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# The UV-A and visible solar irradiance spectrum: inter-comparison of absolutely calibrated, spectrally medium resolution solar irradiance spectra from balloon- and satellite-borne measurements

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Abstract. Within the framework of the ENVISAT/-SCIAMACHY satellite validation, solar irradiance spectra are absolutely measured at moderate resolution in the UV/visible spectral range (in the UV from 316.7-418 nm and the visible from 400-652 nm at a full width half maximum resolution of 0.55 nm and 1.48 nm, respectively) from aboard the azimuth-controlled LPMA/DOAS balloon gondola at around 32 km balloon float altitude. After accounting for the atmospheric extinction due to Rayleigh scattering and gaseous absorption ($O_3$ and $NO_2$), the measured solar spectra are compared with previous observations. Our solar irradiance spectrum perfectly agrees within +0.03% with the re-calibrated Kurucz et al. (1984) solar spectrum (Fontenla et al., 1999, called MODTRAN 3.7) in the visible spectral range (415-650 nm), but it is +2.1% larger in the (370-415 nm) wavelength interval, and -4% smaller in the UV-A spectral range (316.7-370 nm), when the Kurucz spectrum is convolved to the spectral resolution of our instrument. Similar comparisons of the SOLSPEC (Thuillier et al., 1997, 1998a, b) and SORCE/SIM (Harder et al., 2000) solar spectra with MODTRAN 3.7 confirms our findings with the values being -0.5%, +2%, and -1.4% for SOLSPEC -0.33%, -0.47%, and -6.2% for SORCE/SIM, respectively. Comparison of the SCIAMACHY solar spectrum from channels 1 to 4 (- re-calibrated by the University of Bremen -) with MODTRAN 3.7 indicates an agreement within -0.4% in the visible spectral range (415-585 nm), -1.6% within the 370-415 nm, and -5.7% within 325-370 nm wavelength interval, in agreement with the results of the other sensors. In agreement with findings of Skupin et al. (2002) our study emphasizes that the present ESA SCIAMACHY level 1 calibration is systematically +15% larger in the considered wavelength intervals when compared to all available other solar irradiance measurements.

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