

Aircraft-based observations of transport tracers and ozone-depleting substances in and above the Asian monsoon.

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Recent studies show that the Asian summer monsoon could transport emissions from the rapidly industrialising nations in East and South Asia into the tropical upper troposphere (Oram et al., 2017). Further, air masses from the region of the Asian monsoon anticyclone have a significant impact on the chemical composition of the lower stratosphere of the Northern Hemisphere (Ploeger et al., 2017). Here we use measurements on over 100 air samples collected on multiple flights on the M55 Geophysica high altitude research aircraft over the Mediterranean, the Indian Ocean and subcontinent as well as the Himalaya during the summers of 2016 and 2017 as part of the StratoClim EU project. These air samples have been measured for 30-50 trace gas species many of which are ozone-depleting substances (ODSs). We present mixing ratios of a range of ODSs, many of which were enhanced above background conditions, including those of dichloromethane (CH₂Cl₂) and 1,2-dichloroethane (CH₂ClCH₂Cl). We derive the Equivalent Effective Stratospheric Chlorine (EESC) from these substances and compare it to other estimates in the literature in order to assess the potential impact on the ozone layer. Backward trajectories calculated with the trajectory module of the CLaMS model are used to identify the likely source regions of the air masses. We also derive the mean ages of the air from several inert trace gases and compare these, and their correlation with fractional release factors, with results from previous aircraft campaigns in different regions (Leedham Elvidge et al., 2018).

Key words: Asian monsoon, trace gases, age-of-air, ODSs, EESC

References

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