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Status of simulation of GK2A visible channel reflectances using RTTOV v13 and its application

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The simulated radiances of the Water Vapor(WV) and Infrared(IR) channels based on the Geo-Kompsat 2A(GK2A) using Radiative Transfer for TOVS(RTTOV) have been beneficial for diagnosing the performance of predicting WV flows related to synoptic dynamical structures and cloud properties through comparative analysis with satellite observation data. KMA has been producing this data in real-time, utilizing it for weather forecasting support since 2021. The latest RTTOV v13 has been developed to calculate the simulated reflectance of the GK2A visible channels (0.4, 0.5, 0.6, 0.8μm). In this study, we use the newly developed Method for Fast Satellite Image Synthesis(MFASIS, Scheck et al. 2016) in RTTOV v13, which is based on compressed reflectance look-up tables. The input data for calculating the simulated reflectance utilized atmospheric and surface information from NWP models (KIM, GDAPS-UM, ECMWF) currently used in the KMA's operations. Surface reflectance data extracted from the BRDF atlas (Vidot et al., 2018), included in the RTTOV model, use as input into RTTOV-MFASIS to calculate the visible channel simulated reflectance. The accuracy of the visible channel simulated reflectance for cloud is significantly influenced by hydrometeor (ice/water) information and the amount of cloud derived from NWP models. The simulated reflectance revealed a slight negative bias

compared with the GK-2A observations for a one-month period in July 2023 over the East Asian region. Based on these results, performance verification was conducted according to land/sea condition and cloud type classification for detailed analysis of the radiative properties of clouds in the visible channels. In order to enhance use of simulated images in weather forecasting and monitoring support, we provide simulated images(day-night RGB, true color RGB, as well as IR and WV color-enhanced images) generated by combining simulated brightness temperature and reflectance. Simulated RGB composite images allow for the analysis of cloud type and properties, while simulated color-enhanced images facilitate the identification of the characteristics such as the strengthening/weakening of clouds and dry regions, and the location and intensity of pressure troughs. This study aims to introduce the technology of retrieving simulated reflectance for the visible channels of the GK2A and can be seen as the diagnostic results of simulated performance through comparison with satellite observation data.

Key words: GK2A, RTTOV, Visible Channel, Simulated Reflectance, Performance Diagnosis