Precipitation structure during the life cycle of cloud systems over Peru using satellite based observations

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In the present study, a unique approach is applied to investigate the life cycle properties of the precipitation combining the satellite-based information. Data from Global Precipitation Measurement Dual Precipitation Radar (GPM-DPR) and brightness temperature (BT) form the GOES satellite. First, we used the GPM-DPR data to identify the precipitating cloud systems (PCSs) and then 9 (± 4 hours) hours of GOES BT data to identify the life phases for a particular PCSs e.g., a developing stage, a mature stage, or a dissipating stage. The case study of PCS related to different phases of the PCSs shows that PCSs consist of different systematic properties including the area of convective-stratiform precipitation, the convective rain rate and the storm-top height. The developing stage PCSs have the highest convective precipitation fraction (~26%) with highest near surface rain rate (RR, 4.97 mm h⁻¹), whereas the dissipating stage PCSs have the largest precipitation area (11489 km²) with least near surface convective RR (~4.11 mm h⁻¹). The vertical structure of precipitation and raindrop size distribution (DSD parameters) show the different characteristics above and below the freezing level and related with the different microphysical processes during different stages and related with the convective to stratiform area fraction and water vapour. The developing stage PCSs have the largest but sparse, droplets in convective precipitation, whereas the mature stage has the largest droplets below in the freezing level for all the vertical rainy profiles. The developing stage PCSs have the highest concentration of least sized of hydrometeors. Also, north-eastern continent of SA has higher near surface RR with higher sized of hydrometeors and even higher in developing stage PCSs. Our analysis indicates that the different microphysical properties for the PCSs in different phases are related to cloud and ice water path upward motion and related to the orographic influence.