Uncertainties in the estimation of precipitation from GPM-DPR satellite over the Andes from ground based Ka-band profiler perspective

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Improving the estimation of rainfall intensity from spaceborne sensors remains a challenge, even more in places of complex topography such as the Andes, where the rain network is much scarcer and less representative than other areas. There are great expectations for uses of satellite estimates, however these can not yet replace traditional rain gauges. In order to obtain atmospheric data to study the physical processes associated with water and energy balance; in 2015 the Instituto Geofísico del Perú implemented the Atmospheric Microphysics And Radiation Laboratory (LAMAR), Huancayo Observatory (12.0ºS, 75.3ºW, 3313 m asl). As part of LAMAR, a Ka-band profiler (MIRA35c) was installed.
In this work, we are comparing simultaneous observations between MIRA35c (35 GHz) and Dual-frequency Precipitation Radar (DPR) onboard the GPM core satellite (14 GHz and 35.5 GHz), with focus on KaPR. We presented an approach to estimate the averaging time to make a puntual observation closer to GPM footprint, based on Taylor's hypothesis of frozen turbulence. And we analyzed the 2016 - 2017 period, 26 overpass were collected and we found 3 events where GPM records precipitation.
We found that the blind zone over our study area is around of 1.2 km agl and he DPR clutter free bottom is overestimated, specially in stratiform rainfall. The mean melting layer height is 4.7 km asl over our study area and DPR clutter free bottom was flagged in average at 4.8 km asl in the whole period and 5.3 km when there is precipitation. In stratiform events the resulting rain rate slightly underestimated and better agreement for convective event were found. These results suggest that stratiform precipitation over 3 km asl in the central Andes would be under the blind zone effect and its estimation would be made using data above the melting layer. As result, it is expected underestimation in stratiform rainfall and a better or overestimation in the convective rainfall.

Keywords: Global Precipitation Measurement Mission (GPM), Dual-frequency Precipitation Radar (DPR), Ka band radar