The Role of Ultraviolet (UV) Solar Radiation in Erythema and Vitamin D Synthesis

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A smart-phone application has been developed for calculating time to sunburn and solar vitamin D production. UV exposure is directly related to squamous cell carcinoma and basal cell carcinoma and is a factor in malignant melanoma. UV from the sun is needed for the production of vitamin D, whether in plants or in human bodies. Severe vitamin D deficiency results in rickets in children, a deforming bone disease, and osteomalacia in adults. The health benefits of vitamin D include the strengthening of bones and muscles, and a lowered risk for some types of autoimmune diseases and cancers such as colon and breast cancer. The smart phone application is to provide a tool for sensible sun exposure that avoids erythema while optimizing vitamin D production. This tool utilizes a cloud-based and a cloud-free UV Index forecast from the NOAA's Climate Prediction Center. Several methods are proposed for applying cloud modification factors to the clear-sky UV Index forecast. Vitamin D production from sunlight is calculated from the UV Index using calibration and correction factors to convert from erythemally weighted solar irradiance to solar irradiance weighted with the Commission internationale de L'Eclairage vitamin D action spectrum and with an earlier version of the vitamin D action spectrum. The correction factors from UV Index to vitamin D weighted solar irradiance were calculated using the tropospheric UV and visible radiative transfer code. Results for vitamin D production are presented as a function of latitude and season.

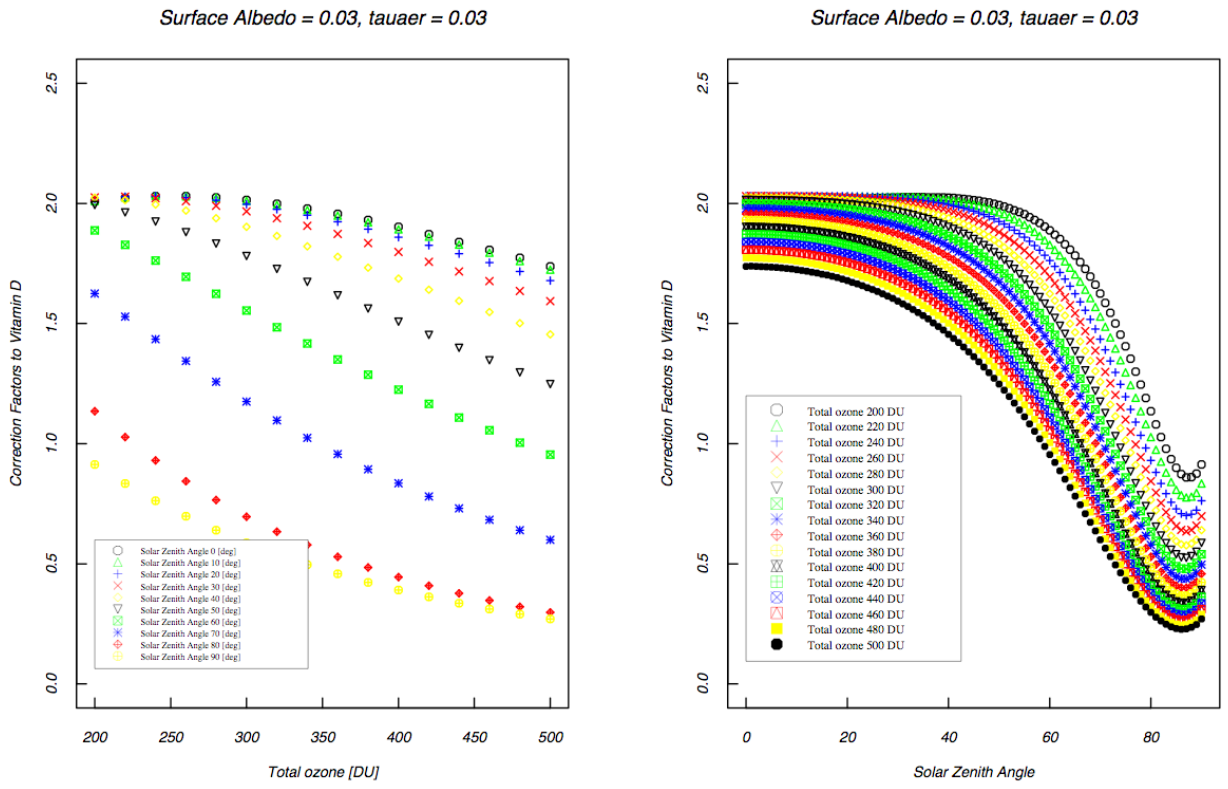

Figure 1. Correction factors for the conversion of UV Index to Vitamin D weighted solar irradiance.