Inner filter correction of dissolved organic matter fluorescence - DTU Orbit (29/12/2018)

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The fluorescence of dissolved organic matter (DOM) is suppressed by a phenomenon of self-quenching known as the inner filter effect (IFE). Despite widespread use of fluorescence to characterize DOM in surface waters, the advantages and constraints of IFE correction are poorly defined. We assessed the effectiveness of a commonly used absorbance-based approach (ABA), and a recently proposed controlled dilution approach (CDA) to correct for IFE. Linearity between corrected fluorescence and total absorbance (ATotal; the sum of absorbance at excitation and emission wavelengths) across the full excitation-emission matrix (EEM) in dilution series of four samples indicated both ABA and CDA were effective to an absorbance of at least 1.5 in a 1 cm cell, regardless of wavelength positioning. In regions of the EEMs where signal to background noise (S/N) was low, CDA correction resulted in more variability than ABA correction. From the ABA algorithm, the onset of significant IFE (>5%) occurs when absorbance exceeds 0.042. In these cases, IFE correction is required, which was the case for the vast majority (97%) of lakes in a nationwide survey (n = 554). For highly absorbing samples, undesirably large dilution factors would be necessary to reduce absorbance below 0.042. For rare EEMs with ATotal > 1.5 (3.0% of the lakes in the Swedish survey), a 2-fold dilution is recommended followed by ABA or CDA correction. This study shows that for the vast majority of natural DOM samples the most commonly applied ABA algorithm provides adequate correction without prior dilution.
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