Geophysical Research Abstracts
Vol. 19, EGU2017-10969, 2017
EGU General Assembly 2017


# Development of hybrid fog detection algorithm (FDA) using satellite and ground observation data for nighttime

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In this study, we developed a hybrid fog detection algorithm (FDA) using AHI/Himawari-8 satellite and ground observation data for nighttime. In order to detect fog at nighttime, Dual Channel Difference (DCD) method based on the emissivity difference between SWIR and IR1 is most widely used. DCD is good at discriminating fog from other things (middle/high clouds, clear sea and land). However, it is difficult to distinguish fog from low clouds. In order to separate the low clouds from the pixels that satisfy the thresholds of fog in the DCD test, we conducted supplementary tests such as normalized local standard derivation (NLSD) of BT11 and the difference of fog top temperature (BT11) and air temperature (Ta) from NWP data (SST from OSTIA data). These tests are based on the larger homogeneity of fog top than low cloud tops and the similarity of fog top temperature and Ta (SST). Threshold values for the three tests were optimized through ROC analysis for the selected fog cases. In addition, considering the spatial continuity of fog, post-processing was performed to detect the missed pixels, in particular, at edge of fog or sub-pixel size fog. The final fog detection results are presented by fog probability (0∼100 %). Validation was conducted by comparing fog detection probability with the ground observed visibility data from KMA. The validation results showed that POD and FAR are ranged from 0.70 $\sim$ 0.94 and 0.45 $\sim$ 0.72, respectively. The quantitative validation and visual inspection indicate that current FDA has a tendency to over-detect the fog. So, more works which reducing the FAR is needed. In the future, we will also validate sea fog using CALIPSO data.