

Annual patterns of ultraviolet radiation effects on temperate marine phytoplankton off Patagonia, Argentina

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We carried out experiments to evaluate the effects of solar ultraviolet radiation (UVR; 280–400 nm) upon primary production of different natural phytoplankton assemblages (i.e. characteristic of a seasonal cycle) from Patagonia (Argentina) from January 2001 to January 2002. The short-term impact of UVR (i.e. measured as radiocarbon incorporation) was assessed by exposing samples to solar radiation under six radiation treatments: uncovered quartz tubes and tubes covered with different cut-off Schott filters (WG295, WG305, WG320, WG360), and Plexiglas UF-3 (cut-off at 400 nm), so that samples received radiation at five different intervals within the UVR in addition to photosynthetically active radiation (PAR), and only PAR, respectively. Phytoplankton composition and abundance allowed us to differentiate pre-bloom, bloom and post-bloom periods, with pre- and post-bloom samples characterized by small cells (e.g. flagellates <10 µm), whereas the bloom was dominated by large diatoms (~50 µm). Absolute values of photosynthesis inhibition were lower during the bloom, but biological weighting functions (i.e. inhibition per unit energy) indicated that this assemblage was more sensitive to UVR (especially in the UV-B region, 280–320 nm) than those of the pre- and post-bloom periods. UV-A radiation (320–400 nm) accounted for most of the reduction in carbon incorporation (>60%), especially during the pre- and post-bloom periods. Most of the observed variability was inter-seasonal, although small intra-seasonal fluctuations were also observed. Our results indicate that the taxonomic composition and cellular size are especially important when addressing UVR effects upon these assemblages. However, other factors such as mixing can also contribute to the variability in responses to UVR.