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Ship-based aerosol optical depth measurements in the Atlantic Ocean

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Aerosol optical depth measurements were made in October -December 2004 aboard of R/V Akademik Sergey Vavilov. The cruise area included a transect in the Atlantic from North Sea to Cape Town and then a crossing in the South Atlantic to Ushuaia, Terra del Fuego. The hand-held Microtops II sunphotometer was used to acquire 292 series of measurements spanning 35 days. The hand-held sunphotometer was pre-calibrated at the NASA Goddard Space Flight Center against a master sun/sky radiometer instrument of the Aerosol Robotic Network (AERONET). The direct sun measurements were acquired in five spectral channels: 340, 440, 675, 870 and 940 nm. The estimated uncertainty of the optical depth in each channel did not exceed plus or minus 0.02. The measurements were carried out in clear weather conditions to ensure the solar disk was free of clouds (visually controlled by the operator). The number of measurements averaged into one data point was not less than 5 during a three-minute period. The number of series during the day varied from 1 to 33. Arithmetic and geometric daily averages of optical depth agree within 0.005 or less. Aerosol optical depth was retrieved by applying the AERONET processing algorithm (Version 2) to raw data. Aerosol optical depth values were close to background oceanic conditions (0.06-0.08 at 500 nm) in the open oceanic areas not influenced by continental sources or long-range aerosol transport. Spectral dependence characterized by the Angstrom parameter can be described as neutral (Angstrom parameter was less than 0.6). Relatively turbid conditions (optical depth 0.30 at 500 nm) in the Atlantic were associated with the Saharan dust transport. In the “roaring forties” of the South Atlantic aerosol optical

depth at 500 nm did not exceed 0.11, varying mainly within same range (0.06-0.08) as in other remote oceanic areas, however dominance of smaller Angstrom parameters (0.0-0.20) was evident. The most transparent conditions were encountered near coast of Argentina where measured aerosol optical depth was 0.04 or even less. Columnar water vapor retrievals and optical depth correlations with various meteorological parameters are presented also.