[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-AS Atmospheric Sciences, Meteorology & Atmospheric Environment

[A-AS04]Towards integrated understandings of cloud and precipitation processes

convener:Kentaroh Suzuki(Atmosphere and Ocean Research Institute, University of Tokyo), Yukari Takayabu(Atmosphere and Ocean Research Institute, the University of Tokyo), Hirohiko Masunaga
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Clouds and precipitation are among the largest uncertainties in weather predictions and climate projections. To overcome this difficulty, substantial progresses are required in understandings of cloud and precipitation processes and their interactions with large-scale environment. Such progresses, however, have been hampered by historical separation of the science community into two, namely, one for clouds and the other for precipitation, despite the fact that clouds and precipitation are inseparable phenomena.
This session aims to integrate various studies of clouds and precipitation across the two communities over different spatial and temporal scales. A particular focus is placed on better understandings of fundamental processes governing the cloud and precipitation phenomena and their multi-scale interactions with environment through dynamical, thermodynamical and radiative processes. A wide variety of studies with theoretical, modeling and observational approaches are solicited in this session to seek a novel way for combining different methodologies to obtain unified, holistic understandings of the cloud and precipitation systems. The solicited area of research includes but is not limited to cloud microphysics, cloud-radiation interaction, convection dynamics, meso-scale phenomena and various multi-scale interactions including tropical aggregation of clouds, by means of a breadth of approaches encompassing in-situ and satellite observations, theoretical process studies and numerical modeling. Through discussion of presented papers, the session is also intended to enhance collaborations among different disciplines and communities for substantially advancing our understandings of cloud and precipitation processes.

[AAS04-P02]Characterizing Vertical Particle Structure of Precipitating Clouds from CloudSat and CALIPSO Satellite Observations

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Keywords:cloud radar, lidar, satellite, cloud observation, precipitation observation

Cloud-precipitation process takes one of the key roles in the climate system. The formation of precipitating system is especially important in the water cycle of the Earth. The precipitation system also influences the radiation budget of the Earth through the interaction with its cloud fields. Thermodynamic particle generation is an essential factor in the precipitation formation as it influences the life cycle of the precipitating cloud system through physical mechanisms such as latent heat release and aggregation processes.

In this study, we investigated the vertical hydrometeor particle type structure of precipitating cloud systems. Here, the hydrometeor particle type indicates cloud/precipitation phase and ice crystal shapes. Following the past works by Masunaga et al. 2008 and Matsui et al. 2016, we classified the precipitating cloud regimes into the following five categories: Shallow Warm, Shallow Cold, Mid Warm, Mid Cold and Deep. For the classification of the precipitating cloud regimes, the previous studies employed cloud top height from the

Visible and Infrared Scanner (VIRS) and precipitation top height form the Precipitation Radar (PR) onboard the TRMM satellite. Here in this study, we determined the cloud and precipitation top heights from the CloudSat and CALIPSO observations to extend the analysis from the tropics to global. To determine the vertical particle structure, the hydrometeor particle type classification is also utelized from the CloudSat and CALIPSO using the algorithm developed by Kikuchi et al. 2017. While deep convective system was found to have relatively simple structure, dominated by randomly-oriented ice cloud, followed by snow and melted rain at the bottom, shallow cold system having moderately-thick cloud layer with low precipitation underneath consisted variety of particles, accompanying an addition of ice-plates and drizzles. The representative vertical profiles for all five categories will be given in the presentation. Furthermore, the cloud-top buoyancy estimation by Luo et al. 2008 using MODIS is investigated to address how cloud-top buoyancy effect the vertical profiles of precipitating cloud regimes.