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## Optical properties of dissolved organic matter (DOM) in trophically diverse streams of the Świdwie Nature Reserve

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### Abstract

Dissolved organic matter (DOM) plays a key role in carbon cycling and water quality in shallow, eutrophic freshwater systems. This study examined the spatial variability of DOM in trophically diverse streams of the Świdwie Nature Reserve (NW Poland) during early autumn circulation. Physicochemical analyses were combined with UV-Vis spectroscopy, fluorescence excitation-emission matrices (EEMs) and PARAFAC modelling to characterize DOM sources and transformation pathways. Dissolved organic carbon (DOC) concentrations ( $12.7\text{--}37.4\text{ mg L}^{-1}$ ) revealed strong contrasts between tributaries. Water bodies rich in fresh organic matter (the Gunica River) contained low-aromatic DOM, whereas water bodies rich in highly humified DOM (Struga Żurawia and the Bolków–Łęgi Canal) contained aromatic, terrestrially derived DOM enriched in nutrients. Optical indices ( $\text{SUVA}_{254}$ ,  $a_{280}$ ,  $a_{350}$ ,  $E_{250}/E_{365}$ , SR) and fluorescence parameters (BIX, HIX,  $f_4/f_3$ ) consistently distinguished autochthonous from allochthonous DOM. PARAFAC identified two humiclike components: C1, associated with less humified, microbially derived DOM, and C2, representing more aromatic, fulviclike material. Multivariate analyses (CCA, clustering, Pearson correlations) indicated that nutrient enrichment, conductivity and humification degree were the main drivers of DOM variability. The strong positive relationship between total fluorescence and conductivity suggests that ionic enrichment enhances DOM optical activity. These findings highlight the sensitivity of small, shallow catchments to natural and anthropogenic pressures and demonstrate the effectiveness of optical methods in resolving DOM dynamics.

**Keywords:** DOM, streams, fluorescence, UV-Vis, PARAFAC, soluble biogenic compounds

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