An improved algorithm for quantitative precipitation nowcasts from AMI onboard the GEO-KOMPSAT-2A satellite

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Statistical approaches for quantitative precipitation nowcasts (QPNs) have emerged with recent advances in sensors in geostationary orbits, which provide more frequent observations at higher spatial resolutions. Several investigations have reported that extrapolation-based prediction can be more effective than numerical weather model-based prediction for a short lead time of less than a few hours. This study introduces the algorithm based on extrapolation method to produce QPN products for Advanced Meteorological Imager (AMI) onboard South Korea's second geostationary satellite (GEO-KOMPSAT-2A). The algorithm first provides the 3-hour potential accumulated rainfall (PAR) for a very-short-range forecast using extrapolation and then calculates the probability of rainfall (POR) during the same time period through statistical methods. The algorithm for PAR first identifies rainfall features and computes the motion vectors of the identified rainfall features through tracking between two consecutive GEO-KOMPSAT-2A rain rate images. The algorithm can then extrapolate future rainfall rates from current and previous rainfall rates outputs. In addition, the extrapolated rainfall fields are used as inputs for the POR estimation process, which produces the rainfall probability during the same 3-h period. POR is estimated based on rainfall frequency and adjusted by neighboring rainfall feature information. POR can provide a quantitative measure for the uncertainty in the PAR estimates. Retrieved PAR and POR from the QPN algorithm are validated with 3-h accumulated rainfalls obtained from the GEO-KOMPSAT-2A rain rate products. Forecasting accuracy of the PAR algorithm with time has also been investigated. The accuracy tends to decrease with increasing lead time, as expected. It may be due to the limitations of the extrapolation technique and degradation of the accuracy of the PAR estimates. The details on the improvements from the prototype algorithm and validation statistics will be discussed.