Estimation of Monthly Temperature Normals over Mountainous Region in the Korean Peninsula

Jin-Hee Kim[1] and Jin I. Yun[2*]
[1]*National Center for Agro-Meteorology, Seoul National University, Seoul 151-742, Korea*
[2]*Department of Ecosystem Engineering, Kyung Hee University, Yongin 446-701, Korea*

A seamless, high-definition climate data are necessary to assess climate change impacts on forest ecosystems, which is artificially disconnected by the DMZ (demilitarized zone) but functionally connected between the northern and southern parts of the Korean Peninsula. Since there is no information available on North Korean watersheds, existing geospatial technology for digital climate mapping cannot be transferred to North Korea. We applied a watershed extraction algorithm based on ArcHydro to the North Korean portion of ASTER GDEM and utilized geographical information on major rivers and mountains to adjust the products. Proposed hydrologic zoning system for North Korean watersheds consists of 21 river basins, 93 stream basins and 885 catchments. Combined with the existing 840 South Korean hydrologic units, a complete set of 1,725 catchments is available. Monthly averages of daily maximum and minimum temperature maps were prepared at a 30m resolution based on 1971-2000 observations at the 27 North and 56 South Korea weather stations. Local effects of the urban heat island, the thermal belt, and the cold air drainage were incorporated in daily minimum temperature estimation in addition to the elevation effect. Solar irradiance on sloping surfaces were considered in daily maximum temperature estimation. Results show that the spatial average of January minimum temperature is -12℃, with the range of -30.9 ~ 3.5℃ across the Peninsula. Jeju-do and Yanggang-do can be classified as lower and upper outliers, respectively. The spatial average of August maximum temperature ranges from 11.8 ~ 32.7℃ with the average of 26.5℃.