A-5 Effects of Enhanced UVB Radiation on Terrestrial and Marine Ecosystem

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This project is aimed to study the effects of enhanced UVB on terrestrial (forest, annual plants, natural alpine plants for natural community and crops, vegetables, ornamental crops for artificial community) and marine (phytoplankton and zooplankton) ecosystem by determining their primary mechanisms of damage, defense, and acclimation to develop a forecasting model for the prediction of future effects.

A-5.1 Effects of Enhanced UVB on Forest Ecosystem

Moderate UVB radiation to young seedlings of spruce and beech caused good growth. Kaenpferol-3-glucoside was used as a quantifiable marker of UVB stress on woody plants. Global UVB 500 m mesh data in Japan was obtained for fine weather although a further tuning UVB model was necessary.

A-5.2.1 Interactive Effects of Increased UVB and Global Warming on Growth of Crops

A greenhouse experiment was conducted to study the effect of UVB on wheat growth and yield by the fractional factorial design of 6 factors. Sensitiveness differed among wheat cultivars; Kitakami-komugi was not affected by UVB while UVB increased tiller number or inhibited plant height of Norin 61.

A-5.2.2 Studies on Evaluation of Effects of UVB Increase on Growth of Vegetables and Ornamental Crops

Increased UVB provided either positive or negative effects on the growth depending on cultivars of cabbages and radishes. Effects of about 10% ozone layer depletion, expected for the middle latitude, on the yield of vegetables in Brassica can be ignored.

A-5.3.1 Evaluation of the Influence of Enhanced UVB Radiation on the Interrelationship between Phytoplankton and Zooplankton

Phytoplankton and zooplankton were likely suffered by enhanced UVB radiation, and particularly microzooplankton were relatively more vulnerable than phytoplankton. The balance between phytoplankton production and zooplankton grazing will be most likely disrupted by enhanced UVB radiation.

A-5.3.2 Effects of Enhanced UVB on Primary Production in the Ocean

Relative penetration of UVR to the euphotic layer indicated a strong seasonality with high in winter and low in summer. This seasonality was related with spring increase of chlorophyll *a* concentration followed by summer increase of dissolved organic matter in a shallow thermocline. When smaller cells than 10μm were dominant and UVB increased in summer, the inhibition rate of primary production increased.

A-5.4 Research on the Effect of Increased UVB Radiation on the Wildlife Plants

Solidago virgaurea seeding in high altitude accumulated more anthocyanins by UVB radiation the one in low altitude. Solar radiation accumulated more dimers in cucumber cotyledons in Iriomote Island than inn Sapporo.