Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

ACG40-P01 Room:Convention Hall Time:May 19 18:15-19:30

Utility of operational meteorological data to diagnose environmental conditions for local-scale convective rain events

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Local-scale convective rain events develop rapidly and sometimes spawn water-related disasters. Densely populated urban areas are vulnerable to such disasters due to the local-scale convective rain events. From the perspective of disaster prevention and mitigation, the prediction and diagnosis of local-scale heavy rain events are critically important. In general, such local-scale heavy rain events occur under the influences of synoptic-scale weather disturbances such as typhoons and fronts; but they do develop without the influences of such synoptic-scale disturbances. It is well known that cumulonimbus clouds develop in the afternoon under synoptically undisturbed conditions; however, it is quite difficult to predict and diagnose the intensity of cumulonimbus clouds and when and where those cumulonimbus clouds develop. To overcome this difficulty, research projects that deploy a local-scale dense observation network and merge those high-resolution observed data to numerical weather prediction models are currently underway; these projects in general require a large amount of material and human resources. On the other hand, operational meteorological data compiled by Japan Meteorological Agency (JMA) can be used by research community outside JMA. We have been investigating mesoscale meteorological phenomena by use of the JMA operational data (Nomura and Takemi 2011, SOLA) and the outputs of the JMA/MRI climate simulations with a global warming scenario (Takemi et al. 2012, JMSJ). In the present study, we discuss the utility of operational meteorological data for local-scale analysis by investigating the characteristics of local-scale rain events and their environments under synoptically undisturbed conditions in summer. We focus on the rain events in the Nobi Plain during July and August after the end of the Baiu periods. We statistically analyze Radar-AMeDAS analysis precipitation, AMeDAS surface observations, radiosonde upper-air observations, and mesoscale objective analysis data (MANAL) during the period of 2003 and 2010. The diurnal and regional characteristics of the rain events and the relationship with surface wind and temperature fields are shown. After examining the representation and validity of the MANAL data with the upper-air observations at Hamamatsu, the environmental conditions over the Nobi Plain and the surrounding regions are investigated. By comparing the environmental conditions with and without the rain events, we show that the middle-level moisture contents control the development of local-scale convective rain events in the Nobi Plain. The utility of the operational meteorological data for the mesoscale analysis is demonstrated. We should recognize the utility of the JMA data both for operational and research perspectives; the JMA dataset is our national important property that nothing can be its substitute.

Keywords: Local-scale rainfall, precipitation, environmental condition, operational meteorological data, Japan Meteorological Agency

ACG40-P02 Room:Convention Hall Time:May 19 18:15-19:30

Improvement of the cloud top database based on geostationary satellite observation

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Stratiform clouds (nimbostratus and cirriform clouds) in the upper troposphere accompanied with cumulonimbus activity extend in the large part of the tropical region and largely affect the radiation and water vapor budgets there. Recently new satellites (CloudSat and CALIPSO) can give us the information of cloud height and cloud ice amount even over the open ocean. However, their coverage is limited just below the satellite paths; it is difficult to capture the whole shape and to trace the lifecycle of each cloud system by using just these datasets. We made, as a complementary product, a dataset of cloud top height and visible optical thickness with one-hour resolution over the wide region, by using infrared split-window data of the geostationary satellites and released on the internet. (http://database.rish.kyoto-u.ac.jp/arch/ctop/).

We made lookup tables for estimating cloud top height only with geostationary infrared observations by comparing them with the direct cloud observation by CloudSat (Hamada and Nishi, 2010, JAMC). We picked out the same-time observations by MTSAT and CloudSat and regressed the cloud top height observation of CloudSat back onto 11micro m brightness temperature (Tb) and the difference between the 11micro m Tb and 12micro m Tb. We will call our estimated cloud top height as "CTOP" below. The area of our coverage is 85E-155W (MTSAT2) and 80E-160W (MTSAT1R), and 20S-20N. We briefly introduced the first version of the product in the JPGU meeting 2012.

We compared the cloud top statistics between our CTOP product and CloudSat 2B-GEOPROF data. In the upper troposphere above 11 km, the distribution of cloud top in CTOP has good agreement with that in CloudSat direct observation both seasonally and longitudinally. Next, we tried to extend the analysis into the middle troposphere (6-11 km), where we have not estimated how CTOP can be reliable. We found that the number of such cloud systems is not constant with seasons but frequently increased in some specific seasons in both datasets. However, the large discrepancy between the datasets was detected near the edge of MTSAT view. It is probably due to the effect of the thin overlapped clouds in the upper troposphere which has longer optical path in the condition of large zenith angle near the edge of the view.

We are now making a new version of the dataset. Major revisions are made on the following points: Exclusion of the CloudSat pixels with no-cloud when making lookup table (LUT). Maybe due to imperfect matching between MTSAT sample and CloudSat sample and presence of the optically thin cloud that cannot be observed by CloudSat, some cloud-free pixels of CloudSat have lower Tb value than that of fine-weather pixel. In revised version, we will exclude such pixels for regression. It improves the estimation in the parameter range where the estimation error is large in the first version. We also conducted the geometric adjustment when regressing MTSAT data with CloudSat data. Edge region of MTSAT picture has satellite zenith angle larger than 60 degree. Therefore, the cirrus whose height is larger than 10 km is recorded to the position where is shifted several grid from the actual place. We will take into account the shift when making LUT. We introduce the improvement in the estimation from the previous version.

Keywords: geostationary satellite, cloud top, infrared radiation, tropical atmosphere

ACG40-P03 Room:Convention Hall Time:May 19 18:15-19:30

Discussion for more effective data sharing

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For better understanging of the Earth environments, maximal utilization of data is essential. However only limitted (well documented) datasets are used for analysis. In this presentation, I will show the standing points for more effective data shareing, to take into account for the point of views in ”top-down” and ”bottum up”. I hope that such standing points are usefull for the discussion in this session.

Keywords: data sharing, bottom up, top down

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ACG40-P04 Room:Convention Hall Time:May 19 18:15-19:30

Atmosphere-Ocean Coupled Ensemble Analysis: CLERA

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An atmosphere-ocean coupled ensemble analysis: CLERA (CFES-LETKF Experimental ReAnalysis) is introduced.

Keywords: Atmosphere-Ocean Coupled, Ensemble Analysis