Catchment Scale Correction of Synoptic Weather Data for Local Agrometeorological Service in Complex Terrain

Jin I. Yun[1], Soo-ock Kim[2], Jin-Hee Kim[2] and Dae-jun Kim[1 2]

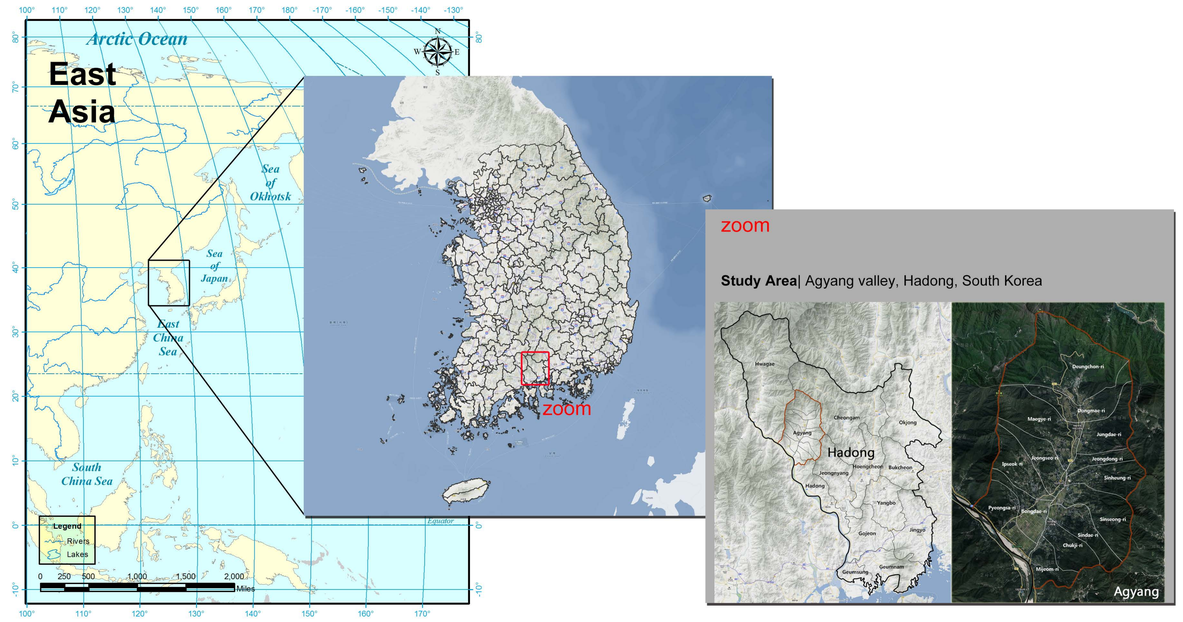
[1] Kyung Hee University, Seocheon-dong, Giheung-gu, South Korea
[2] National Center for Agrometeorology, Seoul, South Korea

Objectives

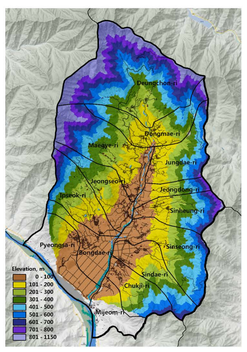
The spatial resolution of local agrometeorological service for farming activities often exceeds the current scales of weather and climate information. When crop models are applied to regional scales, the same problem occurs especially in complex terrain where the coarse meteorological inputs can never represent the underlying land attributes. To supplement the insufficient spatial resolution of official weather and climate information, we suggest a catchment-specific correction scheme based on recently developed techniques in geospatial climatology.

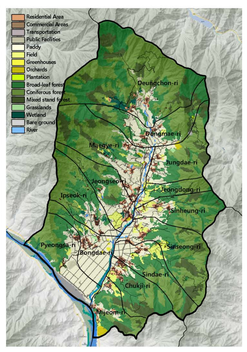
Methods

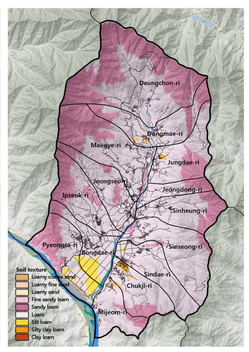
Given a single value for a catchment from the nearest weather office, daily minimum temperature at a 30m resolution across the catchment can be produced by the cold air drainage and thermal belt effect embedded in this scheme. Daily maximum temperature can be estimated at the same resolution by applying the solar irradiance effect on sloping surfaces. Rainfall distribution at a 270m grid spacing can be produced by combining the micro-topography effect with the weather RADAR products. We applied this scheme to the study area to produce gridded surfaces for temperature, solar radiation, and precipitation at hourly to daily time intervals.

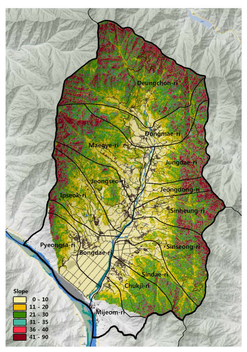


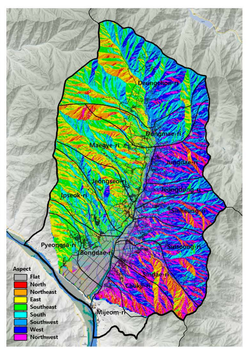
Study area: Rural catchment of 50 km^2 area with complex terrain and located on a southern slope of Mountain Jiri National Park.
Elevation: 1 - 1,100m (Hyongjebong peak)

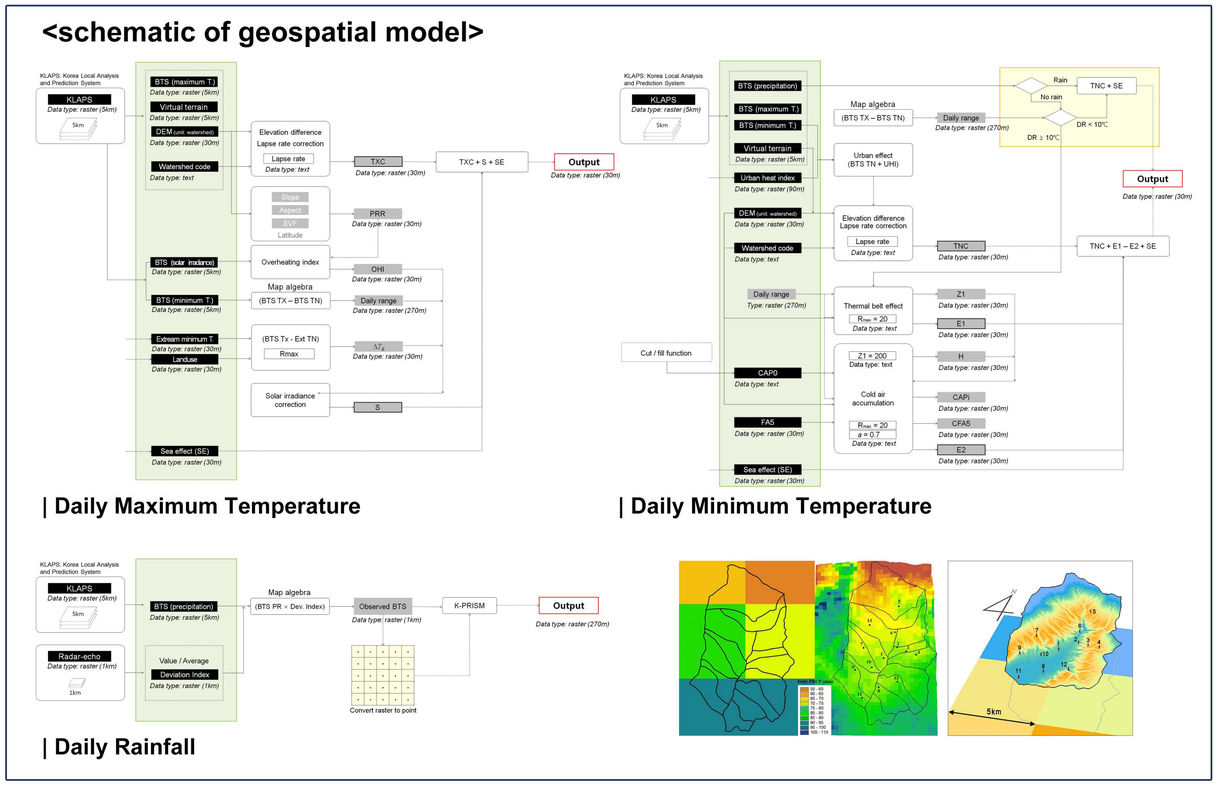

| Elevation


| Landcover


| Soil texture

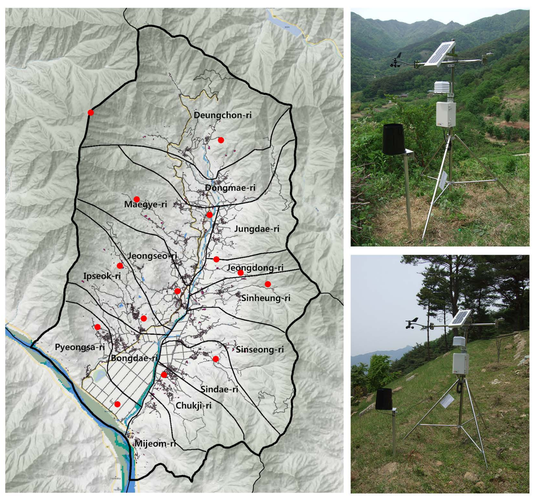

| Slope


| Aspect

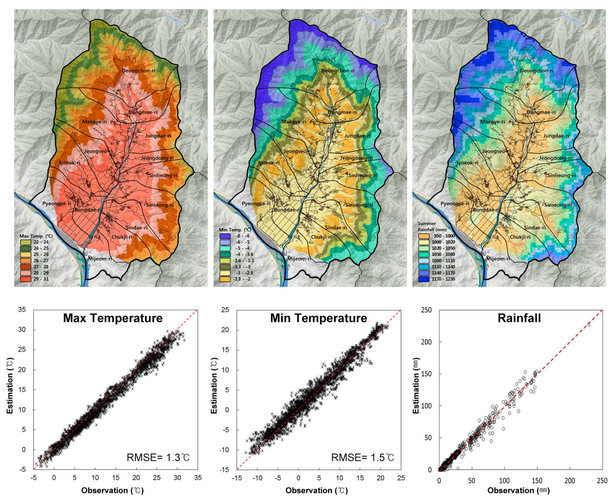


Results

Observations at 14 sites showed the validity of this scheme with an operational accuracy. The fine resolution weather data were used to run diverse agronomic models in a site-specific manner together with the localized land attributes such as soils and crop species. Final products in a form of agrometeorological warnings with brief countermeasures were delivered to volunteer farmers to help protect their crops from high impact weather. The economic return from this location-based agrometeorlogical service was compared with that of conventional services using uncorrected weather data and related products.



| 14 Automated Weather Stations (AWS)



| Model Validation

References

Chung, U., H. H. Seo, K. H. Hwang, B. S. Hwang, J. Choi, J. T. Lee, and J. I. Yun, 2006: Minimum temperature mapping over complex terrain by estimating cold air accumulation potential. *Agricultural and Forest Meteorology* **137**, 15-24.

Chung, U., H. C. Seo, J. I. Yun, S. J. Jeon, K. H. Moon, H. H. Seo, and Y. S. Kwon, 2009: Extrapolation of daily maximum temperature in a mountainous terrain. *Asia-Pacific Journal of Atmospheric Sciences* **45**(4), 473-482.