Variations in the Erythemal Ultraviolet Exposure to the Human Facial Region

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Skin cancer, a condition that affects more Australians, than any other population group of the world is potentially a preventable disease. Exposure to ultraviolet radiation (UV) is the cause of a number of biological responses in the skin, including increasing the risk of developing skin cancer. The level of UV exposure received from the Sun depends on lifestyle, time spent in the Sun, season, latitude or location on the Earth, and local atmospheric conditions including cloud and ozone level. Using a computer model these physical parameters can be taken into account to make predictions of the level of UV that might be received on a flat horizontal surface under a set of varying conditions or scenarios.

Employing a computer model whose output agrees with measured UV levels measured in Toowoomba, predictions of the erythemal UV exposures to the human facial region have been made for cloud free days with an estimated error of 20 % or better. This has been done by weighting the modeled horizontal plane UV exposure with measured exposure ratios that represent the exposure received on various parts of the face relative to the top of the head (a flat horizontal surface). Exposure ratios for the human face were measured by placing polysulphone dosimeters on different sites of the face and these values were interpolated to cover the entire facial region. To account for the changes to exposure ratios with the position of the Sun in the sky, a series of exposure ratio measurements at different solar zenith angles (SZA) have been made. Resultantly, for any site on the human face, the changing UV exposure on a horizontal plane predicted by the computer model for any time and location on the Earth can be weighted with the specific set of exposure ratios for the appropriate SZA. The facial erythemal UV exposures are presented pictorially. This provides the UV ‘hot spots’ on the face. The technique is used to examine the clear sky erythemal UV exposure to the face at different latitudes and during different seasons.