



Development and application of a new star photometer for measuring aerosol optical depth at harsh environments

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Aerosols are known to have a significant influence on the radiative balance of the Earth. However, the knowledge of the physical and radiative properties of aerosols, horizontal and vertical distributions as well as temporal variability still remains insufficient. Uncertainties in radiative forcing due to aerosols are still very large. Photometry with the sun as light source is a technique widely applied for the determination of aerosol parameters of the atmosphere. In addition to the sun, also stars can be used as extraterrestrial light sources. In 1995, first regular measurements of aerosol optical depth (AOD) and water vapour by using a star photometer have been started at the Richard-Aßmann-Observatory in Lindenberg, Germany. At AWIPEV Base, Ny-Ålesund (Spitsbergen) a star photometer is in operation since 1996 for measuring AOD during the polar night. Star photometers are of particular interest for polar regions since the sun is not available during the polar night. Despite the high potential of this technique only a few star photometers are in operation worldwide so far.

Based on the many years of experience at Lindenberg and Ny-Ålesund, a new and innovative star photometer has been developed by us. The instrumental design with a new and reliable automatic measuring mode is based on a completely new technical concept. During a recent campaign at the Izaña observatory, Tenerife, the performance of the new system was tested under ideal atmospheric conditions. Further tests in a cold chamber (-80°C) have demonstrated that the system can be operated in polar regions even at extreme low temperature environments.