CGMS-37 KMA-WP-12

Prepared by KMA
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Operational Analysis of Fog Detection at KMA

This paper is the Operational Fog and Low Cloud Analysis at KMA. KMA has been using the GEO as well as LEO for operation fog and low cloud analysis since 2005. DCD is basically used for fog and low cloud detection due to their emissivity difference on low stratus. The probability of fog area is determined by comparison between surface temperature and 11㎛ brightness temperature.

DCD : Dual channel difference between 11㎛ and 3.7㎛

Operational Fog and Low Cloud Analysis at KMA

1. Introduction

KMA has operated manual observation and satellite data analysis to detect fog and low cloud. The satellite monitoring of fog and low cloud is based on dual channel difference (DCD) method using thermal infrared and short wave infrared channels from MTSAT-1R and NOAA. The brightness temperature of short wave infrared channel is lower than that of thermal infrared channel, since the former channel is not a black body to lower stratus cloud but a gray body.

2. DCD method for fog and low cloud

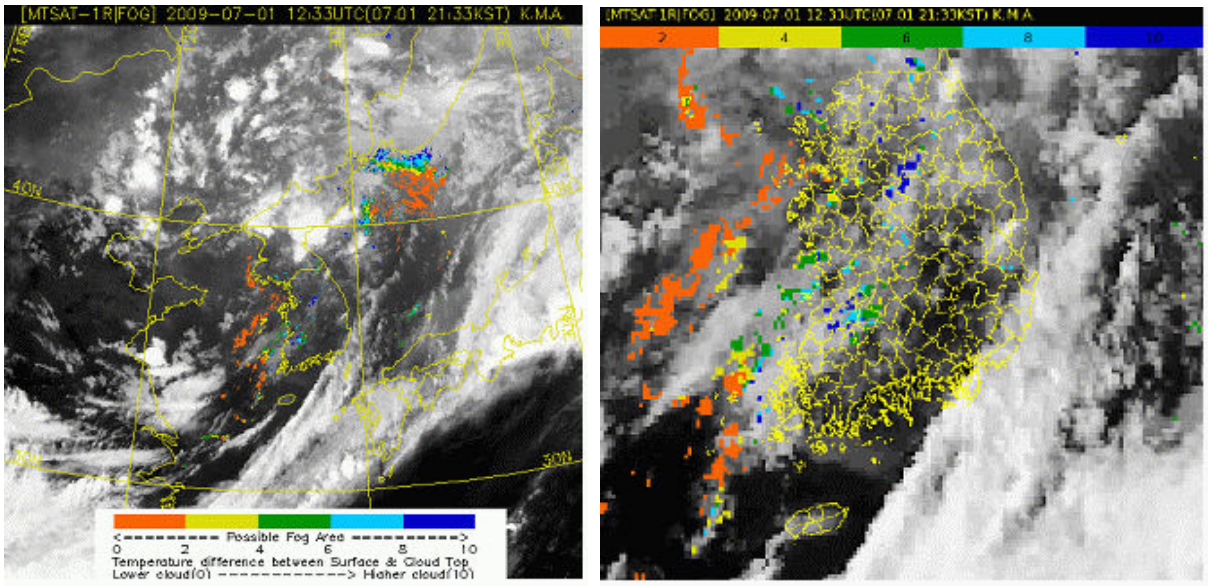
Operational Analysis using MTSAT-1R and NOAA

- Dual channel difference (DCD): using the difference of brightness temperatures between 11㎛ and 3.7 ㎛ IR channels of MTSAT-1R.
- When the values (3.7㎛-11㎛) are between -9.5 and -2.5, the designated pixels are assigned to fog and low cloud.
- The fog and low cloud are classified to five different sectors by comparing with land or sea surface temperature. The less difference between 11㎛ temperature of the designated pixel and land or sea surface temperature, the higher the probability of the fog area. The detail criteria are shown in the table below.

3. Criteria of fog and low cloud and fog detection images

Table 1. Criteria of fog area classification

	Land	Sea
3.7㎛ DCD	-9.5 < (3.7㎛-11㎛) < -2.5	
Criteria	D=LST-11㎛ D < 2 → Orange 2 ≤ D < 4 → Yellow 4 ≤ D < 6 → Green 6 ≤ D < 8 → blue 8 ≤ D < 10 → cyan	D=SST-11㎛ D < 2 → Orange 2 ≤ D < 4 → Yellow 4 ≤ D < 6 → Green 6 ≤ D < 8 → blue 8 ≤ D < 10 → cyan



Fog detection images, area around the Korean peninsula (left) and Republic of Korea (right) with administrative district lines.

4. Future plan

Future plan for Operational Analysis using GEO (COMS and/or MTSAT-1R)

KMA have been newly developed an algorithm to detect fog as a part of CMDPS (COMS Meteorological Data Processing System). The new algorithm includes DCD method and empirical one to classify as fog in twilight zone;

- In twilight zone, the algorithm does not use DCD method but the empirical method.
- The empirical method reapplies fog area in a previous image to the post image.

The satellite fog detection data are validated by comparison with the ground truth data, such as hourly manual observation data and automatic visibility data.