

# Variability of UVR Effects on Photosynthesis of Summer Phytoplankton Assemblages from a Tropical Coastal Area of the South China Sea<sup>†</sup>

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## ABSTRACT

From June to September 2005, we carried out experiments to determine the ultraviolet radiation (UVR) -induced photoinhibition of summer phytoplankton assemblages from a coastal site of the South China Sea. Variability in taxonomic composition was determined throughout the summer, with a peak chlorophyll *a* (chl *a* ~20 µg chl *a* L<sup>-1</sup>) dominated by the diatom *Skeletonema costatum* that was detected early in the study period; the rest of the time samples were characterized by monads and flagellates, with low chl *a* values (1–5 chl *a* µg L<sup>-1</sup>). Surface water samples were placed in quartz tubes, inoculated with radiocarbon and exposed to solar radiation for 2–3 h to determine photosynthetic rates under three quality radiation treatments (*i.e.* PAB, 280–700 nm; PA, 320–700 nm and P, 400–700 nm) using different filters and under seven levels of ambient irradiance using neutral density screens (*P vs E* curves). UVR inhibition of samples exposed to maximum irradiance (*i.e.* at the surface) varied from –12.2% to 50%, while the daytime-integrated UVR-related photoinhibition in surface seawater varied from –62% to 7%. The effects of UVR on the photosynthetic parameters  $P_{\max}^B$  and  $E_k$  were also variable, but UV-B accounted for most of the observed variability. During sunny days, photosynthesis of microplankton (> 20 µm) and piconanoplankton (< 20 µm) were significantly inhibited by UVR (mostly by UV-B). However, during cloudy days, while piconanoplankton cells were still inhibited by UVR, microplankton cells used UVR (mostly UV-A) as the source of energy for photosynthesis, resulting in higher carbon fixation in samples exposed to UVR than the ones exposed only to photosynthetically active radiation (PAR). Our results indicate that size structure and cloudiness clearly condition the overall impact of UVR on phytoplankton photosynthesis in this tropical site of South China. In addition, model predictions for this area considering only PAR for primary production might have underestimated carbon fixation due to UVR contribution.

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