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Aerosol Transport from the Asian Summer Monsoon into the Arctic Lower Stratosphere

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The Asian summer monsoon is linked to deep convection over the Indian subcontinent and to an anticyclonic flow that extends from the upper troposphere into the lower stratosphere region. This allows both gas-phase aerosol precursors and aerosol particles from surface sources to reach the stratosphere. The horizontal transport out of the Asian monsoon anticyclone towards the extratropical lower stratosphere of the Northern Hemisphere is the focus of this study.

We present an annual record of Lidar observations at AWIPEV in Ny-Ålesund. The data record is free from obvious layers like polar stratospheric clouds, volcanic eruptions or forest fires. Nevertheless, the lower stratosphere reveals an annual cycle with lower backscatter values in winter and spring and higher backscatter values in summer and autumn. The Lidar measurements have been linked to backward trajectory calculations and simulations of artificial surface origin tracers with the three-dimensional Chemical Lagrangian Model of the Stratosphere (CLaMS). The simulations show that air masses observed above Ny-Ålesund have been transported from surface sources in Asia into the Arctic lower stratosphere. Thus, the increased backscatter values during summer and autumn can be explained by transport of aerosol particles from the Asian summer monsoon into the Arctic lower stratosphere.