# UTLS aerosol measurements over Japan within eastward shedding vortices coming from the Asian summer monsoon anticyclone

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The Asian summer monsoon (ASM) anticyclone develops over the Tibetan Plateau and surrounding regions in the upper troposphere and lower stratosphere (UTLS). Various pollutants emitted from the Asian countries are convectively transported to and accumulated in the ASM anticyclone, before being transported quasi-horizontally and widely to the global UTLS. The eastward transport from the ASM anticyclone often takes a form of eastward shedding vortices covering the whole Japanese archipelago, with a frequency of ~3 times per month. We investigate the aerosol characteristics of these vortices by analyzing data from the lidar systems at Fukuoka (33.55N, 130.36E) and at Tsukuba (36.1N, 140.1E) during the summer of 2018.

We found several events of enhanced particle signals at Tsukuba at 16~17.5 km (at or above the tropopause) during August-September 2018, with averaged backscattering ratio of ~1.10 and particle depolarization of ~5%. Each event had a time scale of a few days. During the same period, we observed similar enhanced particle signals at Fukuoka as well.

Backward trajectory calculations from these two sites, starting on the days with enhanced particle signals observed and on the days without separately, showed tendency that the former airmass came more from the region within the anticyclone while the latter came more from the edge regions.

The particle characteristics obtained from the lidar measurements are consistent with the solid ammonium nitrate (NH4NO3) particles from the ASM anticyclone as suggested by Hoepfner et al. (2019). But, there still is a possibility that particles originated from Ambae/Aoba Island in Vanuatu (15.389S, 167.835E) which erupted during 11-17 July 2018 are mixed in the airmass.

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