Abstract
Biological weighting of UV-B radiation. The importance of wavelength for the inhibition of microalgae. Kristin I.M. Andreasson, 2006

The ozone layer protecting the earth from UV-B radiation (UVBR, 280-315 nm) is diminishing. The resulting elevated UVBR is a potential threat to the biota. I have made a range of studies to evaluate each wavelength in the UVBR, to measure how wavelength-dependent the inhibition by UVBR is to affect microalgal processes. The sources of variation in the estimation of the inhibition by the UVBR were studied. This was done by estimating each wavelengths contribution to the measured effect, by calculating polychromatic biological weighting functions, BWFs.

The effect of different BWFs on the modelled microalgal production in a scenario with diminished ozone layer was estimated in a model study. The choice of BWF was found to be of great importance.

With emphasis on the BWF calculations, a set of studies were done; both at the laboratory with algae cultures and in the field with natural planktonic communities.

The first laboratory experiments were done on three microalgae; *Phaeodactylum tricornutum*, *Dunaliella tertiolecta* and *Rhodomonas* sp., the second laboratory experiments was done on the first two of them. Three ways to assess the inhibition by UVBR were tested, two short-duration photosynthesis measurements and one growth rate during 72 hours measurement. The first photosynthetic measurement was done with a PAM (pulse-amplitude-modulation) fluorometer, which gives a measure of the function of photosystem II and the following electron transport. The second was the carbon fixation (using ^{14}C), which measures the function of the whole photosynthetic apparatus. Growth rate was measured; it adds up the whole cellular metabolism, it is also a measurement which measures during a prolonged time period. From the laboratory it was found that the choice of species and parameter measured contributed a great deal to the variation in the BWF. The parameters varied so that, when generalised, growth rate was the most wavelength dependent followed by carbon fixation and finally PAM was the least wavelength dependent. In addition to this the species also differed from each other in the degree of variation between the measuring methods.

Model ecosystems in the field were used in two fjords in Denmark and one fjord in Svalbard, to evaluate the importance of nutrient regimes, light prehistory - both UVBR prehistory and PAR (photosynthetic active radiation, 400-700 nm) prehistory, season and time of the day, latitude, and temperature for the BWFs. Measures were also taken directly from the fjords to measure the influence of the time of the day the incubations were made.

The UVBR had the effect to change the structure of the model ecosystems, but this was not manifested in the BWFs. The nutrient availability had no significant effect either. The PAR light prehistory was important the high light incubated model ecosystems got less wavelength dependent than the low light incubated. The time of the day the incubations were made was of great importance, the samples got less wavelength dependent during the day.

Keywords: UV-B radiation, biological weighting functions, BWF, *Phaeodactylum tricornutum*, *Dunaliella tertiolecta*, *Rhodomonas* sp., microcosm, mesocosm, growth rate, PAM, carbon fixation, model ecosystem