Interactions between Soil Moisture and Weather Prediction in Rainfall-Runoff Application : Korea Land Data Assimilation System(KLDAS)

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The interaction between land surface and atmosphere is essentially affected by hydrometeorological variables including soil moisture. Accurate estimation of soil moisture at spatial and temporal scales is crucial to better understand its roles to the weather systems. The KLDAS(Korea Land Data Assimilation System) is a regional, specifically Korea peninsula land surface information systems. As other prior land data assimilation systems, this can provide initial soil field information which can be used in atmospheric simulations. For this study, as an enabling high-resolution tool, weather research and forecasting(WRF-ARW) model is applied to produce precipitation data using GFS(Global Forecast System) with GFS embedded and KLDAS soil moisture information as initialization data. WRF-ARW generates precipitation data for a specific region using different parameters in physics options. The produced precipitation data will be employed for simulations of Hydrological Models such as HEC(Hydrologic Engineering Center) - HMS(Hydrologic Modeling System) as predefined input data for selected regional water responses.

The purpose of this study is to show the impact of a hydrometeorological variable such as soil moisture in KLDAS on hydrological consequences in Korea peninsula. The study region, Chongmi River Basin, is located in the center of Korea Peninsular. This has 60.8Km river length and 17.01% slope. This region mostly consists of farming field however the chosen study area placed in mountainous area. The length of river basin perimeter is 185Km and the average width of river is 9.53 meter with 676 meter highest elevation in this region. We have four different observation locations : Sulsung, Taepyung, Samjook, and Sangkeug observatoriesn, This watershed is selected as a tentative research location and continuously studied for getting hydrological effects from land surface information. Simulations for a real regional storm case(June 17~ June 25, 2006) are executed. WRF-ARW for this case study used WSM6 as a micro physics, Kain-Fritcsch Scheme for cumulus scheme, and YSU scheme for planetary boundary layer.

The results of WRF simulations generate excellent precipitation data in terms of peak precipitation and date, and the pattern of daily precipitation for four locations. For Sankeug observatory, WRF overestimated precipitation approximately 100 mm/day on July 17, 2006. Taepyung and Samjook display that WRF produced either with KLDAS or with GFS embedded initial soil moisture data higher precipitation amounts compared to observation.

Results and discussions in detail on accuracy of prediction using formerly mentioned manners are going to be presented in 2011 Annual Conference of the Korean Society of Hazard Mitigation.

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