MORNITORING SOIL MOISTURE CHANGE IN NORTH AFRICA WITH USING SATELLITE REMOTE SENSING AND LAND DATA ASSIMILAITON SYSTEM

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ABSTRACT

In researches related to the global warming and climate change, soil moisture is serving as an excellent environmental indicator which controlling and regulating the interaction between the atmosphere and the land surface. The distribution pattern of soil moisture, both spatial and temporal, is the key to understanding the spatial variability and scale problems. Moreover, soil moisture also is an important factor in animal and plant productivity and it can even be related to the pattern of settlement in arid and semiarid regions.

North Africa, a typical arid and semiarid region where the largest desert of world locates, has an environment vulnerable to the climate change. On the other hand, it is very difficult to monitor the environmental changes in this region due to its tough situations. In this study, we proposed and compared two sets of soil moisture data in this region based on the passive microwave remote sensing retrieval product and land data assimilation system simulation, respectively.

The satellite remote sensing soil moisture product was generated by applying the soil moisture retrieval algorithm to the AMSR-E 6 years Brightness Temperature data. The algorithm was developed by the University of Tokyo group, in which both the volume scattering effects of soil particles and the surface scattering effects of surface roughness were included.

As the second data set, the hourly soil moisture was simulated by the land data assimilation system developed at the University of Tokyo (LDASUT). The dynamic model used in LDASUT is a revision of the simple biosphere model (SiB2), while the model operator of the LDASUT is a radiative transfer model which is also used in the soil moisture retrieval algorithm. The data assimilation system was forced by NCEP reanalysis data and 6 years AMSR-E Brightness Temperature was merged into the system to produce the second soil moisture data set.

Two sets of soil moisture were analyzed to know the change tendency and the distribution characteristic in this region. The quality of both data sets was evaluated by comparing them with the rainfall events. Through the comparison of these two data sets, it is clear that the soil moisture product of LDASUT has a better temporal resolution than that of direct retrieval algorithm, giving the facts that LDASUT generated hourly soil moisture data while the algorithm retrieved soil moisture near daily. The accuracy of soil moisture simulation of LDASUT was partly influenced by the quality of the forcing data while that of the direct retrieval algorithm was mainly depended on the parameterization. The quality of both data sets can be improved by adopting more advanced radiative transfer model or by better parameterization..

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