Trends in Noon-Time Irradiance

In the main paper, time series and trend analyses were based on daily doses, which have been calculated by integrating instantaneous measurements over 24 hour periods. Here we present the same analysis based on near-noon-time spectra, which were measured at 01:00 UT.

Figure 1 shows time-series of measurements at 01:00 UT of four Version 2 data products for the period December 1989 – January 2004. The four data products are spectral irradiance at 305 nm, the UV Index[1], spectral irradiance integrated between 342.5 and 347.5 nm, and spectral irradiance integrated between 400 and 600 nm. Figure 1 also shows noon-time measurements of short-wave irradiance (0.3-3.0 μm) performed by New Zealand's National Institute of Water & Atmospheric Research (NIWA) with a pyranometer at New Zealand's research station Scott Base. Note that these values represent the average irradiance between 00:00 UT and 01:00 UT. Up until 10/31/95, data had a coarser resolution than more recent data.

Values measured in different years on the same calendar day were averaged to setup a climatology. These climatological mean values are indicated by thin lines in Figure 1 for all five data products. The pattern in noon-time irradiance is similar to that in daily doses and the conclusions presented in the main paper also apply here.

Monthly averages of noon-time irradiances are shown in Figure 2. Only months with at least 25 available data days were used for further analysis. Trend lines were calculated for all data sets by linear regression and are also shown in Figure 2. Slopes of the trend lines (expressed in change per decade relative to the year 1990), their 2σ-uncertainty, and regression coefficients R^2 are given in the figure's legend. These trends are very similar to those observed for daily doses.

References

McKinlay, A.F. and B.L. Diffey (Eds.), A reference action spectrum for ultraviolet induced erythema in human skin, in: Commission International de l'Éclairage (CIE), *Research Note*, *6*(1), 17-22, 1987.

World Meteorology Organisation (WMO), *Report of the WMO-WHO meeting of experts on standardization of UV Indices and their dissemination to the public*, Global Atmospheric Watch Report No. 127, WMO, Geneva, Switzerland, 1998.

1 UV Index is an internationally recognized measure of sun-burning UV irradiance, and is defined as spectral irradiance weighted with the CIE erythemal action spectrum [*McKinlay and Diffey*, 1987], expressed in the units of W/m², and multiplied by 40 [*WMO*, 1998].

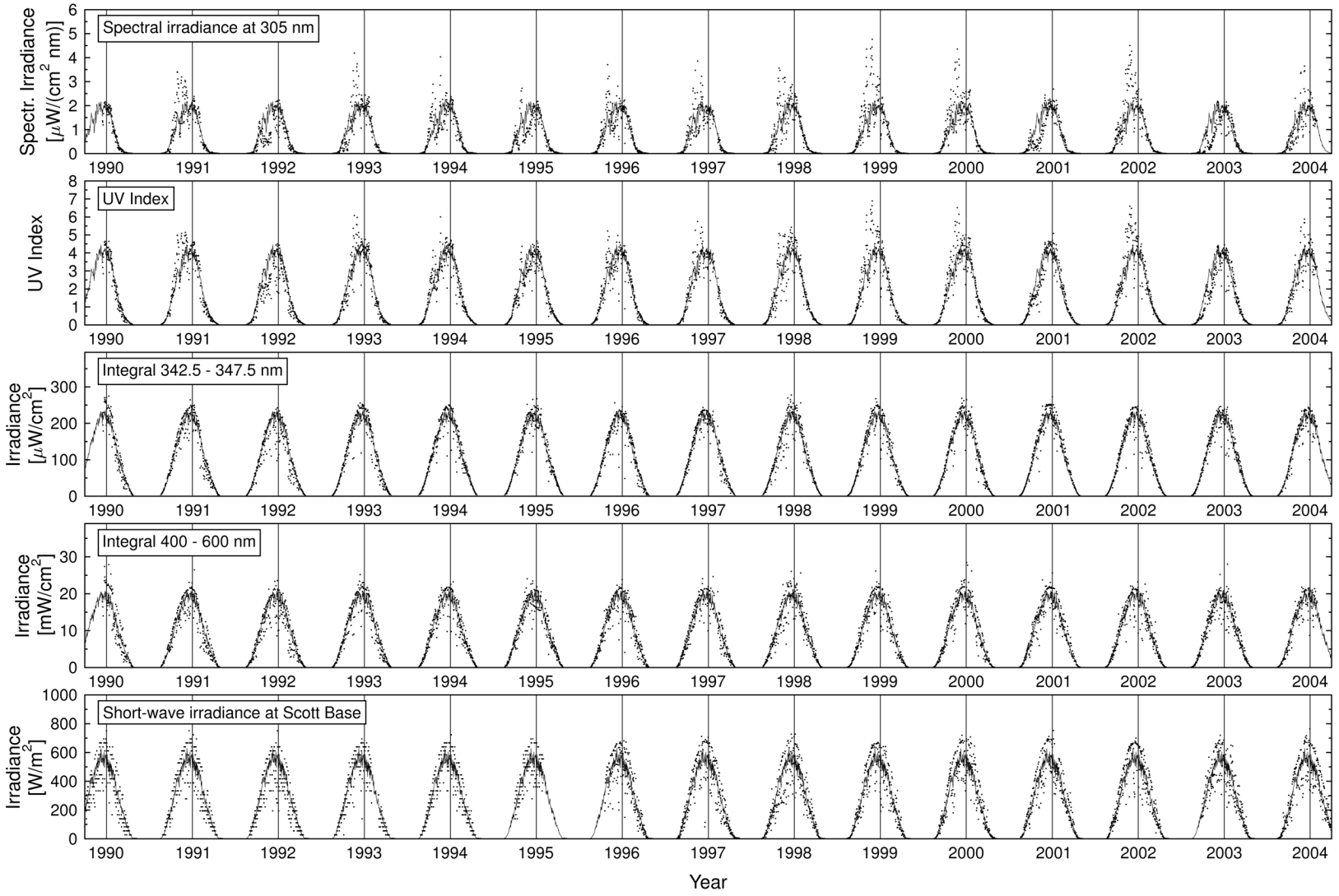

Figure 1: Time series of noon-time measurements of the data products spectral irradiance at 305 nm, UV Index, integral 342.5 – 347.5 nm, and integral 400 – 600 nm at Arrival Heights; and short-wave irradiance at Scott Base. Thin lines indicate the climatology, calculated by averaging measurements of all years.

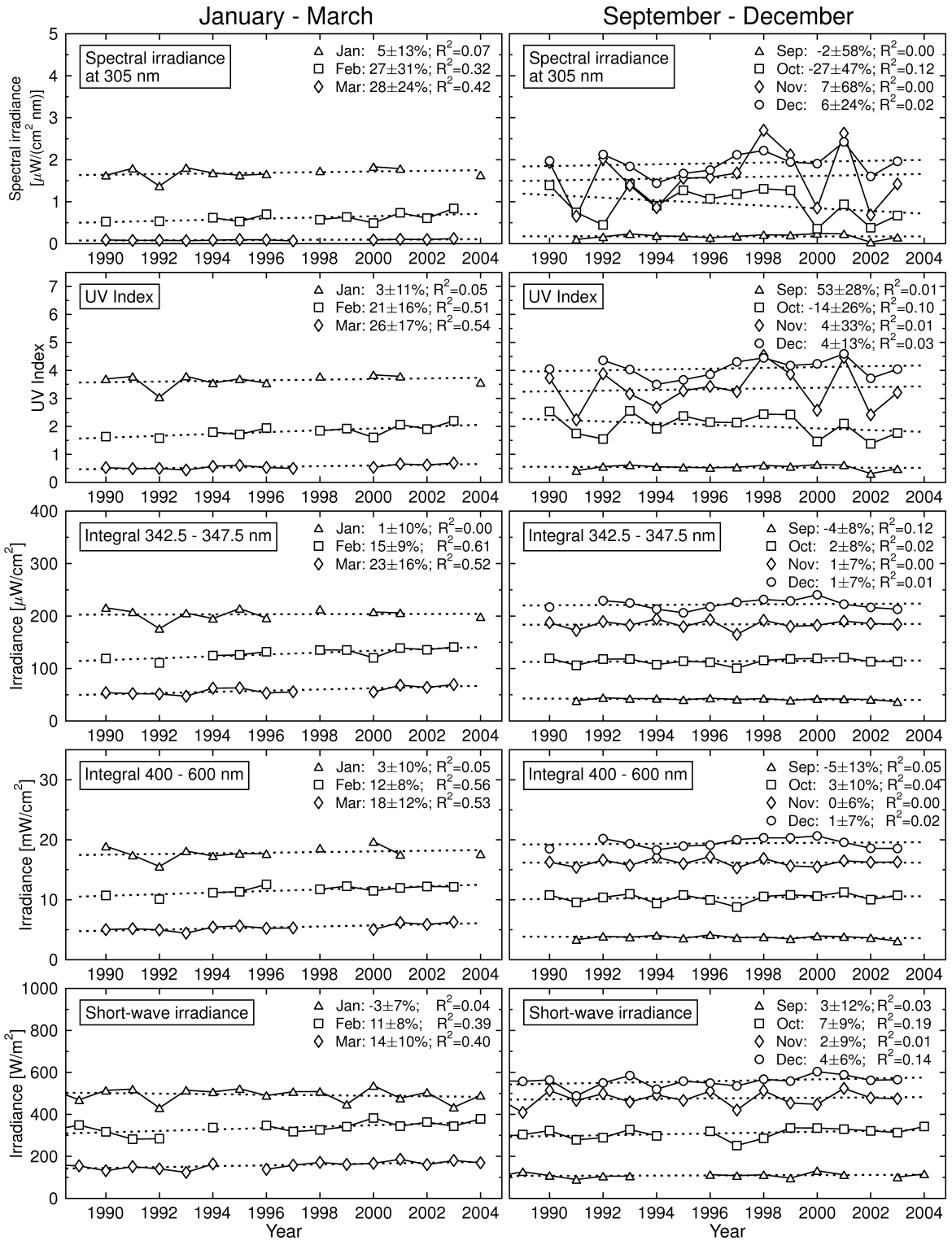

Figure 2: Time series of average noon-time measurements for months of January – March (left column) and September – December (right column) and five data products, indicated in the top left corner of each plot. Dashed lines are trend lines determined by linear regression. Trend per decade relative to 1990, 2σ-uncertainty of trend, and regression coefficient R^2 are also indicated in the legend of each plot.