



In situ measurements of solar UV and global irradiance at sea

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Solar radiation affects marine ecosystems in many direct and indirect ways. Organisms living in the near-surface waters, like phytoplankton, are directly threatened by UV radiation induced photodamage. At the same time, these organisms need radiation of another part of solar spectrum to maintain photosynthesis. The organisms therefore need to balance between the harmful and beneficial effects of solar radiation. Solar radiation is also heavily connected to the genesis and faith and marine microplastics as UV radiation is a key factor in fragmentation of plastic debris – the process behind the release of microplastics. Established networks monitoring solar (UV) radiation produce important data on exposure conditions on land. At sea, however, there is a lack of in situ measurements of solar (UV) radiation. This study reports on the in situ measurements of global and solar UV irradiance at sea onboard the research vessel RV Pelagia (The Royal Netherlands Institute for Sea Research) along the route of “Microplastic Transit Cruise” from the Azores to Sicily during 26 Jul – 8 Aug 2018. The measured time series includes data over the whole time period in 1-min time resolution. The time series is connected with the vessel’s logging system including data on, e.g., the location of the ship. The data are compared with the satellite estimates for UV radiation derived from measurements of OMI (Ozone Monitoring Instrument) flying onboard EOS/Aura satellite of NASA and GOME-2 (Global Ozone Monitoring Experiment–2) onboard Metop-B satellite of EUMETSAT. The data are also compared with simulations performed with libRadtran radiative transfer model, and against the in situ measurements of PAR (Photo Active Radiation) onboard and under water. This yields a comprehensive analysis on the unique data set collected during the expedition of global solar and solar UV radiation exposure at sea.