

A study on the meteorological condition associated with very deep rainfall in an open ocean at the fringe of the SPCZ

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Very deep rainfall events, not quite usual over the ocean, has been observed over some parts of open oceans such as at the southern fringe of the South Pacific Convergence Zone, with accumulation of three dimensional observation of rainfall with the TRMM PR (Takayabu, 2006). In order to clarify why such deep rainfall are observed over such an open ocean, we focused on a small region near Fiji and picked up all " deep rainfall events " defined with a ratio of precipitation with precipitation top height above 8km, and analyzed the meteorological condition around the events. As a result, 35% of the events were associated with tropical cyclones, while 56% of events were occurring under weather condition when the region is covered by surface high pressures. We named the latter ones as " high pressure type deep precipitation " , and analyzed their environmental meteorological conditions. Although we have focused on a very small limited region over the ocean, we could obtain as large as 3000 km scale tri-pole structure of precipitable water anomaly in the atmosphere associated with the " deep type rainfall events " . With further detailed analyses, statistically significant occurrences of a coincidence of a deep barotropic anticyclonic circulation in the troposphere in intraseasonal frequency, with approaching transient high pressure systems were observed to make up the large-scale tri-pole structure of precipitable water anomaly. In addition, there was found a simultaneous extension of upper level trough which is associated with low temperature anomaly to the mid-level troposphere to make the atmosphere more unstable. The analysis region at the southern fringe of the SPCZ is a region with relatively high sea surface temperature and unstable atmospheric stratification. In such region, it is suggested that additional dynamical forcing preferable to convection realized the occurrences of deep rainfall similar to those over land, even over an open ocean.

Keywords: TRMM, deep rainfall, meteorological condition, SPCZ, midlatitude transient disturbance, upper tropospheric trough