

Protocol of the intercomparison at Medizinische Universität
Innsbruck, Innsbruck, Austria on August 31 to September 04,
2015 with the travelling reference spectroradiometer QASUME from
PMOD/WRC

Report prepared by Luca Egli

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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 6:30 UT and 18:00 UT have been analysed.

QASUME was installed on the measurement platform of the Universität Innsbruck in the afternoon of August 31, 2015. 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 three and a half days, from morning of September 01 to noon of September 04.

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 0.5 % during the intercomparison period. The internal temperature of QASUME was 25.63 ± 0.13 °C, with an increase of approx. 1°C in the evening of 1 September. The diffuser head was heated to a temperature of 33.1 ± 1.67 °C and a diffusor temperature compensation was applied.

The wavelength shifts relative to an extraterrestrial spectrum as retrieved from the MatSHIC analysis were between ± 50 pm in the spectral range 290 to 500 nm.

Protocol:

The measurement protocol was to measure one solar irradiance spectrum every 30 minutes from 290 to 500 nm, every 0.25 nm, and 1.5 seconds between each wavelength increment.

| DOY | Date | DAY | Weather | Comment |
|-----|---------|-----------|---|--|
| 243 | 31. Aug | Monday | Clear sky | Installed at 14:16 UTC |
| 244 | 01. Sep | Tuesday | Clear sky clouds starting at 13:00 15:00 total overcast | Calibrated: 10:22 UTC using T68523 Calibrated: 10:43 UTC using T68522 |
| 245 | 02. Sep | Wednesday | Overcast & rain | Calibrated: 11:40 UTC using T68523 Calibrated: 14:40 UTC using T68522 |
| 246 | 03. Sep | Thursday | Overcast, no rain | Calibrated: 7:43 UTC using T68523 Calibrated: 14:18 UTC using T68522 |
| 247 | 04. Sep | Friday | Overcast, moving clouds | Calibrated: 9:28 UTC using T68523 End of Campaign: 9:43 UTC |

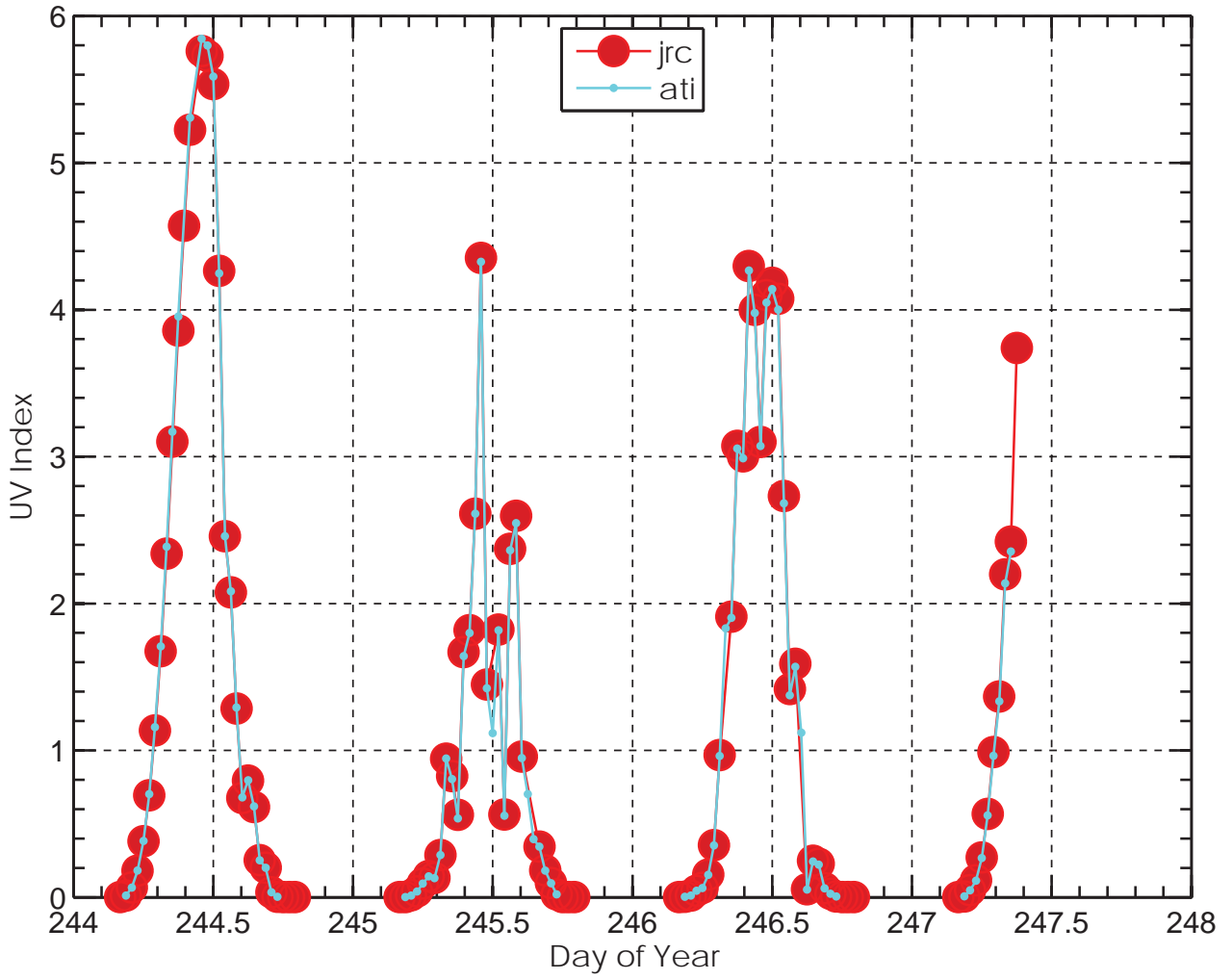
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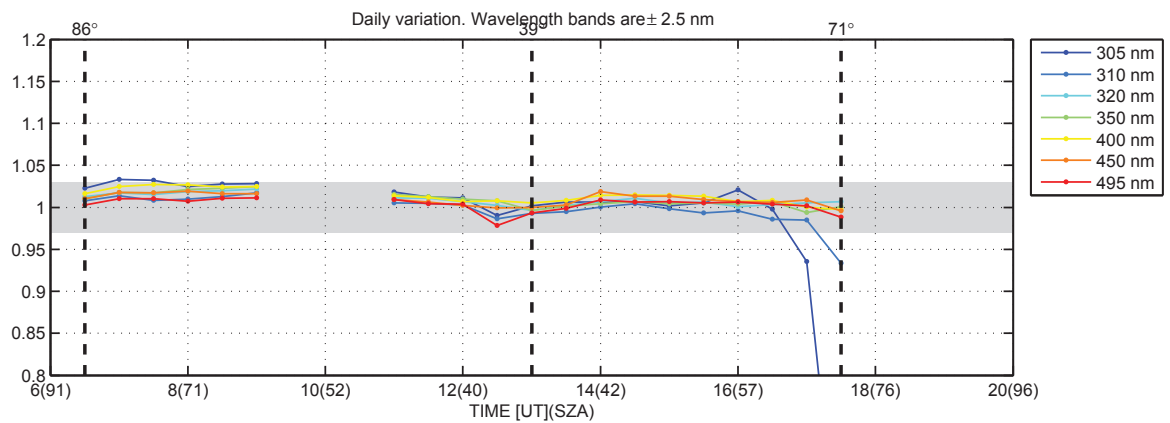
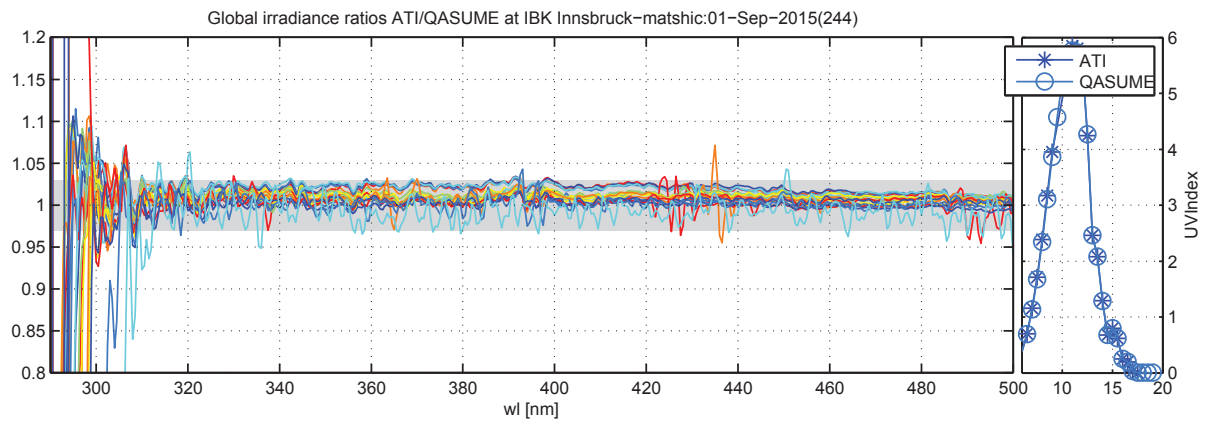
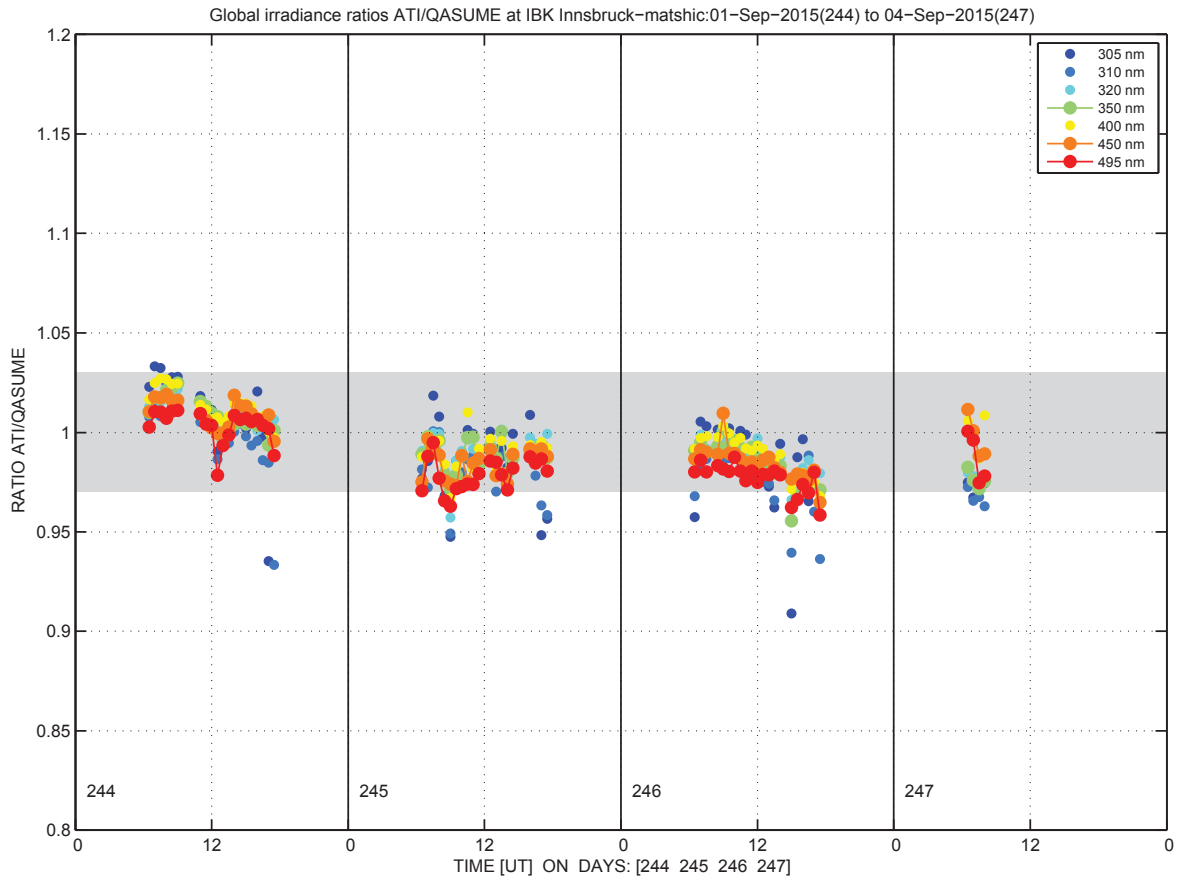
In total 65 synchronised simultaneous spectra from QASUME and ATI are available from the measurement period. Measurements between 6:30 and 18:00 UT have been analysed (SZA smaller than 90°).

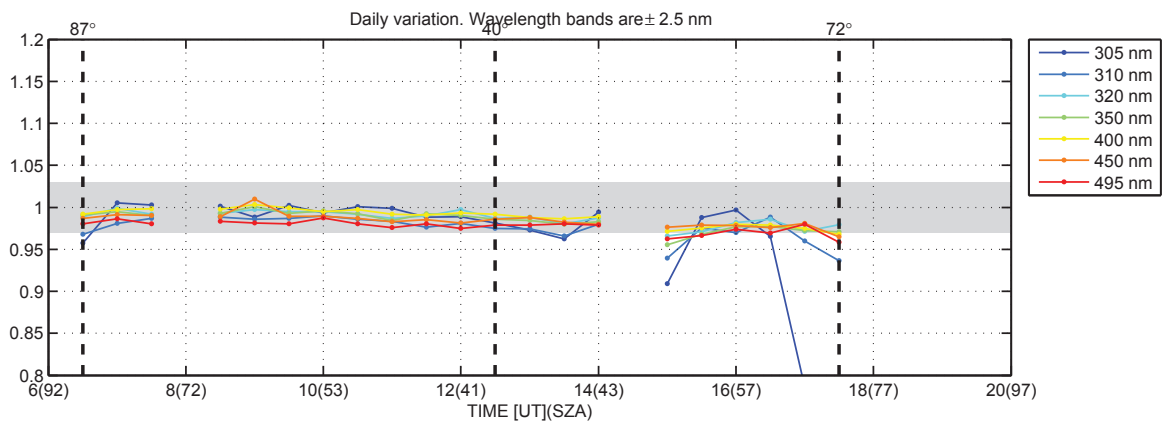
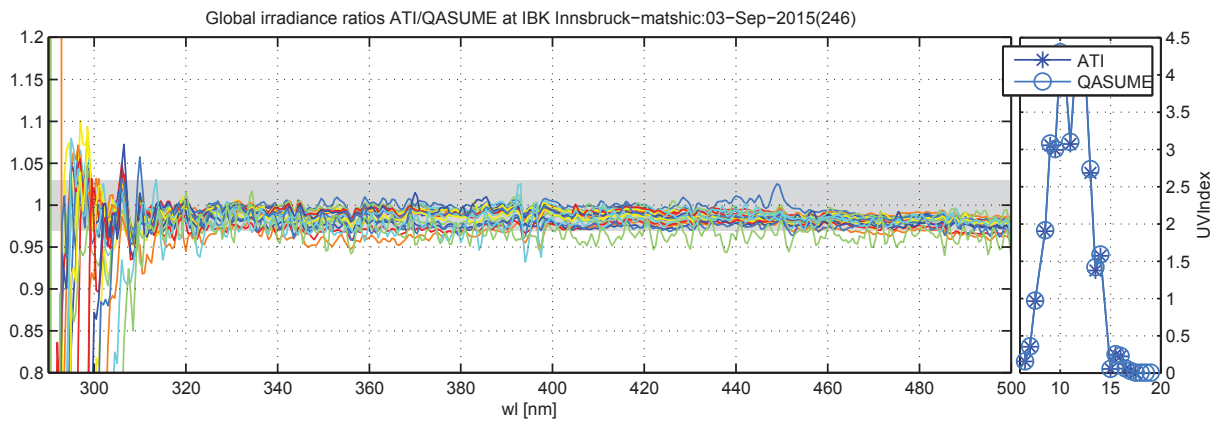
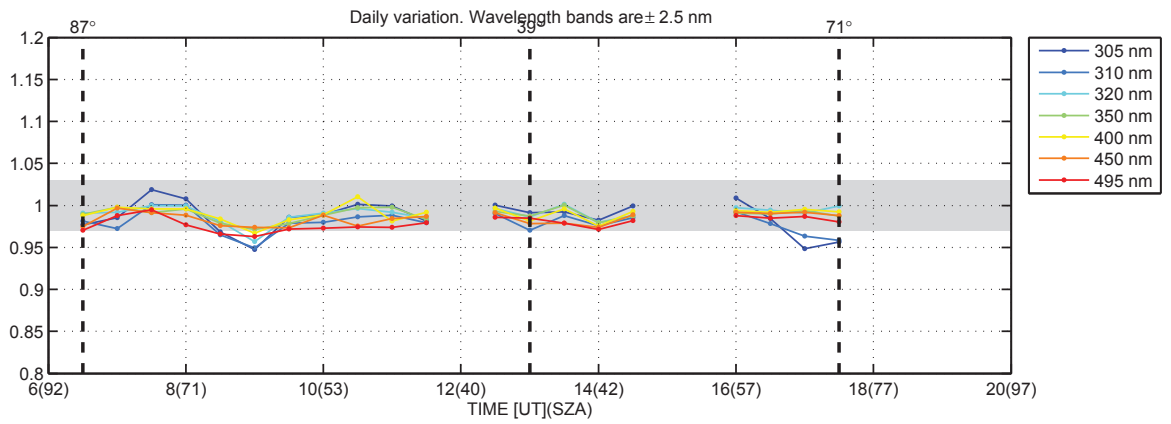
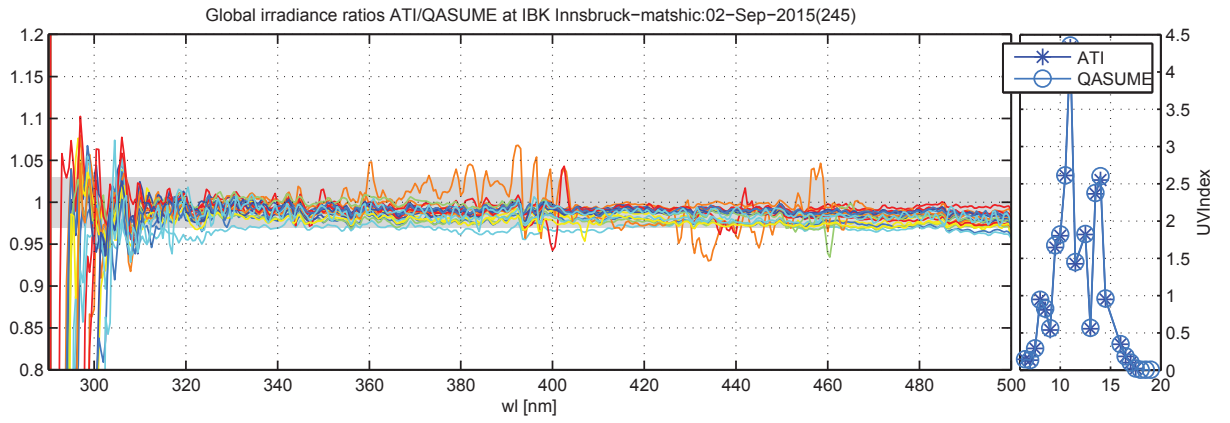
Remarks:

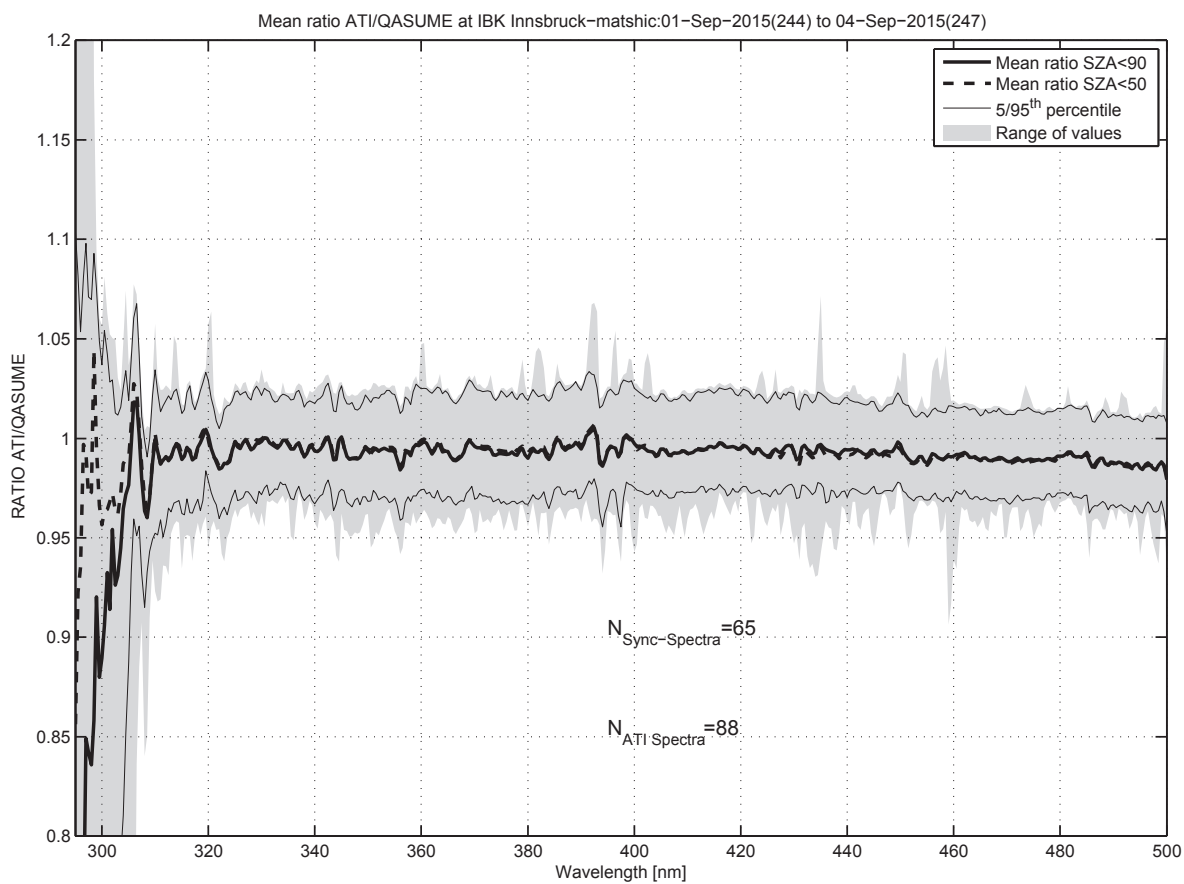
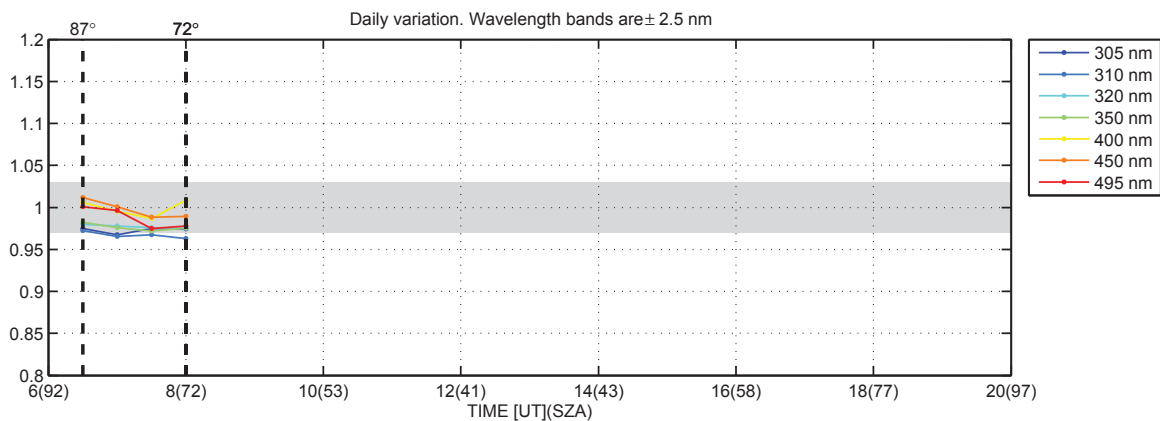
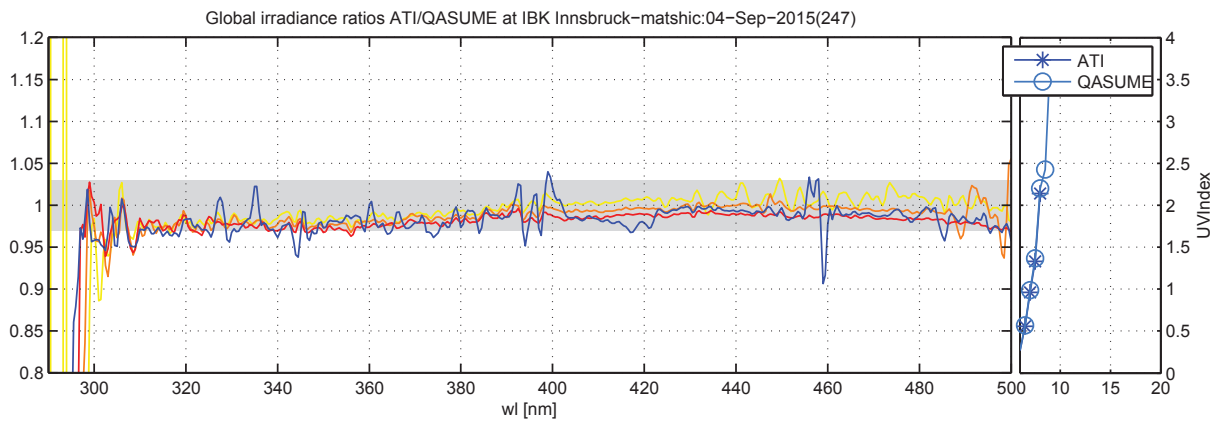
1. The ATI spectroradiometer was calibrated with a portable 200W calibrator during the intercomparison. The 200 W lamp was calibrated by a 1000W FEL Lamp (traceable to PTB).
2. A diffusor head temperature compensation was applied for ATI during the intercomparison.
3. The ratios between ATI and QASUME have on average an offset of less than -1 %.
4. The diurnal variation of the ATI to QASUME ratio is around 2 % on the clear sky day 244, indicating a well cosine response of ATI.
5. The diurnal variation of the ATI to QASUME ratio at the over-casted days (245, 246) is also around 2%.
6. The ratios between ATI to QASUME show a decrease of approx. 2% between the clear sky day (244) and the over-casted days (245, 246). This effect might be attributed to the large air-temperature differences and corresponding head temperature changes between day 244 and the consecutive days. This might indicate a non-ideal diffusor head temperature compensation.
7. Below 300 nm the ratios decrease, in dependence of SZA, due to stray light of the DM150 QASUME spectroradiometer, which is better suppressed by the DM300 ATI instrument.
8. For all solar scans the wavelength shifts of the ATI are between -50 pm and +100 pm.

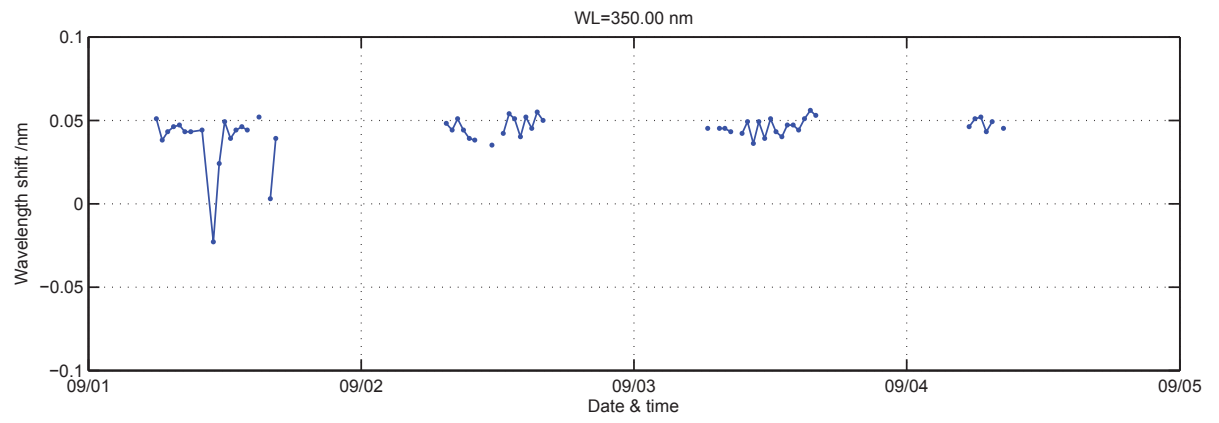
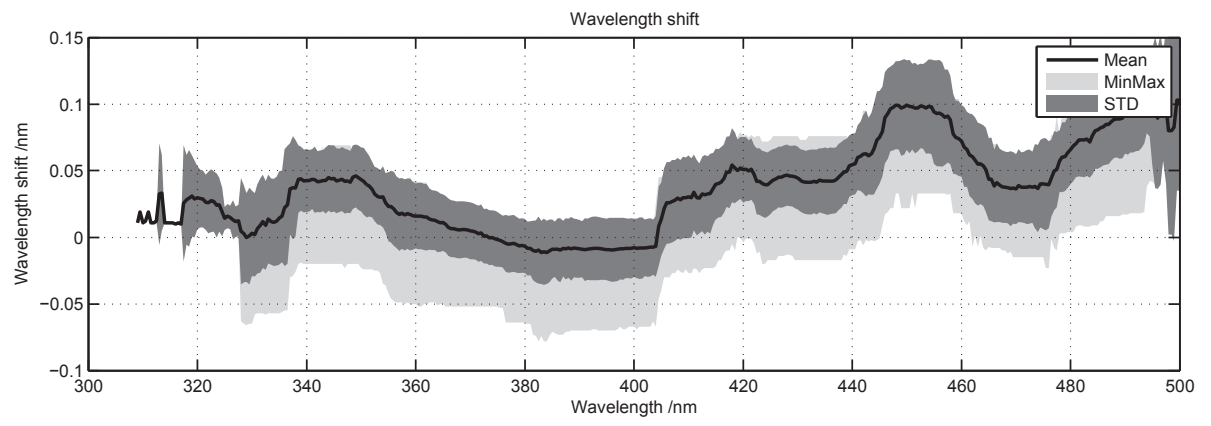
UV Index Innsbruck, September 2015

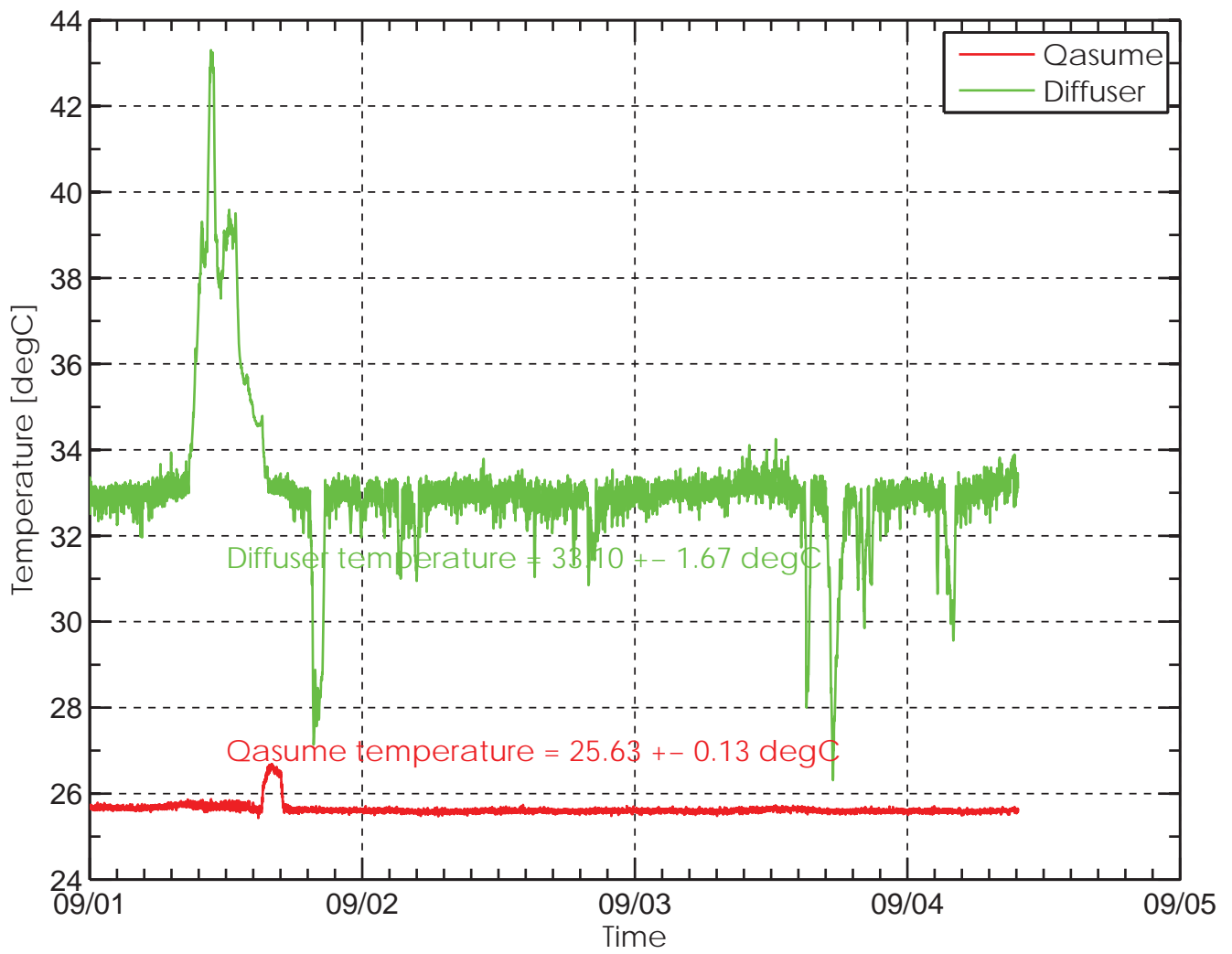












Qasume Responsivity Change, September 2015, Innsbruck (T68522, T68523)

