Determining Earth’s outgoing radiative flux from a Moon-Based Wide Field-of-view Radiometer

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Observing the Earth radiation budget (ERB) at top of the atmosphere (TOA) from space is crucial for monitoring and understanding Earth’s climate. The accurate estimation of Earth’s outgoing radiative flux is of critical importance to studying ERB at TOA. The Moon-based wide field-of-view radiometer (MWFVR) can provide long-term, continuous full-disk broadband irradiance measurements, which provides an important data source for studying the ERB. Within this context, the lunar surface site 0° E 0° N is selected as the position of the Moon-based wide field-view radiometer, and based on the radiation transfer function, the entrance pupil irradiances time series are obtained by utilization of the CER_SYN1deg-1Hour_Edition4 data products and ERBE ADMs, which is used as the substitute for the truth of the measurements. In this work, the Earth outgoing radiative flux estimating model from the MWFVR measurements is established, and according to the framework, the entrance pupil irradiances are converted to full-disk LW and daytime SW outgoing radiative fluxes. By comparing the results from Moon-based radiometer measurements with those from NISTAR data and CERES SYN1deg data, the results show the moon-based data a much better agreement with those from the satellite data. Besides, The Moon-based SW fluxes oscillate around 194 and 205 W·m⁻², and the range of LW fluxes is 251 ~ 287 Wm⁻². Therefore, the complementary advantages and cooperative work of platforms at different altitudes will be an important way for future research on the ERB.