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USDA UV-B Monitoring and Research Program

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Solar Ultraviolet (UV) radiation has significant impacts on human health (e.g., skin cancer) and the environment (e.g., agricultural production and plant litter decomposition). Reductions in UV-absorbing stratospheric ozone resulting from climate change and the anthropogenic emission of ozone depleting substances raised concerns regarding future levels of surface UV radiation. Responding to this potential threat, the U.S. Department of Agriculture (USDA) investigated the need for UV monitoring across the U.S. in 1991 and established the UV-B Monitoring and Research Program (UVMRP) headquartered in Natural Resource Ecology Laboratory at Colorado State University later in 1992. The UVMRP is tasked with providing information on the geographical distribution and temporal trends of UV radiation and studying the effects of UV radiation on a wealth of agricultural interests including crop plants, rangelands, and forests. The UVMRP currently consists of 37 climatological monitoring sites and 4 research sites, most of which are distributed across the U.S., with an additional site in Canada and another in New Zealand. Collectively, these sites encompass 20 ecoregions. Each UVMRP site is equipped with four primary irradiance instruments including the: 1) UV MultiFilter Rotating Shadowband Radiometer (UV-MFRSR), 2) visible MFRSR, 3) UVB-1 broadband meter, and 4) Photosynthetically Active Radiation (PAR) sensor. The UV-MFRSR measures total horizontal, diffuse horizontal, and direct normal irradiance at nominal 300, 305, 311, 317, 325, 332, and 368 nm at 2 nm FWHM (full-width half-maximum). The VIS-MFRSR measures the same three irradiance components at nominal SiC, 415, 500, 610, 665, 860, and 940 nm at 10 nm FWHM. PAR and UVB-1 sensors measure broadband irradiances over the 400-700 nm and 280-320 nm ranges, respectively. All these observations are sampled every 15 or 20 seconds and stored as an average value every three minutes. The raw data measurements are processed following a variety of Quality Control (QC) and calibration procedures to ensure the quality of the data. The primary data products (i.e., irradiances) as well as the derived products (e.g., UV Index and weighted daily/hourly sums) are distributed through the UVMRP website (<http://uvb.nrel.colostate.edu>). In this poster, we present a UV climatology study that explores long-term trends of erythemal irradiance at eight locations across the U.S. derived from 8-11 years of UVMRP measurements.