



Chemical perturbations from Asian summer monsoon in the extratropical UTLS during PHILEAS

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The Asian monsoon anticyclone (AMA) during northern summer is a major contributor to the transport of tropospheric air masses, rich in water vapour, aerosol precursors and surface emissions, into the UTLS. During previous HALO missions TACTS/ESMVal and WISE a significant impact of the monsoon export on the background composition of the lowermost stratosphere (LMS) could be observed. Recent observations during the research missions StratoClim and ACCLIP show evidence for a strong contribution of ammonium nitrate by the AMA to the UTLS aerosol budget and the Asian Tropopause Aerosol Layer (ATAL), likely relevant for cirrus cloud formation. These missions revealed that the northern central Pacific is a key region for the transition of air masses originating from the AMA and emissions from East Asia and China to cross the tropopause. Particularly, over the northern Pacific dynamical and diabatic forcings lead to a subsequent erosion of these eddies and to mixing into the background lower stratosphere.

We will present first results from the PHILEAS mission, which took place between August and October 2023 over Anchorage/Alaska and Europe. We found strong perturbations of the gas phase and chemical composition in the UTLS region. These perturbations can be linked to the Asian monsoon and east Asian pollution sources as well as to Canadian wild fires, which occurred prior and during the measurements.

Based on selected cases we will present clear evidence for cross tropopause transport and mixing of pollution from East Asian pollution and the AMA over the eastern Mediterranean as well as over the northern Pacific. We will show that these sources affected the aerosol as well as the gas phase composition of the lowermost stratosphere.

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