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Chemical composition of the ATAL aerosol measured by in-situ particle mass spectrometry

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The Asian Tropopause Aerosol Layer (ATAL) has been found to be an aerosol layer with exceptionally high particle number concentrations in the UT/LS altitude range. During the StratoClim 2017 field campaign in Nepal we deployed the novel in-situ aerosol mass spectrometer ERICA (ERC Instrument for Chemical composition of Aerosols). It combines the methods of laser ablation mass spectrometry with flash vaporization/electron impact ionisation mass spectrometry in a single instrument to analyse the chemical composition of individual aerosol particles or small particle ensembles in the particle diameter range from 100 nm to 2 μm .

The quantitative analysis shows a strong contribution of ammonium nitrate (AN) to the ATAL aerosol concentration. In this layer, the AN concentrations can be as high as 1.5 μg per standard cubic meter. We present the vertical distribution of the mass concentrations of AN as well as other contributing species like sulphate and organics.

The single particle data from the laser ablation module of ERICA show a distinct particle type with nitrate and sulphate ions without the typical components of primary aerosol (soot, dust, metals) within the ATAL, indicating that a significant fraction of the ATAL aerosol consists of secondary particles formed in the upper troposphere.