Survey of global distribution of convection overshooting tropopause using first year GPM observations

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About a decade ago, the Tropical Rainfall Measuring Mission (TRMM) precipitation radar has observed the deep convection reaching above tropical tropopause dominantly over land, especially over central Africa (Liu and Zipser 2005). Since the launched in February 2014, the Global Precipitation Mission (GPM) satellite, the successor of TRMM, has provided more than one year space borne radar observations covering 65^{o}S-65^{o}N. Using the similar methodology of Liu and Zipser (2015), the global distribution of the convection reaching tropopause is surveyed again with one year GPM data. In addition to the confirmation of what TRMM has observed, significant differences in the occurrence of overshooting convection are found at mid to high latitudes in summer between Northern and Southern hemisphere. Several hotspot regions with frequent overshooting convection are present at mid and high latitudes in Northern land. They could have significant influences in the water vapor budget in the stratosphere there.