

Protocol of the intercomparison at Medizinische Universität Innsbruck, Innsbruck, Austria on July 05 to 09, 2010 with the travelling reference spectroradiometer QASUME from PMOD/WRC

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The purpose of the visit was the comparison of global solar irradiance measurements between the spectroradiometer ATI operated by the Medizinische Universität Innsbruck, Sektion für Biomedizinische Physik (MUI) and the travel reference spectroradiometer QASUME. The measurement site is located at Innsbruck; Latitude 47.26 N, Longitude 11.39 E and altitude 620 m.a.s.l.

The horizon of the measurement site is free down to at least 80° solar zenith angle (SZA). Measurements between 4:00 UT and 18:00 UT have been analysed.

QASUME was installed on the measurement platform of the Universität Innsbruck in the morning of July 05, 2010. The spectroradiometer was installed next to the ATI spectroradiometer with the entrance optic of QASUME within 2 m to the other instrument. The spectroradiometer in use at MUI is a Bentham DTMc300 double monochromator (ATI). The intercomparison between QASUME and the ATI spectroradiometer lasted four days, from morning of July 06 to noon of July 09.

QASUME was calibrated several times during the intercomparison period using a portable calibration system. Two lamps (T68522 and T61253) were used to obtain an absolute spectral irradiance calibration traceable to the primary reference held at PMOD/WRC, which is traceable to PTB. The daily mean responsivity of the instrument based on these calibrations varied by less than 1 % during the intercomparison period. The internal temperature of QASUME was 23.9 ± 0.1 °C and the diffuser head was heated to a temperature of 28.4 ± 1.7 °C.

The wavelength shifts relative to an extraterrestrial spectrum as retrieved from the SHICRivm analysis were between ± 50 pm in the spectral range 290 to 450 nm.

Protocol:

The measurement protocol was to measure one solar irradiance spectrum every 30 minutes from 290 to 450 nm, every 0.25 nm, and 1.2 seconds between each wavelength increment.

DOY	Date	DAY	Weather	Comment
186	05-Jul	Monday	Sun & Clouds few rain	Installed at 12:00 UT Calibrated: 16:34 UT using T68522
187	06-Jul	Tuesday	Mostly overcast sky With rain showers	Calibrated: 9:49 and 16:44 UT using T68522
188	07-Jul	Wednesday	Sun & Clouds Clear Sky in the evening Sun mostly clear	Calibrated: 8:45 and 16:45 UT using T68522
189	08-Jul	Thursday	Clear sky	Calibrated: 10:44, 11:17, 17:14 and 17:44 UT using T68522 and T61253
190	09-Jul	Friday	Clear sky	Calibrated: 7:44 UT using T68522 End of Campaign: 10:14 UT

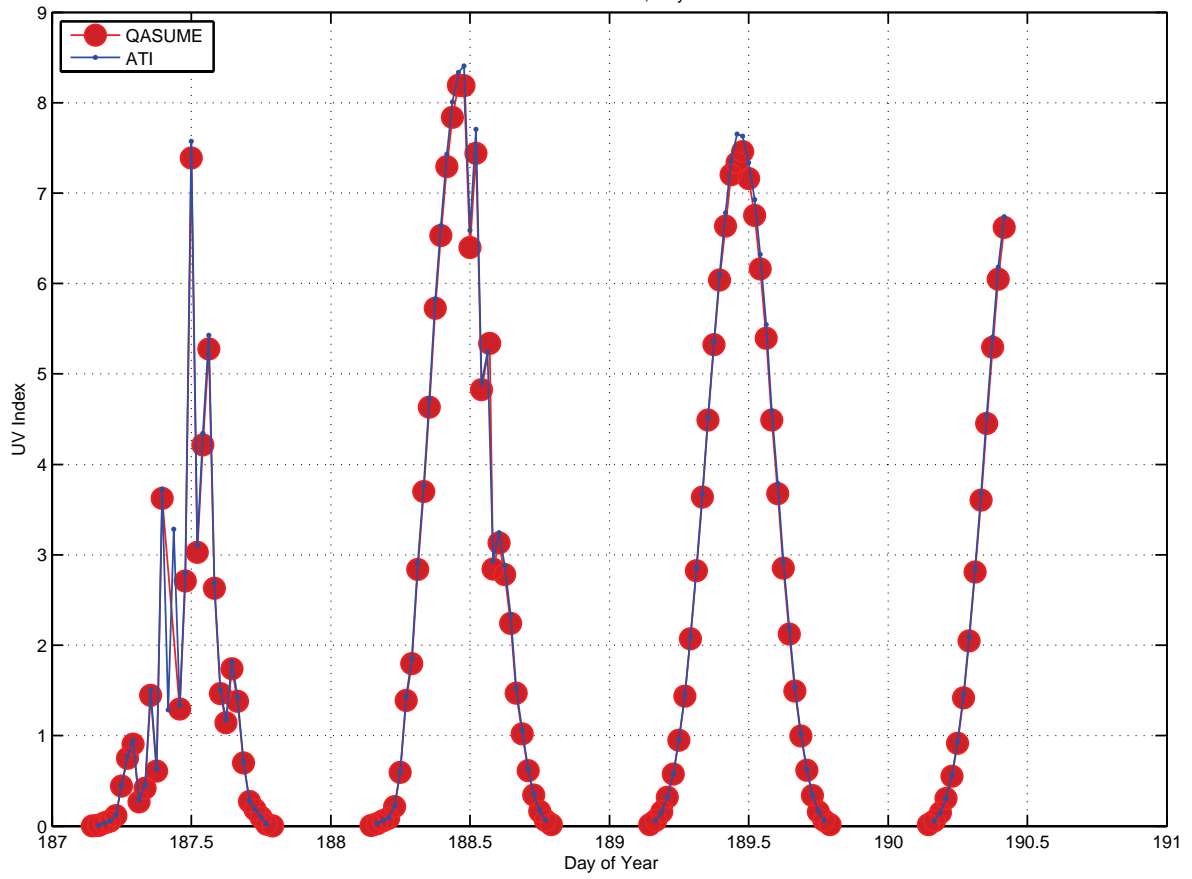
Results:

In total 99 synchronised simultaneous spectra from QASUME and ATI are available from the measurement period. Measurements between 4:00 and 18:00 UT have been analysed (SZA smaller than 90°).

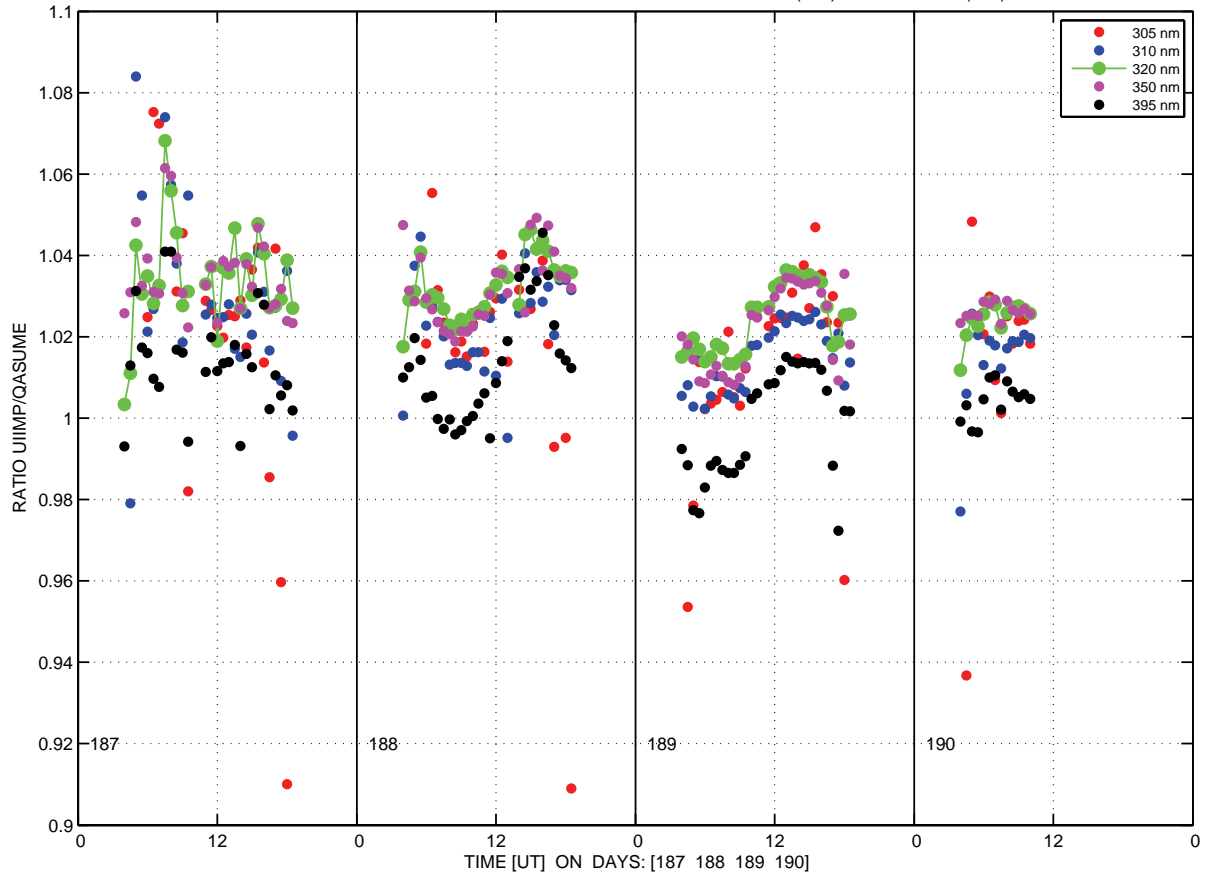
Remarks:

1. The ratios between ATI and QASUME have on average an offset of +3 %.
2. The ATI spectroradiometer was calibrated by a 1000W FEL Lamp prior to the intercomparison.
3. The 3 % offset is mainly due to the different irradiance scales used for the calibration of the two spectroradiometers. This could be shown by a measurement of the travel standard lamp T68522 with the calibrated ATI radiometer (see figure).
4. The diurnal variation of the ATI to QASUME ratio is around 2 % on the relative clear sky day 188. The reason was a misalignment of the ATI diffuser head – looking North-West. This was corrected on the following clear sky day 189 before the 10 UT scan. The remaining diurnal variability can be addressed to the different cosine response function (see figure).
5. The reason for the spectral structure of the ratio could not be found. Only an insignificant change of this structure is observed by changing the slit function of ATI during the processing from an old version (2002) to a new one of this year.
6. The spectroradiometer overestimates Below 300 nm the ratios decrease, in dependence of SZA which is due to stray light of the DM150 QASUME spectroradiometer, which is better suppressed by the DM300 ATI instrument.
7. For all solar scans the wavelength shifts of the ATI are between ± 100 pm.

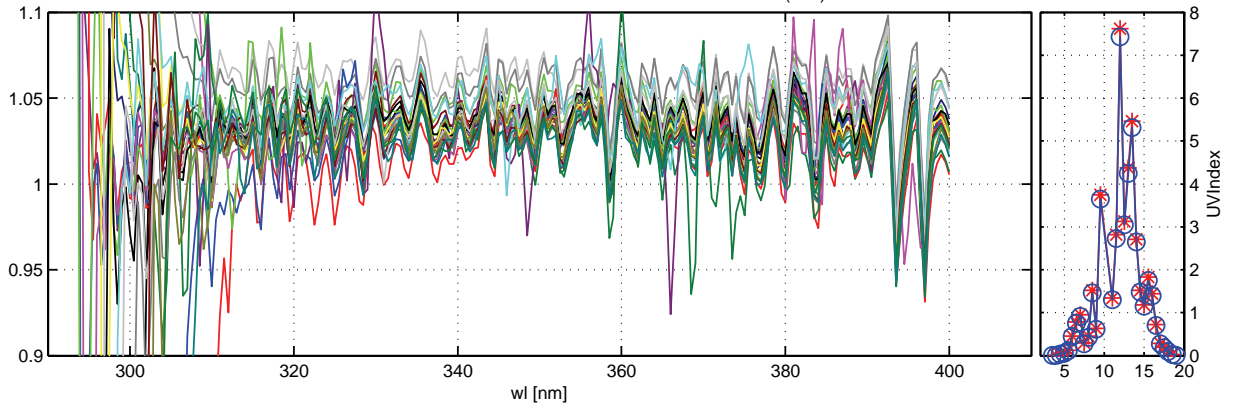
UV Index Innsbruck, July 2010



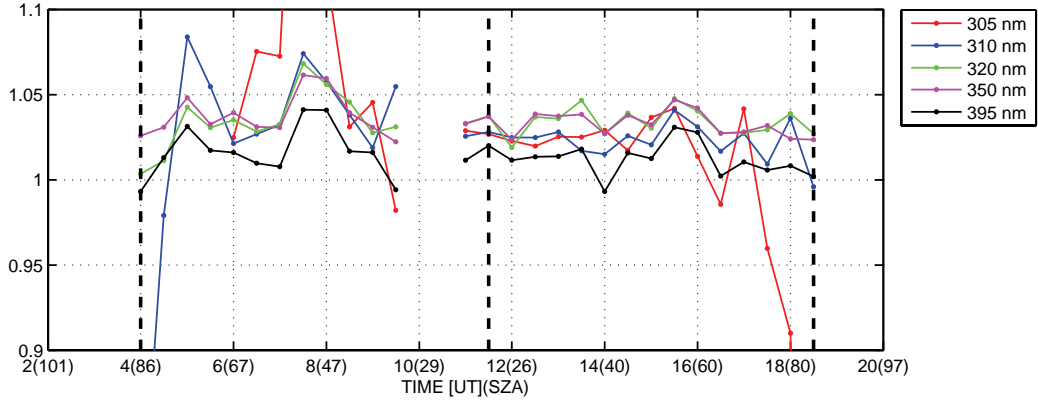
Global irradiance ratios UIIMP/QASUME at Innsbruck:06-Jul-2010(187) to 09-Jul-2010(190)



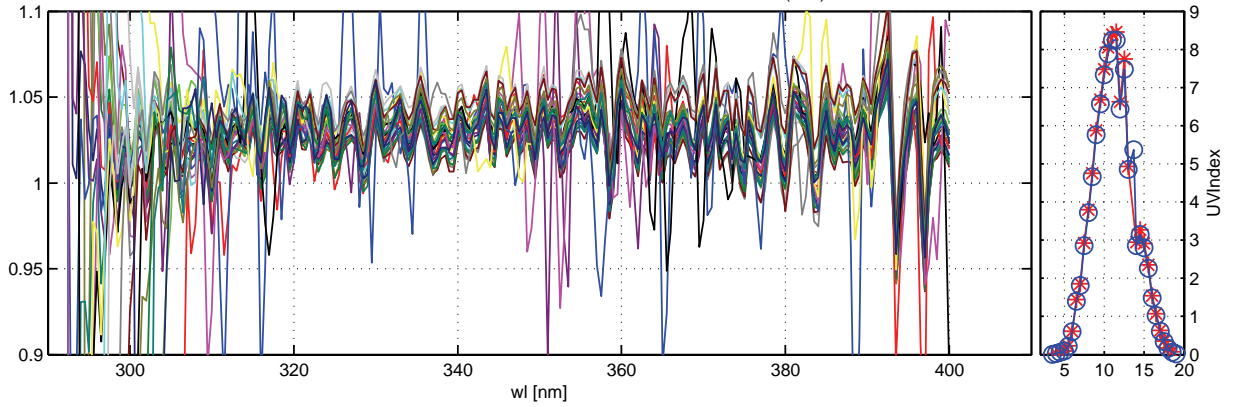
Global irradiance ratios UIIMP/QASUME at Innsbruck:06-Jul-2010(187)



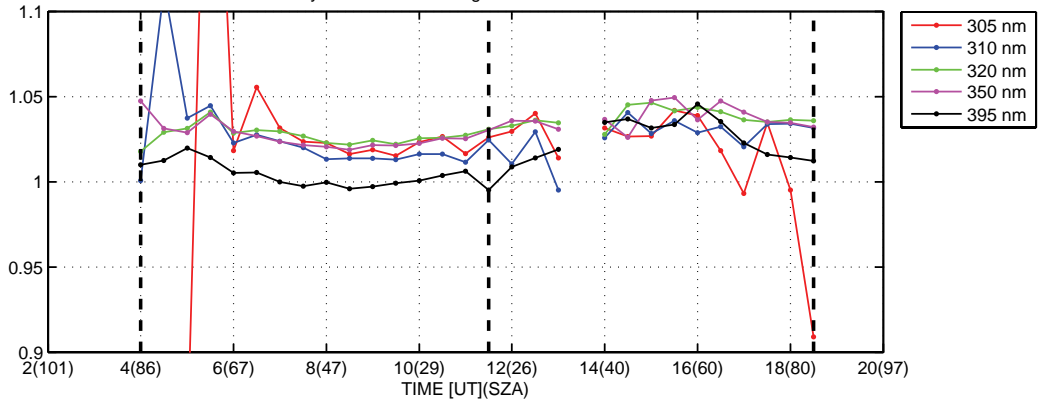
Daily variation. Wavelength bands are ± 2.5 nm

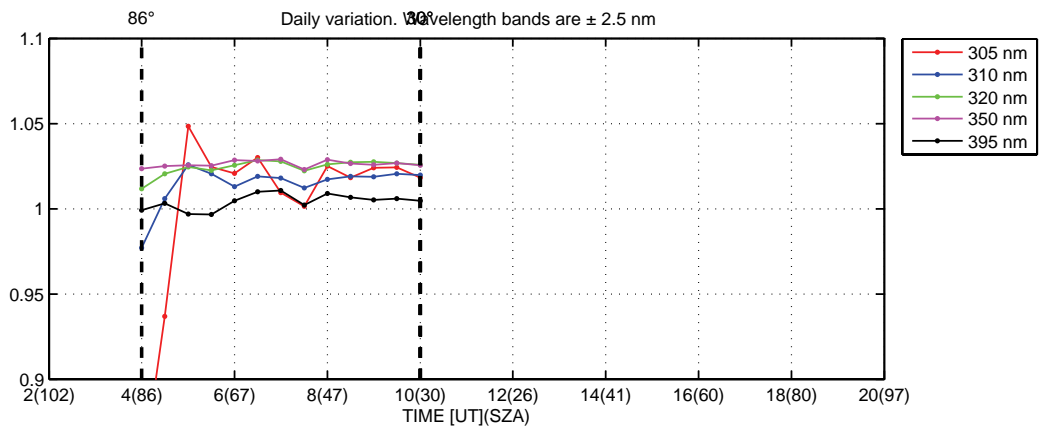
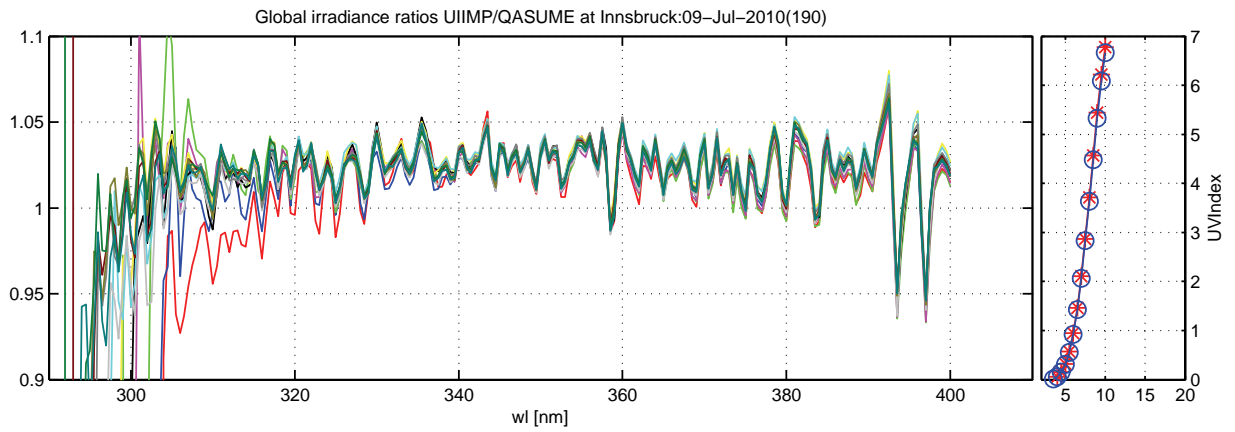
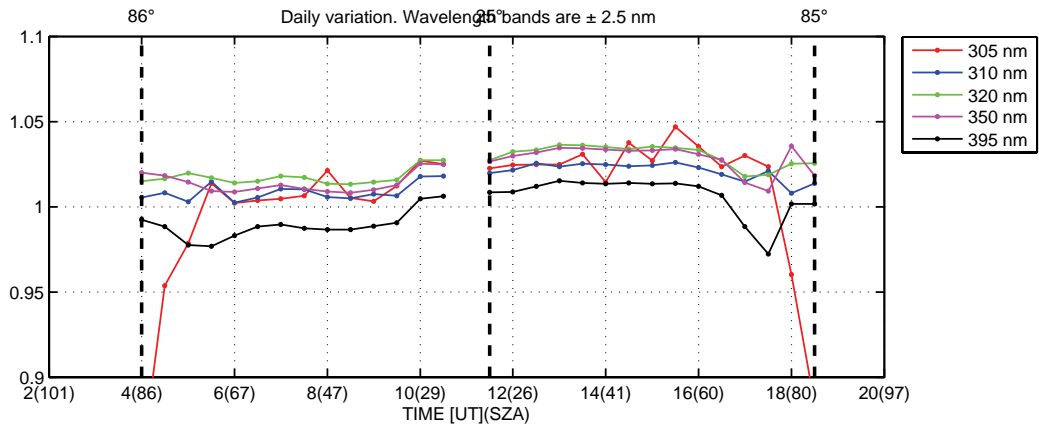
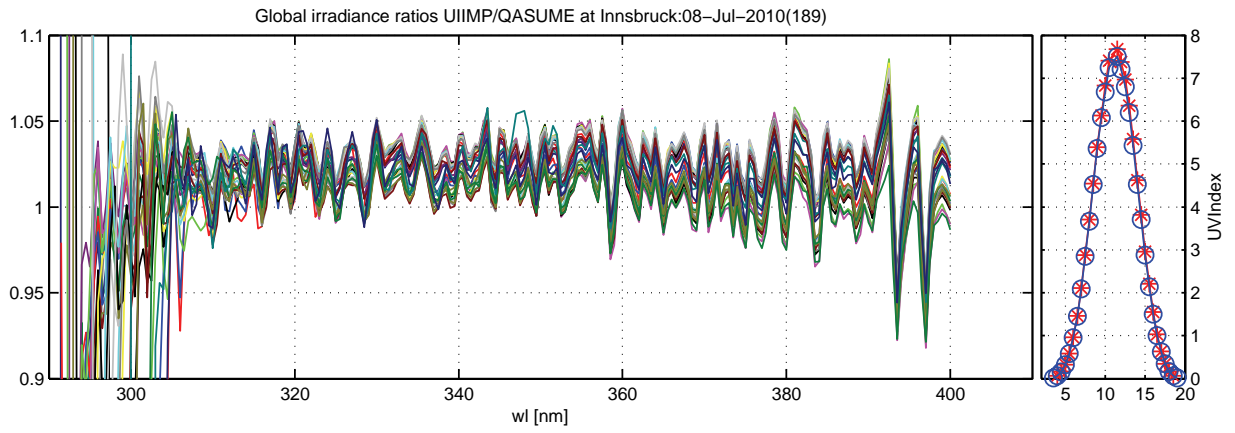


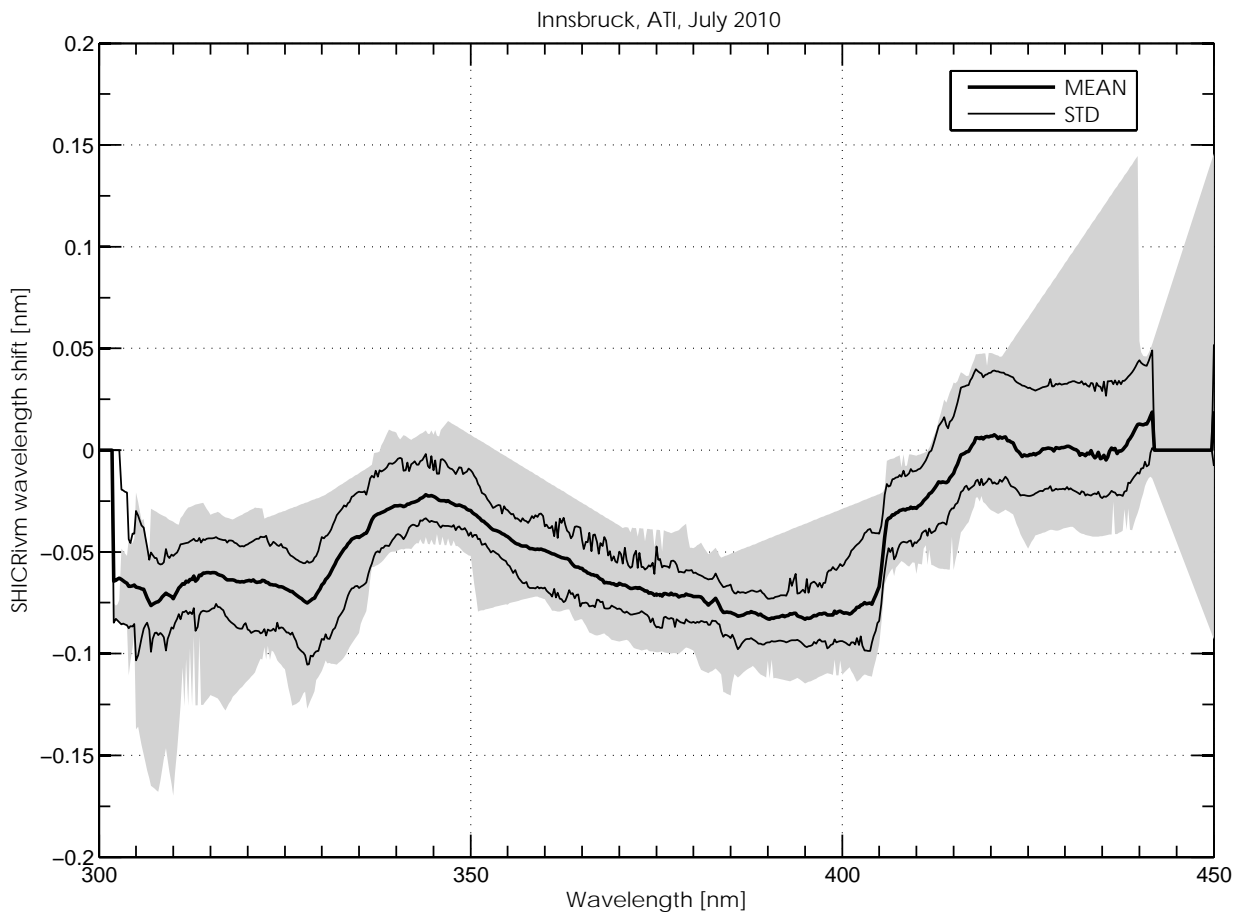
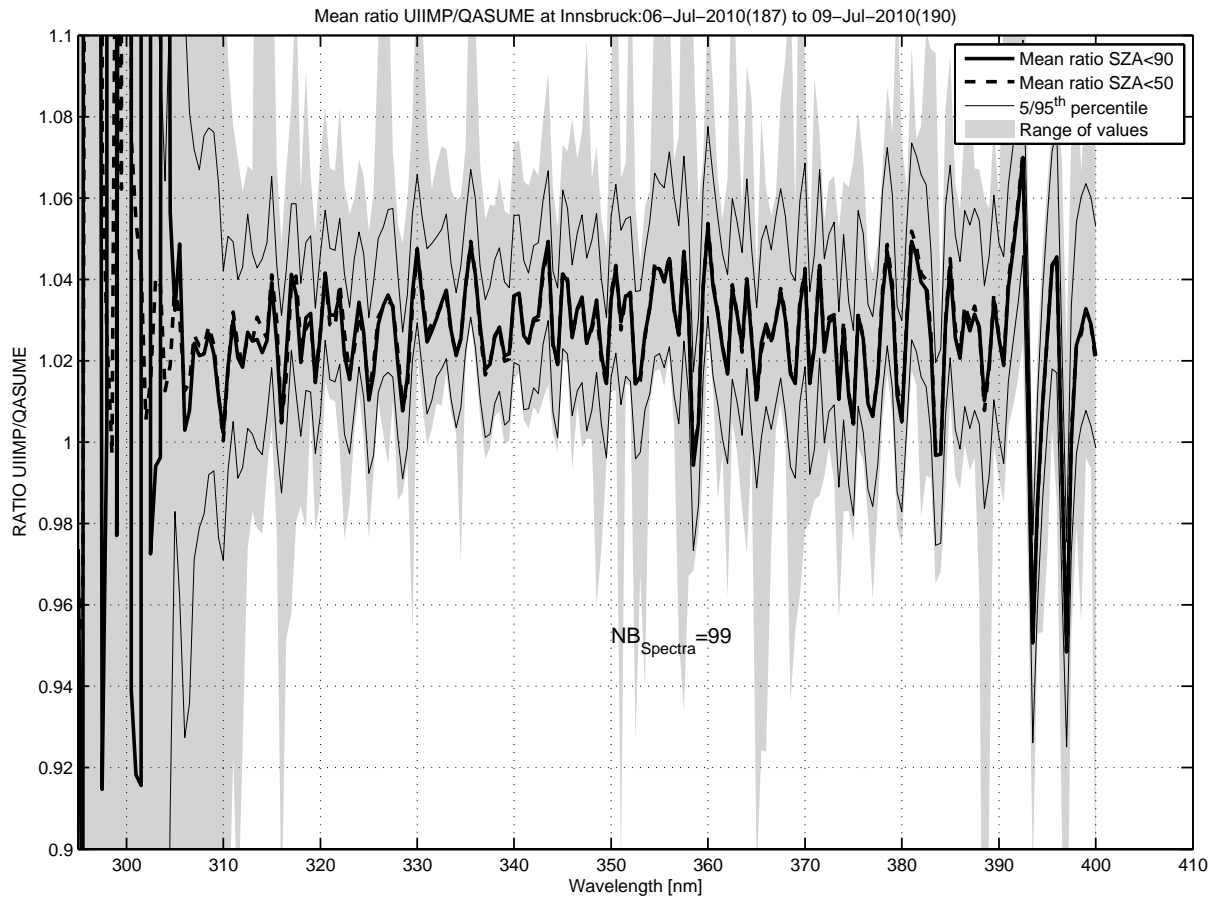
Global irradiance ratios UIIMP/QASUME at Innsbruck:07-Jul-2010(188)



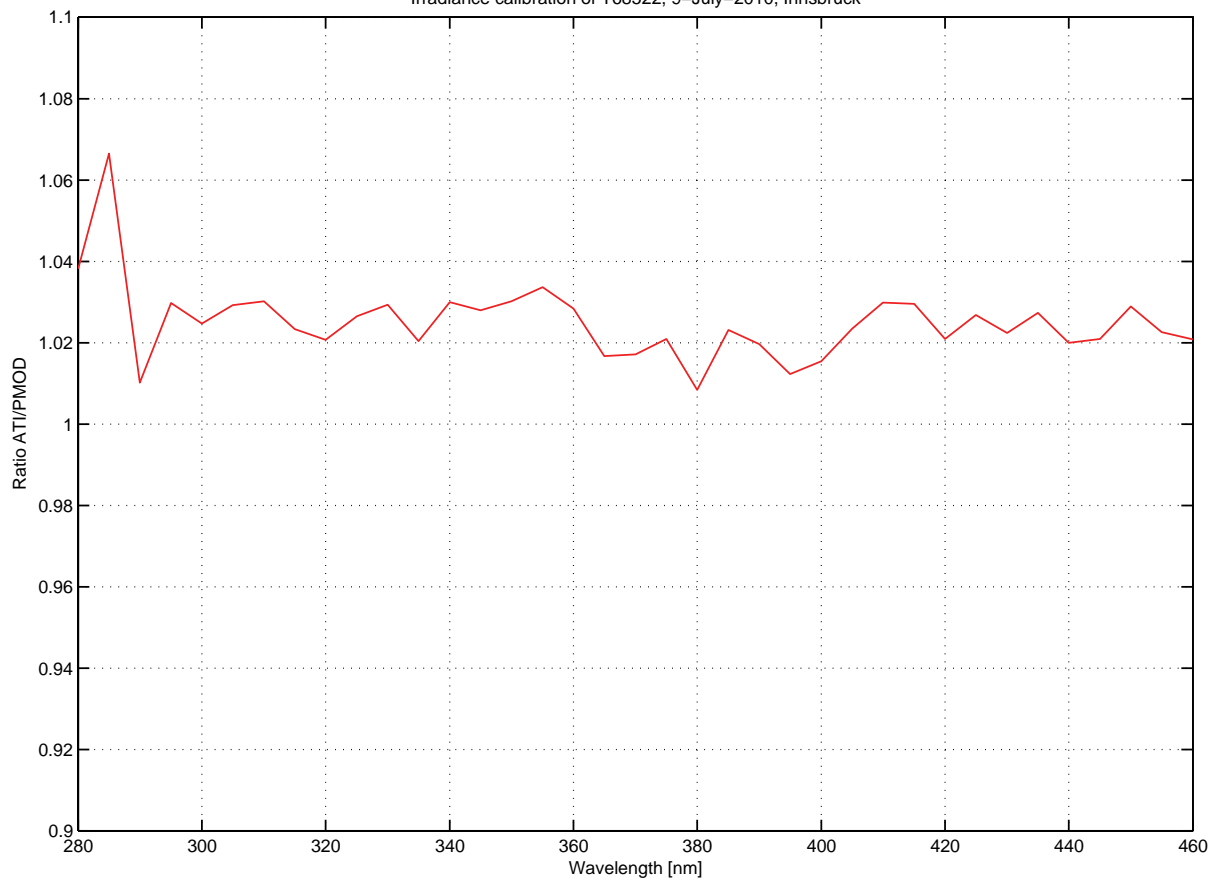
Daily variation. Wavelength bands are ± 2.5 nm







Irradiance calibration of T68522, 9-July-2010, Innsbruck



Cosine Error

