UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences Seminar Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

The Cloud-Top Features of Atmospheric Deep Convection

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You are invited to our weekly online Atmospheric Sciences Spring 2022 seminars via Zoom meeting.
When: January 12, 2022 at 3:30PM HST
Meeting admission: 3:15PM HST

Register in advance for this meeting:
https://hawaii.zoom.us/meeting/register/tJcof--qqjMiEtXX9J8yHV3K8NrAjdJsakyN

After registering, you will receive a confirmation email containing information about joining the meeting. Please save this information for future seminars.

Abstract:

Convective system plays an important role in the global climate including: hydrological cycle; radiative budget; and vertical energy transportation. It is usually associated with severe weather hazards, particularly deep convective clouds. Due to the fast development and short lifecycle, it is difficult to understand the characteristics of convections. This research examines the development of the deep convective cloud over the South China Sea (SCS) and Taiwan during June 2017 using high spatial-temporal geostationary satellite Himawari-8. We track and select convective cases by detecting minimum brightness temperature from 11 μm infrared channel as the cumulus center. Additionally, to investigate the differences in the characteristics of the cloud top from generation to mature, we separate the developing convective lifetime into three stages—Pre-CI, CI, and mature—by using the convective initiation signal.

The cloud top vertical velocities (CTW) are estimated by calculating the change in the cloud top height (CTH), which are found to be clustered 0-4 m s^{-1} and could reach more than 10 m s^{-1}. The value of CTW tends to increase with height when CTH below 10 km. During the mature stage, regardless of location, frequency is highest when CTW values are large. The cloud optical thickness (COT) is mainly distributed between 0–20 and, with the increase of CTH, the higher occurrence frequency shows a lower value of COT. Over Taiwan, the higher value of COT (> 30) occurs frequently in SCS. Furthermore, the cloud effective radius (Re) is mainly distributed between 20–30 μm. When the CTH is lower than 8 km, the Re in SCS is larger than in Taiwan and on mature stage, the Re decreases with development of CTH. In Taiwan, Re is frequently more than 60 μm. Further analysis shows that the stronger the CTW, the harder it is for convective clouds to develop larger COT and RE.