

Short-term ultraviolet (UV) radiation (280–400 nm) effects on xanthophyll cycle activity and photosynthesis were assessed during fluctuating irradiance (60- and 10-min cycles – saturating irradiance to near-zero irradiance) for the marine algae *Thalassiosira weissflogii* (Bacillariophyceae) and *Dunaliella tertiolecta* (Chlorophyceae). Laboratory cultures were cycled, as above, up and down the water column for 8 h under solar radiation, during which photosystem II (PSII) quantum yield in the light $[(F_m' - F_t)/F_m']$ was monitored over 1-min intervals. In addition, pigment composition, xanthophyll de-epoxidation state and carbon assimilation were assessed during the fluctuating irradiance cycles. Although PSII quantum yield in the light of both species mirrored irradiance, the PSII response to irradiance fluctuations changed over time as PSII quantum yield was downregulated at midday. This coincided with maximal xanthophyll de-epoxidation that developed during the course of the day for both species. In contrast to the de-epoxidation levels, nonphotochemical quenching (NPQ) and PSII quantum yield in the light fluctuated with the irradiance dynamics at noon in both species. Maximal xanthophyll de-epoxidation and NPQ at noon was lower under photosynthetically active radiation (PAR) + UV than under PAR exposure for *T. weissflogii* during the 10-min cycle, whereas this was not found for the 60-min cycle and in *D. tertiolecta*. Synthesis of xanthophyll cycle pigments occurred in both species, and was faster for *D. tertiolecta* during PAR + UV than during PAR exposure. Carbon incorporation and on most occasions PSII quantum yield in the light were lower during UV exposure for both species, regardless of xanthophyll de-epoxidation state. UV effects on carbon assimilation were higher during 10-min than during 60-min irradiance fluctuation cycles. However, the 10-min irradiance fluctuation cycle appeared to enhance overall carbon assimilation in *D. tertiolecta* but depressed productivity of *T. weissflogii*, as compared with the 60-min cycles.