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Soil moisture dynamic in Central Asia and Xinjiang province of China over 30 years from microwave remote sensing

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Abstract: Central Asia and Xinjiang province of China are two of the world's main arid and semi-arid regions. Both regions have been experiencing a significantly warming trend since the 1990s, while the precipitation shows a more complicated behavior, which should have a significantly impact on soil moisture change. In this paper, from the Soil Moisture (SM) Essential Climate Variable of Climate Change Initiative (CCI) project of European Space Agency (ESA) which was generated by merging two soil moisture datasets that derived from active microwave observations and passive microwave observations respectively and monthly precipitation and air temperature from the Climatic Research Unit (CRU) during 1979~2010, the temporal and spatial variations of SM and its responses to the precipitation and temperature were analyzed in Central Asia and Xinjiang province of China. The result indicates: (1) The SM increased gradually from southwest to east and north of Central Asia. The SM was highest in Altai, Tien Shan and Kunlun mountains of Xinjiang and lowest in the Junggar Basin and Tarim Basin which are located between the three mountains as mentioned above; (2) The growing season SM of Central Asia decreased dramatically in recent 30 years, but it increased slightly during 1979~1986 and declined significantly during 1988~2010 in Xinjiang; (3) The Spatial pattern of growing season SM was similar to precipitation but opposite of temperature in both study regions. According to the linear trends of climate factors (precipitation and temperature) during growing season, precipitation declined slightly in Central Asia but increased slightly in Xinjiang. Temperature increased significantly in both study regions, but the increasing trend in Xinjiang was less than that in Central Asia; (4) According to the time series variation curves of SM and climate factors in both study regions during recent 30 years, neither the SM nor precipitation and air temperature in Xinjiang were greater than that in Central Asia. But the SM in both study regions were almost the same after 2007, which should be relevant to that the start time of upward trend of SM in Xinjiang (about 2004) was earlier than that in Central Asia (about 2008); (5) The correlation analysis showed that the decreasing precipitation and rising temperature were the dominated factors that led to the growing season SM becoming drier in Central Asia. Significantly negative correlation existed between SM and air temperature in Xinjiang, while no significantly correlation was found between SM and precipitation.

Key words: Soil moisture; Central Asia; China's Xinjiang; Climate change; Regional difference