Retrieval Algorithm of GK-2A Nighttime Cloud Optical Thickness

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Cloud optical thickness (COT) is one of the major products that determine the water content of the cloud, which is crucial for the numerical weather forecasts or climate models. COT is the ratio of incident to transmitted radiant power through the cloud, which is an increasing function of path length. COT from satellite observation is commonly retrieved using shortwave channels. Their valid range is about 0 - 100 or more (averaged global cloud optical thickness is known to be around 10). However, they are limited to daytime because solar radiation is the source of the shortwave which is essential to calculate them. In order to supplement the weakness, there are attempts to obtain COT from infrared (IR) channels. IR radiances exist regardless of the time, which are independent of the sun. Therefore COT retrieved from IR in GK-2A is called as nighttime cloud optical thickness (NCOT) to emphasize its valid time includes nighttime. However NCOT over 8 is sensitive to small change of 10.4 µm cloud emissivity, so the valid range is limited to 0 - 8. COT generally indicates COT at visible 0.6µm (VIS0.6), so GK-2A NCOT algorithm converts calculated IR COT to VIS0.6. As conversion equation is the key of this algorithm, we have tested to find the equation to improve the accuracy. The primary version of the algorithm uses extinction efficiency ratio as a single constant. After several tests, we found the relationship between 10.4 µm cloud emissivity and VIS0.6 COT depends on viewing zenith angle and it is quadric.

Key words: GK-2A, NCOT, cloud retrieval algorithm, cloud optical thickness

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