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Three years of lightning observations from the Lightning Imaging Sensor (LIS) on the International Space station (ISS) and Comparison with Tropical Rainfall Measuring Mission (TRMM) LIS observations

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Abstract

As a follow-on to the long-lived (17 years) Lightning Imaging Sensor (LIS) on the Tropical Rainfall Measuring Mission (TRMM) satellite, a space-qualified LIS built as a flight-spare for TRMM has been operating on-board the International Space Station (ISS) since 27 February 2017. The ISS LIS observes lightning on the earth between ± 54 latitude compared to the ± 38 latitude limits observed by TRMM LIS, thus extending the latitudinal coverage of lightning observations. A number of changes had to be made to the LIS processing algorithms to obtain proper timing and geolocation of the ISS LIS data. Coincident observations with other lightning detection systems confirm that the ISS LIS lightning observations exhibit sub-millisecond ISS LIS timing accuracy and sub-pixel (~ 2 - 2.5 km) location accuracy.

Preliminary lightning climatology derived from 2 years of ISS LIS observations compares favorably to the 17 year TRMM LIS climatology. The ISS LIS climatology at present does not account for the periodic rotation of solar panels within the field of view. A method to account for this periodic field of view obscuration is being implemented and the 3 year results will have this correction applied. Even without the correction, global lightning flash rates obtained by ISS LIS (41.1 fl/s) are very similar to TRMM LIS (40.7 fl/s). The phase and magnitude of diurnal distribution patterns of lightning are also very similar. In addition, lightning statistics (radiance, flash duration, etc.) compare favorably between the TRMM and ISS LIS.

Topic Areas

Lightning Detection from Space: Performance, Research and Applications

Submission Format

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