SOIL MOISTURE ANALYSIS USING MULTISPECTRAL DATA IN MONGOLIA

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Long term moisture data sets on a regional scale could provide reasonable information about climate change and global warming specific regions. Moisture is most important variable in climate change especially drought. Soil moisture (SM) content is one of the most important environmental variables in relation to land surface climatology, hydrology and ecology. The annual evaporation is 150~250 mm in the steppe zone and over 150 mm in desert steppe and deserted zones. This research work will be divided two parts which means long-term moisture analysis in central part of Mongolia and soil moisture modelling in target area. The study area is included seven provinces which as agricultural area and situated central part of Mongolia. Its situated between approximately 589 and 2788 meters and there are thirty-eight climate stations in seven provinces. The aim of this research work is to develop a SM model using multispectral satellite data and long-term moisture mapping in central part of Mongolia. In addition to this, land surface temperature (LST) and normalized difference vegetation index (NDVI) from Landsat satellite images were integrated for the assessment. A digital elevation model (DEM) from ASTER satellite image with 30 m resolution along calculation aspect and slope maps was used. We collected ground truth measurement of soil moisture in Tuv provinces for the validation. The most accurate method to estimate SM is gravimetric sampling. The soil sample from the field has to be immediately measured by putting the sample for 24 to 48 h in a drying oven at 105 °C, to measure the mass of the dry soil. Further soil bulk densities are required to convert gravimetric (water mass per soil mass) to volumetric values (water volume per soil volume). On the long-term analysis, the satellite-derived products can be providing moisture indices events. We interpolated precipitation data into raster imagery from May to August for the 2000-2013 over Mongolia using 127 climate stations. The potential evapotranspiration (PET) was estimated from MODIS data and NDVI was calculated two bands which are near infrared (NIR) and visible red (RED) from SPOT data during the growing season from May – August for the 2000-2013 was acquired. The method of Lewis (1999) was chosen to determine the moisture index (MI) using spectral information from Landsat satellite data and Mathew Tybersky (2008) using derived from precipitation and PET. Regression analysis is used to develop the model. The model shows how SMI from satellite depends on LST, NDVI, DEM, Slope and Aspect in the agricultural area. For the long-term moisture mapping to accurate using NDVI. The result of moisture mapping was compared with NDVI. According the results that moisture of previous months directly affected to vegetation growth of next months. The results of the model were correlated with the ground SM data in Mongolia and indicate that there is 0.65 correlation between output SM and SM of ground truth for the agricultural area. The soil moisture indices based on climate stations measurements could not completely reveal the natural zone effects.

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