During May 2002 we carried out studies with tropical phytoplankton assemblages from coastal waters off SE China to assess the combined effects of solar UV radiation (UVR, 280 to 400 nm) and mixing rates. Water samples were taken daily and incubated using *in situ* and simulated *in situ* conditions under 3 radiation regimes (photosynthetically active radiation [PAR] + UVR, PAR + UV-A and PAR only). Variable radiation regimes, to simulate the irradiance field in the upper mixed layer (UML), were obtained by using a device consisting of 1 fixed (static samples) and 1 rotating system (moving samples). Solar UVR inhibited phytoplankton photosynthesis in the water column (i.e. during *in situ* experiments), and this inhibition (mean value at surface = 24%) decreased with depth, so that at 1.2 m there were no significant differences between radiation treatments. However, at 1.8 m depth, the samples receiving UV-A had significantly higher carbon fixation than those receiving only PAR. Simulated *in situ* experiments showed that solar UVR stimulated phytoplankton photosynthesis under fast mixing conditions (i.e. when the irradiance levels changed from 100 to 6% and back in less than 30 min). With slower circulation periods, solar UVR reduced carbon fixation and consequently the integrated inhibition within the UML approached the values from the static samples. Previous model predictions based on the interactive effects of UVR and mixing might have underestimated phytoplankton photosynthesis in these regions. Overall, our results suggest a high resistance of these coastal tropical assemblages to solar UVR as compared to other regions of the planet.