



## **Polarized measurements and calibration of a multispectral polarimeter to derive aerosol optical properties**

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The Arctic environment is a very sensitive area to changes of climate conditions. The yearly mean temperature did raise on a much higher level compared to other regions of the Earth. Aerosol parameters such as type, number concentration, distribution or the aerosol optical depth can have impacts on the energy fluxes. Secondary effects on clouds and cloud formation have possible impacts on number concentration and cloud condensation nuclei. The characterization of the state of the atmosphere and the knowledge of aerosol parameters help to examine and understand such effects and processes.

The scattering function of particles strongly depend on type and size of the particles. During clean air conditions the pattern of the polarized atmospheric radiation of scattered Sun light differs strongly compared to Arctic haze, polluted or fog conditions. The derived scattering function can give information of type, particle number concentration and other aerosol related parameters.

Thus, polarization is an additional information source to improve radiative transfer retrieval methods. One way to describe polarization of the light is the Stokes vector. The multispectral polarimeter AMSSP (airborne multispectral sunphotometer and polarimeter) measures four intensities with different sets of polarized components simultaneously. Those intensities and a proper characterization of the components are needed to calculate the complete Stokes vector. All angles and further parameters of the polarization sensitive optical components were determined during laboratory calibrations. The characterization of the instrument is critical as small changes in the instrumental parameters result in incorrect Stokes parameters. Thus, a strong emphasis was taken on a correct wavelength depending characterization and calibration of the optical components.

Besides the characterization and calibration, first polarized measurements of the radiation during an Arctic ship cruise from May till July 2017 on the Polarstern (PS106) have been made and the Stokes vectors were calculated for the hemispherical radiation field. Results can be compared to radiative transport simulations to retrieve e.g. aerosol information.