



Observational research study around tropical Western Pacific: PALAU (Pacific Area Long-term Atmospheric observation for Understanding climate change) project

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The warm water pool region in the tropical Western Pacific is a key area for global climate systems, as strong atmospheric convective activity in this area is the driving engine of the atmosphere. However, there are many processes between meso-scale convective activities and the global-scale climate, and these are not fully understood yet. To understand the mechanism of clouds-precipitation processes and air-sea interactions over the warm pool in the tropics, there are in need of further investigation on the Western Pacific monsoon and the tropical-extratropical interactions. Toward these objectives, we have continued a long-term observational project named PALAU (Pacific Area Long-term Atmospheric observation for Understanding climate change) around the tropical Western Pacific near the Republic of Palau. The main target of this project is to describe multi-scale interactions of cloud systems to intra-seasonal oscillations affected by monsoon activities. To elucidate the structure of tropical cyclones, which occur over a monsoon trough near Palau, is also a major interest.

Since November 2000, we have been continuously operating a surface weather observation site in Palau. We also have conducted several intensive field campaigns targeted for various phenomena. PALAU2013, one of the intensive campaign, was carried out to focus on the formation mechanism of tropical cyclones and their relation to intra-seasonal oscillations and monsoon activity over the tropical Western Pacific. During the campaign, R/V Mirai was placed near Palau and conducted atmospheric and oceanic observations using Doppler radar, radiosonde, CTD and so on. Daily profiling Argo-floats were deployed for analyzing air-sea interactions. To capture the monsoon activity with wide area, we constructed intensified sounding network from Philippines, Palau, and Yap to Guam. Three X-band radars were utilized to obtain the internal structure of cloud systems. Dual-polarization parameters also can be captured to the direction of hydrometeor video-sonde (HyVIS) launching.

From the results of PALAU observations, it is indicated that the variability of monsoon activity and ENSO were strongly affected to the structure of convections over the warm pool region. Formation of the initial stage of tropical cyclones are frequently observed around Palau. In the case of PALAU2013, three events of the early stage of tropical cyclone were captured in one month. All of the initial disturbances corresponded to a kind of easterly waves with vortical structures, and after passing through Palau, they developed to the typhoons on the Philippine Sea. Because these typhoons caused strong surface westerly winds in the formative period, they represented a close relation with the monsoon onset and the intensification of the activity of intra-seasonal oscillations over the tropical Western Pacific.

Now we also have a plan of intensive observation in 2018 boreal summer, one of a part of YMC (Years of the Maritime Continent) campaign, around the tropical Western Pacific.