

Photochemical & Photobiological Sciences

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Cover picture: Polar stratospheric clouds over Esrange, Kiruna, Sweden, on 26 January 2000. Geir Braathen, Norwegian Institute for Air Research (NILU).

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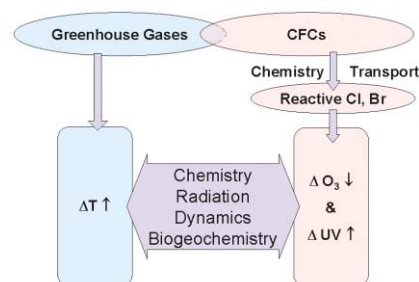
Full Papers

1 Environmental effects of ozone depletion and its interactions with climate change: 2002 assessment

Executive summary

5 Changes in biologically active ultraviolet radiation reaching the Earth's surface

Richard L. McKenzie, Lars Olof Björn, Alkiviadis Bais and Mohammad Ilyas



Future changes in greenhouse gases will affect the future evolution of ozone through chemical, radiative, and dynamic processes. A reliable assessment of these effects on total column ozone is limited by uncertainties in lower stratospheric response to these changes.

16 **Health effects from stratospheric ozone depletion and interactions with climate change**



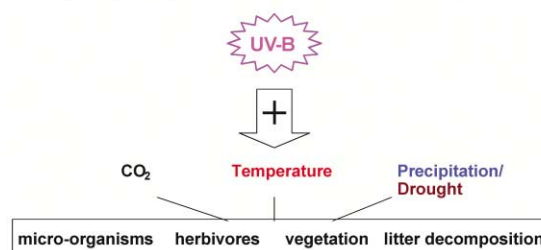
Frank R. de Gruijl, Janice Longstreth, Mary Norval, Anthony P. Cullen, Harry Slaper, Margaret L. Kripke, Yukio Takizawa and Jarv C. van der Leun

Frontal view of a cortical cataract. Worldwide, cataracts are a major cause of blindness if not treated. In 1998, an estimated 135 million people were visually impaired and 45 million people were blind worldwide with cataract as the leading cause. The only effective preventive interventions are to stop smoking and to reduce ocular UV-B exposure.

29 **Terrestrial ecosystems, increased solar ultraviolet radiation and interactions with other climatic change factors**

Martyn M. Caldwell, Carlos L. Ballaré, Janet F. Bornman, Stephan D. Flint, Lars Olof Björn, Alan H. Teramura, G. Kulandaivelu and Manfred Tevini

Biologically important global climate change factors



Major interactions of elevated UV-B with other climate change factors in terrestrial ecosystems.

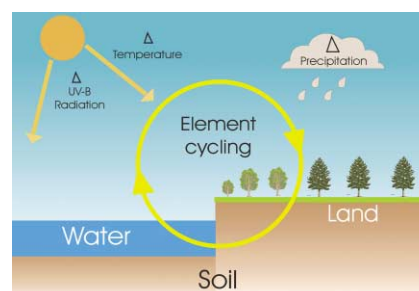
39 **Aquatic ecosystems: effects of solar ultraviolet radiation and interactions with other climatic change factors**



Donat-Peter Häder, H. D. Kumar, Ray C. Smith and Robert C. Worrest

The impact of climate variability on UV-related effects in the most exposed polar ecosystems will result from indirect effects such as reduction in sea ice, changes in water column bio-optical characteristics, changes in cloud cover, and shifts in oceanographic biogeochemical cycles.

51 **Interactive effects of ozone depletion and climate change on biogeochemical cycles**

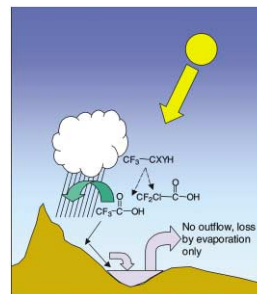


Richard G. Zepp, Terry V. Callaghan and David. J. Erickson III

Interacting changes in climate and UV radiation influence the global cycling of carbon, nitrogen, sulfur, and other elements with accompanying changes in life processes and the exchange of greenhouse and chemically active gases between the biosphere and the atmosphere.

62 **Changes in tropospheric composition and air quality due to stratospheric ozone depletion**

Keith R. Solomon, Xiaoyan Tang,
Stephen R. Wilson, Prodromos Zanis
and Alkiviadis F. Bais



Formation of persistent, water-soluble breakdown products of the HFCs and HCFCs ($\text{CF}_3\text{-CXYH}$) and their movement and concentration by evaporation, along with other water-soluble salts, to surface waters

68 **Effects of climate change and UV-B on materials**

Anthony L. Andrady, Halim S. Hamid and
Ayako Torikai

Solar ultraviolet radiation

Plastics, rubber, wood and other biopolymers

Climate change factor	Greater temperature	Greater humidity	Greater smog and pollutants
Plastics and rubber	+++	++	+
Wood and biopolymers	++	+++	?

Climate change is likely to increase the ambient temperature and humidity in some of the same regions likely to receive increased UV-B radiation. These factors, particularly higher temperatures, are also well known to accelerate the rate of photodegradation of materials such as plastics, and further limit the service life.

ix **Eighteen questions and answers about the effects of the depletion of the ozone layer on humans and the environment**

Pieter J. Aucamp (coordinator)

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