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## Application of GSMaP for the analysis of upper tropospheric radiative cooling over the Asian summer monsoon region

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The Asian summer monsoon system is the strongest monsoon circulation on the Earth. A huge reversal of meridional temperature gradient develops over the area covering the hemispheric region due to strong diabatic heating associated with convective activities. Vigorous convections reach the upper troposphere providing a great amount of high potential temperature air mass. This high potential temperature air mass originates from the high equivalent potential temperature air mass accumulated in the lower troposphere over the Asian monsoon region. The highest potential temperature tropospheric air mass is observed only over the Asian summer monsoon region. To get a total view of the Asian summer monsoon circulation system, we focused on the mass budget of the upper-tropospheric air mass with a potential temperature between 355K to 370K. The non-conservative change of the air mass corresponds with the diabatic heating due to the convective activities, and the diabatic cooling due to the radiative process. To analyze the radiative cooling process that takes place in the upper troposphere, we utilized hourly GSMaP pixel values to detect rain-free pixels of the ERA5 dataset. We calculated the non-conservative air mass tendency over the rain-free pixels on a daily and 0.5 degrees spatio-temporal scale. We found the radiative equilibrium amount of high potential temperature air mass and the Newtonian cooling process with a relaxation time scale of 6 to 7 days. We will show the quantitative estimates of the total convective process of the Asian summer monsoon system associated with the convective clouds and radiative processes, through the mass budget of 355K-370K potential temperature air mass. We will further show results of the evaluation of the accuracy of TRMM and GPM products using our high-resolution tipping bucket raingauge network distributed over the Northeastern Indian subcontinent.