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TOMS AS A MONITOR OF THE ULTRAVIOLET RADIATION ENVIRONMENT: APPLICATIONS TO PHOTOBIOLOGY

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The flux of biologically relevant ultraviolet radiation that reaches the surface of the earth varies with (1) the ozone amount, (2) surface reflectivity, and (3) cloudcover conditions. Although TOMS is generally viewed exclusively as an ozone measuring device, the instrument in fact provides information relevant to all three items listed above. A recent application of satellite-based ozone measurements has been to develop climatologies of the biologically significant UV-B radiation (wavelengths 290-320 nm) reaching the earth's surface. A growing body of research suggests that UV-B radiation tends to suppress the immune system of laboratory mice, and field studies support extrapolation of this conclusion to the immune defenses of human skin. At tropical latitudes where the surface UV-B flux is a maximum, infectious diseases are carried by flies which transmit parasites into human skin via bites. These diseases likely develop most readily in people who have experienced immune system suppression through regular exposure to the UV-B environment. The computed distribution of surface radiation combined with information on disease incidence may clarify the role of UV-B as a suppressor of the human immune system. TOMS used in conjunction with radiative transfer calculations can here provide information of great relevance to the photobiology community.