Title	Generating Accurate and Consistent Top-of-Atmosphere Reflectance Products from the New Generation Geostationary Satellite Sensors

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Abstract	GeoNEX is a collaborative project by scientists from NASA, NOAA, JAXA, and other organizations around the world with the purpose of generating a suite of Earth-monitoring products using data streams from the latest geostationary (GEO) sensors including the GOES-16/17 ABI and the Himawari-8/9 AHI. An accurate and consistent top-of-atmosphere (TOA) reflectance product, in particular the bidirectional reflectance factor (BRF), is the starting point in the scientific processing chain. We describe the main considerations and corresponding algorithms in generating the GeoNEX TOA BRF product. First, a special advantage of geostationary data streams is their high temporal resolution (~10 minutes per full-disk scan), providing a key source of information for many downstream products. To fully utilize this high temporal frequency demands a high georegistration accuracy for every acquired image. Our analysis shows that there can be substantial georegistration uncertainties in both GOES and Himawari L1b data which we addressed by implementing a phase-based correction algorithm to remove residual errors. Second, geostationary sensors have distinct illumination-view geometry features in that the solar angle changes for every pixel. Therefore, to accurately derive a BRF requires a solar position algorithm and the estimation of the pixel-wise acquisition time within an uncertainty of 10 seconds. Third, we discuss the measures we adopted to check and correct residual radiometric calibration issues of individual sensors to enable time-series analysis as well as the cross calibration between different satellite sensors (including those from low-Earth orbit). Finally, we also explain the rationale for the choice of the global grid/tile system of the GeoNEX TOA BRF product.

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