

Three years of Aerosol Measurements Using an Automated Photometer on the First long-term AERONET Ship Site

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The Earth's oceans are vital for regulating global climate and atmospheric processes, with aerosols significantly influencing weather patterns, air quality, and climate dynamics. Despite extensive research on land-based aerosols through networks like AERONET, understanding oceanic aerosol dynamics remains a critical gap. Efforts to address this gap involve enhancing monitoring infrastructure, advancing satellite technologies, and innovating approaches to oceanic aerosol study.

The work focuses on surface ship-based aerosol observations using a ship version of the automatic CIMEL 318-T photometer (AERONET standard instrument) in development since 2017. This innovation brings surface ocean photometry to the precision and automation standards of ground-based AERONET sites. In 2021, a significant milestone was achieved with the establishment of the first permanent ship-site on the RV Marion Dufresne in the Indian Ocean (MAP-IO program, www.mapio.re).

Our primary analysis focuses on presenting the first 3-years of Aerosol Optical Depth (AOD) data from Marion Dufresne automatic photometer. Also we show the first microphysical and optical aerosol properties retrieved from sky/sun measurements meeting AERONET Level 2 criteria ($AOD(440) > 0.4$), during a biomass burning event in the Indian Ocean region in October 2023. Finally, we utilize AOD measurements from the ship-based automatic photometer to validate AOD data from satellite sensors, particularly S3-OLCI and S5P.

Keywords: ship-borne photometer, aerosol retrieval, MAP-IO program