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Supplementary material

The effect of irradiance and temperature on the role of photolysis in the removal of organic micropollutants under Antarctic conditions

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The relationship between photolysis rate constant and total (integrated) irradiance *I* was modeled using equation 1.

$$k = \ln(10)\ I\ \frac{A}{V}\ \varepsilon\, l\ q \qquad (1)$$

where irradiated area (*A*), sample volume (*V*) and path length (*l*) are prescribed by the experimental parameters, the molar absorptivity (ε) may be easily measured or estimated from literature values, and *q* is the normalised reaction quotient defined by:

$$q = \frac{\int I(\lambda)\ Q(\lambda)\ d(\lambda)}{\int I(\lambda)\ d(\lambda)}$$

where $I(\lambda)$ is the spectral irradiance profile and $Q(\lambda)$ is the reaction yield per unit photon energy. If $Q(\lambda)$ is a slowly varying function of λ, as expected under environmental conditions for photolysis of triclosan and 4-*t*-OP, the normalised reaction yield should remain approximately constant under all experimental conditions considered here.

Temperature dependence of the rate constants was modelled by least squares fitting to the linearised Arrhenius equation:

$$\ln(k) = \ln(A) - \frac{Ea}{RT} \qquad (2)$$

where *R* is ideal gas constant (8.3145 J mol^{-1} K^{-1}), *Ea* is activation energy (J mol^{-1}) and *A* is Arrhenius pre-exponential factor.