

Optical and Radio Observation of Lightning from Space

Lightning is an electrical discharge inside thunderstorm and emits broad range of electromagnetic waves from DC to gamma ray. Optical and radio observations are widely used to investigate the physical characteristics of lightning discharge, and especially the location of the source of the emission is determined from these observations, which gives us practical applications. The first observation of lightning from space was enabled by the Japanese ISS-b satellite, and was a byproduct of the satellite's original purpose. Nevertheless, this mission firstly showed the possibility of lightning observations from space. After that, the first satellites specifically designed for observing lightning are the OTD (Optical Transient Detector) and LIS (Lightning Imaging Sensor) aboard the Tropical Rainfall Measuring Mission (TRMM), which clearly show the global distribution of lightning, a global lightning rate of about 50 flashes/s and so on. These optical sensors have a successful detection efficiency of more than 90 percent. They reveal not only time-varying global distribution of lightning, but also that the data on lightning can be assimilated into weather prediction models. Based on these results, lightning measurements from geo-stationary was planned and launched in 2017 from the United States. In Japan, the Global Lightning and sprItE MeasurementS (GLIMS) on the International Space Station (ISS) was launched in 2012 successfully to detect and locate optical transient luminous events (TLEs) and its associated lightning simultaneously from the non-sun synchronous orbit. In this presentation, firstly an overview of lightning discharge is given based on some examples of radio and optical observations conducted so far, and then some projects on satellite observation of lightning in the US and Japan are introduced.