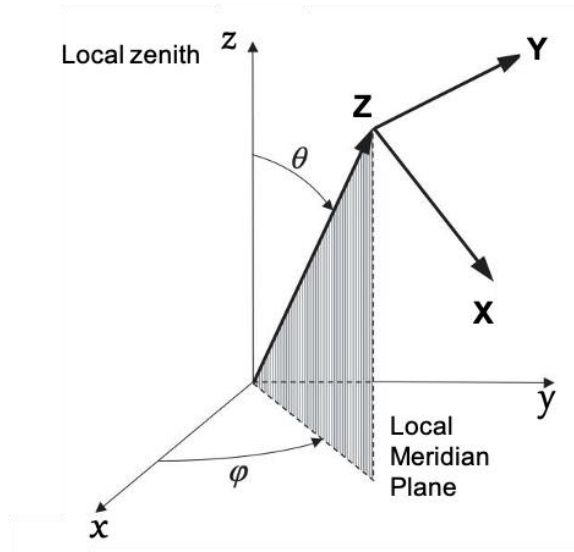Atmospheric
Measurement
Techniques

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Supplement of

Geostationary Environment Monitoring Spectrometer (GEMS) polarization characteristics and correction algorithm
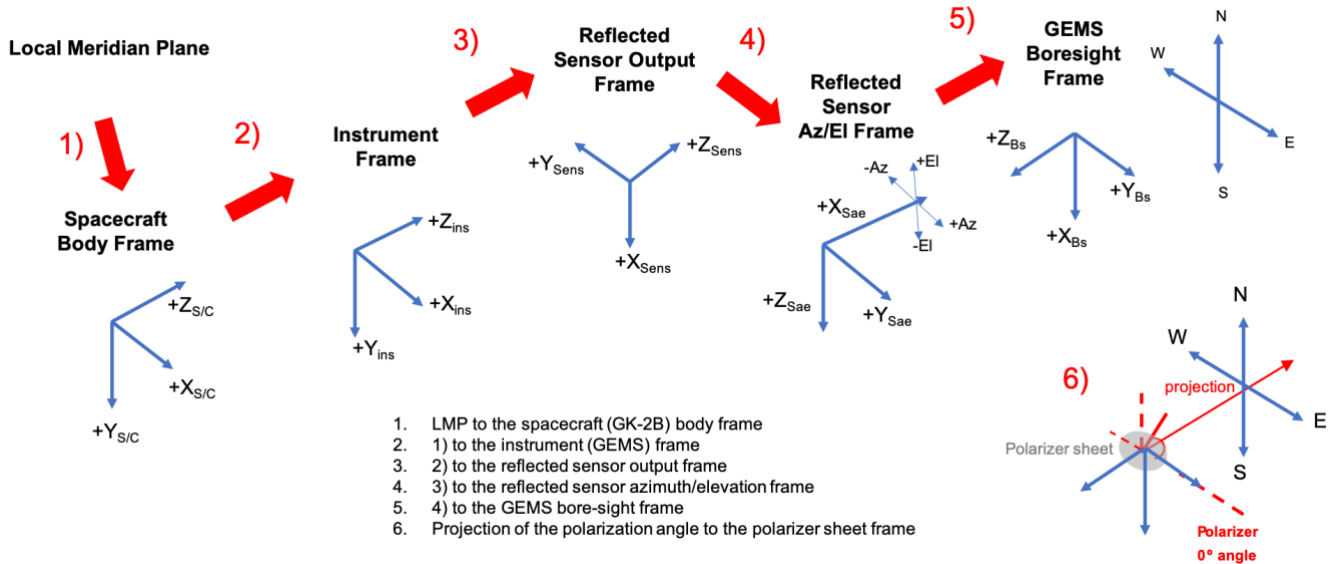
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Figure S1: The description of geometric coordinate to determine the polarization angle via local meridian plane (LMP).

1. LMP to the spacecraft (GK-2B) body frame
2. 1) to the instrument (GEMS) frame
3. 2) to the reflected sensor output frame
4. 3) to the reflected sensor azimuth/elevation frame
5. 4) to the GEMS bore-sight frame
6. Projection of the polarization angle to the polarizer sheet frame

Figure S2: Schematic diagrams of the orientation of the coordinate axes of each part inside the GEMS payload. The polarization angle defined for the local meridian plane (LMP) is defined for the polarization angle relative to the instrument reference plane (IRP) by sequentially rotating for each part's coordinate axis.
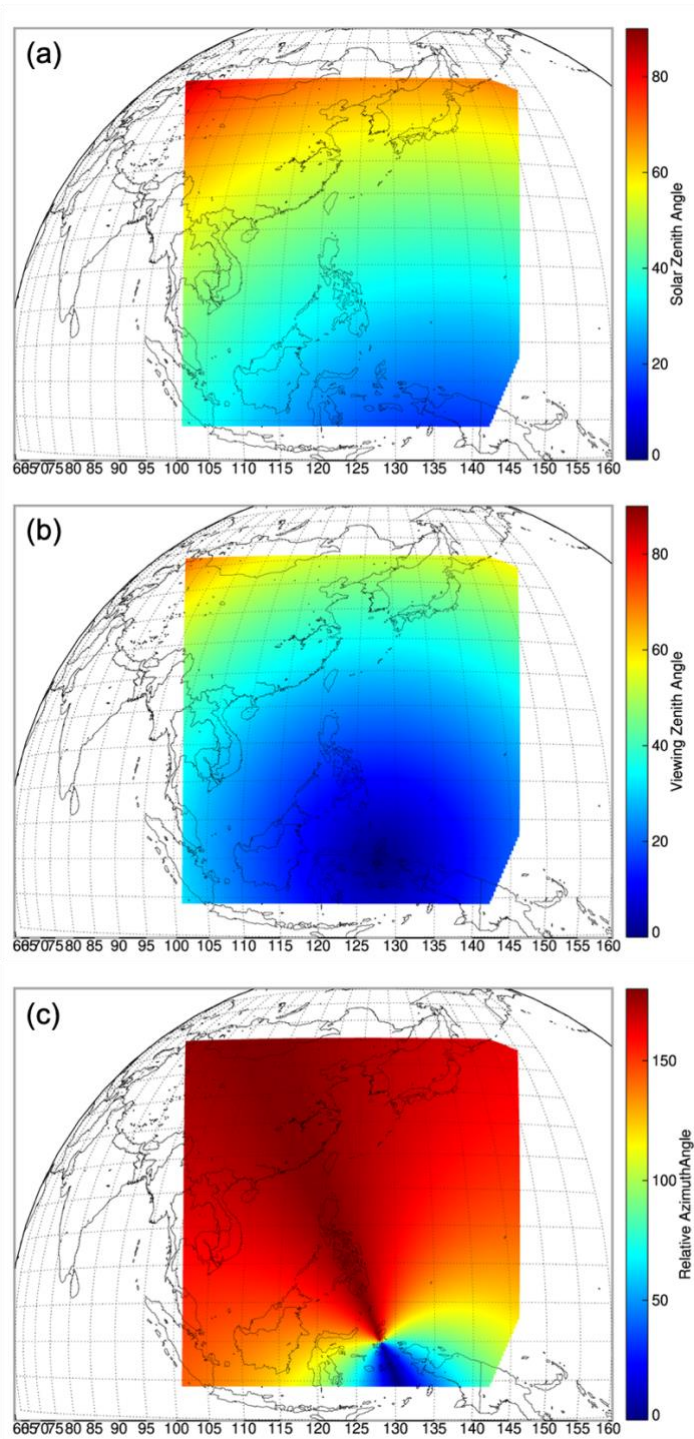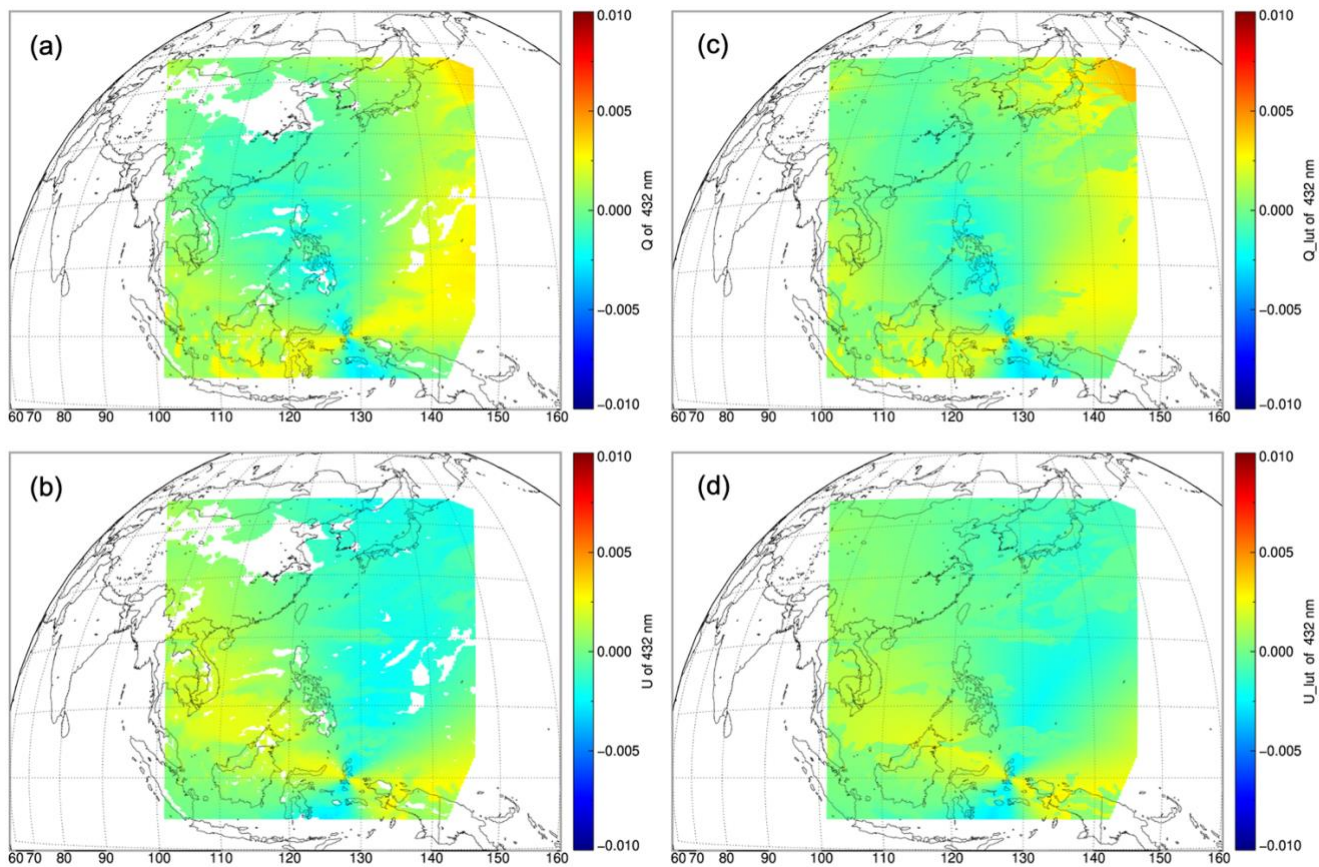
Figure S3: The satellite-sun geometry for (a) solar zenith angle (SZA), viewing zenith angle (VZA), and relative azimuth angle (RAA) to simulate the synthetic data. The synthetic data was simulated for the January 15, 2016 at 03:00 UTC.

Figure S4: Comparison of spatial distributions of Q and U at 432 nm (a, b) simulated by a radiative transfer model (RTM) for synthetic data with those (c, d) estimated based on look-up tables (LUTs) as described in the main manuscript.

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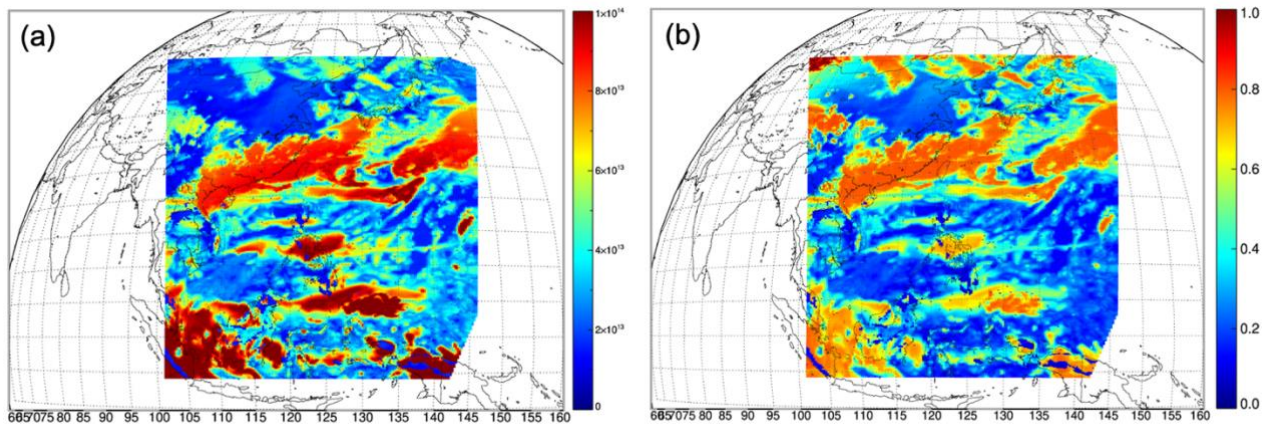
40 **Figure S5: Spatial distributions of (a) radiance and (b) reflectivity at 432 nm. In this study, the clear sky was defined as a region with a reflectivity less than 0.2.**