Soil moisture difference between sand desert and gobi desert at Qira in the Taklimakan Desert - Results of ADEC 2002 -

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1. Introduction

Gobi and sand deserts are widely distributed in the northern and western regions in China. In order to clarify the effect of soil property difference on soil moisture and to understand the basic relation between soil moisture and dust/sand outbreak, in situ soil moisture measurements were carried out at Qira in the Taklimakan Desert for deserts of different soil types, sand and gobi, in April, July and November 2002 using a direct gravimetric technique.

2. Results

2.1 Seasonal variation

The monthly mean volumetric water contents were 0.05% in sand desert and 0.34% in gobi desert at the top 0-1 cm depth in April. Surface soil moisture in gobi desert was higher than that in sand desert. Land surface was very dry in April. Soil moisture increased from April to November due to rainfall in summer and autumn in the Tarim basin.

Soil moistures at the depth of 20 cm in sand desert and at the ground surface in gobi desert increased from April to November. The depths in which such seasonal variation appeared are different in each desert. This result means that the percolation processes of soil moisture are different; sand soil moisture percolates faster than that in gobi soil, on the other hand gobi soil moisture remains in the surface soils due to absorption.

Snow covered over the desert area from the middle of January 2002 until the beginning of February. In mid-February, the covered snow was melt rapidly accompanying with the air temperature climb above zero. We think that the snow cover suppress the occurrence of the aeolian dust storm in winter. In generally, 1) Asian dust storms occur frequently during spring and early summer when it is low precipitation and less vegetation, 2) Occurrence frequency of the blowing dust/sand and the dust/sand storm in Qira and Hotan was the maximum in May of all the year. These correspond to the drying season in the Taklimakan Desert. We think the seasonal variation of soil moisture have influence to the number of aeolian dust outbreak.

2.2 Vertical variability

Soil moisture at the lower depth in gobi desert was also higher than that in sand desert. The vertical gradient of soil moisture near the ground surface was very large in gobi desert. The vertical difference of soil moisture between upper layer and lower layer was getting larger from Spring to Autumn accompanying with the increase of precipitation. As mentioned above, surface soil moisture in gobi desert increased from spring to autumn, however that was not varied under 5 cm depth. It is supposed that the soil moisture is absorbed to the small grains in the gobi surface where the porosity was small, and then the percolation is suppressed. On the other hand, sand soil moisture at the depth of 20 cm increased.

2.3 Heterogeneity

Spatial variability of soil moisture was larger in gobi desert: standard deviations at the depth of 5 cm were 0.02 % in sand desert and 3.50 % in gobi desert in April, 0.76 and 5.29 in July, and 0.14 and 3.43 in November. It is assumed that the difference of heterogeneity of soil moisture between both deserts is caused by the difference of soil structure. Especially, the smaller grains are dominant in gobi desert.

3. Concluding Remarks

The soil moisture in gobi desert was larger than that in sand desert. That means that the difference of capillary force dependent on soil property and soil size distribution is related to the soil moisture; small size grains like clay have larger moisture tension. Land surface was almost dry in both deserts in April; it attained a state in which small grains tended to be saltant and suspended. However, high soil moistures were distributed like patch shape. The heterogeneity of soil moisture is assumed to effect on the total supply of dust/sand from the ground to the atmosphere. The difference of soil moistures in adjacent deserts illustrates the complexity of sand-dust outbreak in the Taklimakan Desert.