S06-2

Detection of convective overshooting tops using MSG SEVIRI, Himawari-8 AHI, and CloudSat CPR data

Miae Kim(1), Jungho Im(1), Seonyoung Park(1), Sanggyun Lee(1)

(1)Ulsan National Institute of Science and Technology (UNIST)

The clouds that penetrate into the tropopause and grow to the bottom of stratosphere at the top layer of cumulonimbus with very strong updraft are referred to as Overshooting Tops (OTs). The cumulonimbus clouds with OTs can cause severe weather conditions such as ground lightning, large hail, strong winds, and heavy rainfall. Turbulence and lightning occur very frequently in the area near OTs. Thus, OTs are a very important risk factor for aviation operations. Especially, Federal Aviation Administration reported that 509 cases out of 4326 cases of weather-related events were caused by turbulences from 1992 to 2001. Therefore, detecting OTs is very crucial to predict the degree and location of severe weather conditions such as turbulence and lightning. There are two widely used methods to detect OTs using multispectral images. One is a Water Vapor-InfraRed window channel Brightness Temperature Difference (WV-IRW BTD) approach, which uses the differences in brightness temperatures at an infrared channel (about 11 ㎛). The other is an InfraRed Window texture (IRW-texture) method based on the characteristics of OTs that appear a group of pixels with low temperatures. In this study, an improvement to the IRW-texture algorithm was evaluated. While the typical IRW-texture approach uses simple thresholds to detect OTs, we tested machine learning approaches with various variables from geostationary satellite data such as MSG SEVIRI (over Africa) and Himawari AHI (over East Asia) to improve OT detection. Reference OT samples were extracted using CloudSat cloud profiling radar data. The results from the machine learning approaches were compared with those from the original IRW-texture algorithm as well as WV-IRW BTD. CloudSat and available lightning data were used for quantitative assessment of detected OTs.