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Photochemical Production of Ammonium in the Oligotrophic Cyprus Gyre (Eastern Mediterranean)

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We investigated the photoproduction of ammonium (NH_4^+) in surface waters of the Cyprus gyre in the central Eastern Mediterranean in May 2002, in 8 on deck irradiations around local solar noon (<3 hour irradiation) with freshly collected, filtered samples. A survey of the study area found significantly lower absorbance of Chromophoric Dissolved Organic Matter (CDOM) and lower Dissolved Organic Carbon (DOC) in near surface waters (<30 m depth) compared to deeper waters. NH_4^+ photoproduction (photoammonification) increased with time-integrated irradiance during the course of irradiations. Photoammonification rates, 0.9-3.8 pmol L^{-1} h^{-1} /(W m^{-2}) normalised to time-integrated irradiance were significantly correlated with DOC normalised CDOM absorbance at 300 nm. These results are consistent with succesive CDOM photobleaching in the surface mixed layer resulting in lower DOC-normalised light absorbance and photochemical ammonium release. Combining our experimental data with estimates of daily solar irradiance and water column light attenuation yields a photoammonification rate for the Cyprus Gyre of 237 $\pm$ 101 μmol m^{-2} d^{-1} during our study period. Based on this analysis, NH_4^+ photoproduction makes a significant contribution to the nitrogen budget of the euphotic zone in the oligotrophic Cyprus Gyre.