

## **MEASUREMENT AND ANALYSIS OF SPECTRAL UV OVER 25 YEARS**

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### **Introduction**

The health effects of solar UV radiation depend on its spectral composition and how that varies with solar elevation, cloud, ozone, aerosol, altitude, and surface reflectance. Both erythema and vitamin D induction depend critically on the UV-B region (280-315 nm), wherein solar intensity ranges over six orders of magnitude. Measurements require precise spectral alignment, high stray-light rejection, and wide dynamic range.

### **Methods**

At NIWA's Lauder, Central Otago site (45°S, 170°E, altitude 370 m), spectral UV irradiance has been measured since the late 1980s. The scanning double monochromators are regularly aligned and calibrated to the exacting standards of the Network for the Detection of Atmospheric Composition Change (NDACC), and data are regularly submitted to the NDACC archive for use in international comparisons, satellite validation, and model studies. They have elucidated the effects of season, time of day, and dependences as above. Since 2001, two spectroradiometers have operated in Melbourne, Alice Springs, and Darwin at different times. Together with the instruments at Lauder, they provide a reference for solar spectral UV radiation throughout Australasia.

### **Outcomes**

Peak UVI values at Lauder can be 40% greater than at corresponding latitudes in the Northern Hemisphere. This arises partly from differences in ozone, air-clarity, and seasonal changes in Earth-Sun separation, but half of the difference remains insufficiently explained. The main variability in daily UV is due to seasonal changes in solar zenith angle (SZA), but change in cloud cover is also important. Melbourne (38° S) shows similar average daily UV to Lauder, with cloud and aerosol compensating for latitude. Alice Springs (24° S) has 50% more UV per day in summer, but 3-5 times as much in winter as Melbourne or Lauder. Cloud cover in Darwin (12° S) limits summer (wet season) UV to little more than Melbourne, but with the winter dry there is almost no seasonal change in average daily UV.

### **Relevance**

Beyond their own implications, these spectral UV measurements provide a reference for broadband instruments and a test for model predictions throughout both countries.