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Forecasting the weather
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High Resolution Grid Agricultural Meteorology Information System based on Local Analysis and Prediction System (GAMIS-LAPS) with Surface Observation at the Agricultural Field

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High resolution meteorological information in space and time is needed in agricultural practices to meet various needs in pesticide spray, irrigation, harvest, etc. Such information depends on the quality of the meteorological data. Local and site-specific weather data were monitored using weather stations at the agricultural fields in the past. In this study Local Analysis and Prediction System (LAPS, McGinley, et al., 1991) was utilized to produce high resolution agricultural meteorological data based on the data from automatic weather stations (AWS) in the agricultural fields. LAPS was able to assimilate various data including AWS, remote sensing, and regional numerical weather prediction models of Korea Meteorological Administration (KMA).

GAMIS-LAPS uses 10 km resolution model data of KMA's Regional Data Assimilation and Prediction System (RDAPS) as initial fields. It assimilates AWS data from agricultural fields (AF, 33 sites) as well as KMA (185 sites) in Gyeonggi-do region, which is about 11,730 km2 including Seoul and Incheon city area. Three groups of surface AWS were composed to test the effectiveness of the agricultural AWS: AF-only, KMA-only, and all AWS. Estimated air temperature, wind speed and direction, relative humidity, and rainfall were compared against observation for each group.

The system was tested during Feb. 17 - 20, 2010 and Aug. 1-31, 2009. Mean air temperature deviations at the AF sites, calculated by subtracting observed data from estimated data, were improved from 0.84 C to 0.39 C during February by incorporating the AF data into the KMA-only data. Although the addition of AF to KMA data made the estimation of air temperature more reliable in the agricultural field, there are more to consider evaluating these comparison results: the AWSs in the Gyeonggi-do region have high variability in urbanization rate from station to station; the density of the AWSs is high in city area and low in rural area; topography is rather flat for city and complex and elevated for rural area. The accuracy of the system could also be improved by further optimization of analyzing options of the system.

GAMIS-LAPS is able to produce gridded weather data such as air temperature, wind speed and direction, rainfall, and relative humidity for agricultural field at 100m resolution. The process can be finished in 20 minutes and will support more reliable weather data than KMA's AWS data alone for various agricultural application models to support safe agricultural production.