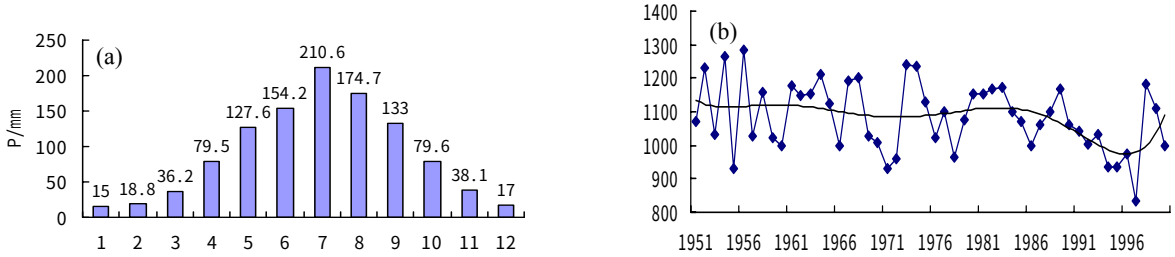

Figure 3: (a) Monthly precipitation averaged in 1951-2000 in Sichuan and Chongqing basin; (b) Yearly precipitation between 1951 and 2000 in Sichuan and Chongqing basin Unit: mm

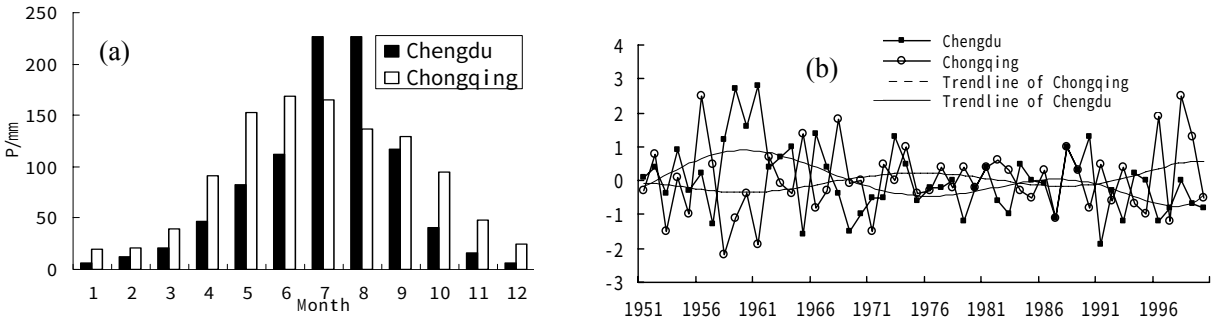

Figure 4: (a) Monthly precipitation averaged in 1951-2000 Unit: mm (b) yearly precipitation between 1951 and 2000 in Chengdu and Chongqing.

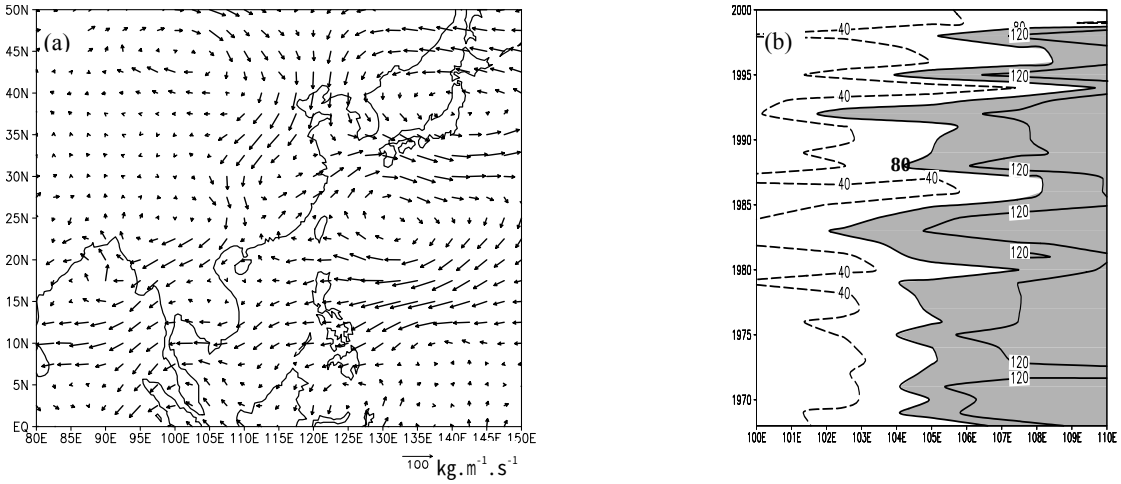

Figure 5： (a) The water vapor transport difference fields between 1980-2000 and 1968-1979. Units: $kg.m^{-1}.s^{-1}$
(b) Time-longitude section of vertically integrated water vapor transports of July along 27.5～32.5ºN
Units: $kg.m^{-1}.s^{-1}$

4. CONCLUSION

It is found that the Water Vapor Transport of the Tibetan Plateau and its surroundings has an obvious seasonal change. The abnormal progression and retreat of the moisture with southlies will affect the occurrence of floods and droughts. Sichuan and Chongqing Basin, as a transferring station on the water transport way from the South China Sea and the west Pacific Ocean to Northwest and North China in summer and autumn, plays a great role on the water budget of the areas around. But we found that the precipitation of Sichuan and Chongqing Basin had been decreased from the year of 1951 to 2000 especially between 1990 and 1997.There is an evident difference of precipitation in the eastern and western part of Sichuan and Chongqing Basin. The precipitation in the western part had been decreased in 50 years, and contrary to the western part, the precipitation in the eastern part showed an increased tendency. The weakeness of northward and westward march of the water vapor transport with summer moonsoon has an important influence on the variation of precipitation in the region. The decrease trend of the precipitation will affect the change of the water resource in the basin, so we must pay high attention to the water resource in this region in future.

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