Assessment of Distributed Snow Modeling using Ground and Remote Sensing Data in Mountainous Eastern Turkey

Ali Arda Sorman\textsuperscript{1} and Mustafa Cansaran Ertas\textsuperscript{2}

\textsuperscript{1}Eskisehir Technical University, Civil Engineering, Eskisehir, Turkey (asorman@eskisehir.edu.tr)
\textsuperscript{2}Eskisehir Technical University, Civil Engineering, Eskisehir, Turkey (cansaranertas@gmail.com)

Water has an essential effect on climate change, global warming, drought, flood and all kinds of living life as a result of the continuous movement between earth and atmosphere. In high latitude and elevated regions of the world, most of the annual total precipitation occurs in the form of snow and snow melting provides the majority of usable water. Due to the large impact of snow cover on water/energy balance, the quantity, spatial and temporal distribution of the snow is very important in the hydrological system.

Turkey is the 4\textsuperscript{th} highest country in Europe, after Andorra, Georgia and Switzerland, with an average elevation of 1140 m. Therefore, snow frequently occurs and may stay on the ground more than half of the year especially in the north, east and central regions. Snowmelt runoff in the mountainous eastern part of Turkey, where large dams are located, is of great importance as it constitutes 2/3 in volume of the yearly total runoff during spring and early summer months. Therefore, determining the amount and timing of snowmelt is of utmost value in order to use the water resources of the country in an optimal manner.

In this study; conceptual snowpack model SNOW-17, which has a common usage in the literature, is applied in a fully distributed manner in the Upper Euphrates Basin. SNOW-17 is a conceptual model using air temperature as the sole index to determine the energy exchange across the snow-air interface. The model results of snowpack components, such as height of snow (HS) and snow water equivalent (SWE) are evaluated with independent pointwise in-situ measurements and spatially distributed satellite images. The snow model results show an average success of 0.81 and 0.66 in terms of Nash-Sutcliffe Efficiency (NSE) for the calibration and validation periods, respectively. In addition, the extreme snowfall and early snowmelt event that occurred in 2004 snow season is further evaluated by the snow model and satellite products.