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DIURNAL AND SEASONAL DYNAMICS OF THE LIGHT SPECTRAL COMPOSITION
IN STRATIFIED WATER BODIES SEPARATED
FROM THE WHITE SEA

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Postglacial uplift along the White Sea coast has created numerous meromictic lagoons at various stages of isolation from the sea. Coastal meromictic water bodies at different stages of isolation from the sea are characterized by varying concentrations of chromophoric dissolved organic matter (CDOM) and different optical properties of the water column. In our previous studies, we showed that an increase in CDOM content leads to a shift in the spectral composition of underwater light toward the longer-wavelength region. Seasonal and diurnal changes in the sun's altitude lead to changes in the spectrum of sunlight reaching the water's surface. The aim of this study was to analyze the spectral composition of underwater light at different times of the day, as well as in different months of the summer season – in early July and early September. The lower position of the sun above the horizon causes the short-wavelength edge of the spectrum to shift 40–50 nm to the right. However, changes in the solar spectrum at the surface have little effect on the proportions of different colors in underwater spectra: they vary between seasons and within a 24-hour period only in the upper layers, but in water bodies with low CDOM content, these differences are more pronounced. This effect can be explained by the significant absorption of blue light by CDOM. In more isolated water bodies, blue light disappears at 0.5 m depth, which leads to more stable spectral composition in them at different times of the day and across different seasons. However, in the fall, the attenuation of blue light is less pronounced, which may be associated with seasonal changes in CDOM concentration in the upper layers and a decrease in phytoplankton proliferative activity. Despite slight differences in the spectral composition of light, the underwater light environment in summer and autumn has differences. In the morning and evening hours in autumn, illuminance is significantly lower than during the day: for example, the photon flux density in the chemocline on the depth of 3 m is around 2 $\mu\text{mol}/\text{m}^2\cdot\text{s}$ during the day, at 8 a.m. the same intensity is registered at 2.7 m, and at 8 p.m. it reaches only a depth of 0.3 m. Thus, during the different months of the White Sea summer, the underwater light conditions in highly isolated humic water bodies primarily vary in terms of daylight duration. In addition, in poorly isolated water bodies the underwater changes of light spectral composition are registered when the Sun is low on the horizon.

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