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Ship-borne rotating shadowband radiometer observations for determination of components of spectral irradiance and aerosol optical properties

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The Maritime Aerosol Network (MAN) has been established as a sub-project of AERONET and a long-term program to collect ship-borne aerosol optical depth measurements over ocean. Its purpose is to serve as reliable reference database for the evaluation of models and satellite products. Data are currently collected by handheld Microtops II photometers, as the automated acquisition of data from sun photometers on stabilized platforms is so far too expensive for wide-spread use. A promising alternative to the sun photometer is the rotating shadowband radiometer, whose principle of operation allows the determination of the direct-beam component of solar radiation without stabilizing the instrument, if the orientation of the detector horizontal is known. OCEANET, a project to investigate the exchange fluxes of energy and matter between the atmosphere and ocean, has contributed aerosol observations to MAN on several of its cruises on RV Polarstern during the transit between the hemispheres. On the recent cruise (PS 83) from Cape Town to Bremerhaven, TROPOS has operated for the first time a 19 channel rotating shadowband radiometer (GUVis-3511) built by the company Biospherical, as a possible means to provide automated irradiance and aerosol optical depth measurements. Calibration and processing of the raw data will be described, and an initial evaluation of the instrumental performance will be given. Aerosol optical depths derived from Microtops II measurements and the rotating shadowband radiometer will be compared. We show that the standard deviation of Aerosol optical depths observed with Microtops II and the shadowband radiometer is about 0.02 for matching channels, and an aerosol type classification based on Angstrom exponent shows good agreement. Also the influence of ship smoke and ocean swell is studied. The suitability of the instrument to automate MAN observations is discussed, and an outlook to the use of the instrument to also derive cloud optical properties is given.