Validation of SCIAMACHY In-flight Measured Irradiances, Radiances and Selected Tracegas Products by Comparison with Measurements from Independent Satellite Instruments (VIRTIS, FKZ: 50 EE 0025)

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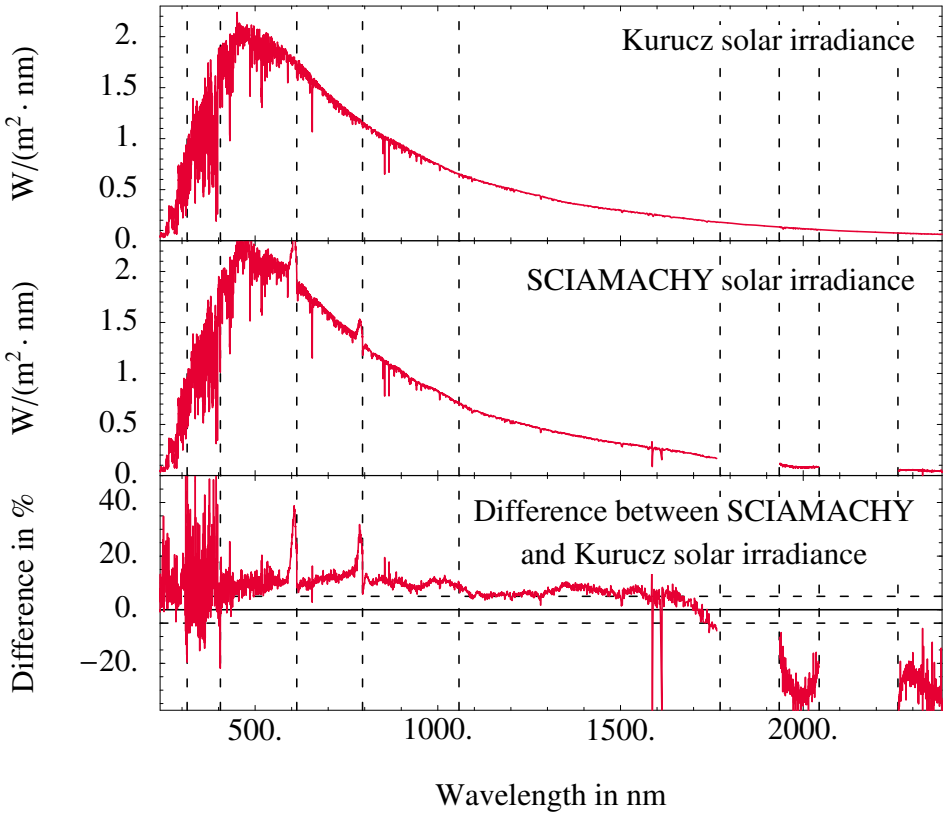
Level-1 Validation: Absolute radiometric accuracy (1)

Early result:



- **Early results showed an irradiance offset of about +10 %**
- **Additional problems:**
  - **Channel boundaries**
  - **Icing in channels 7 and 8**
  - **Instrumental characteristics: Non-linearity of IR detectors, memory effect of channels 1 to 5, neutral density filter, . . .**

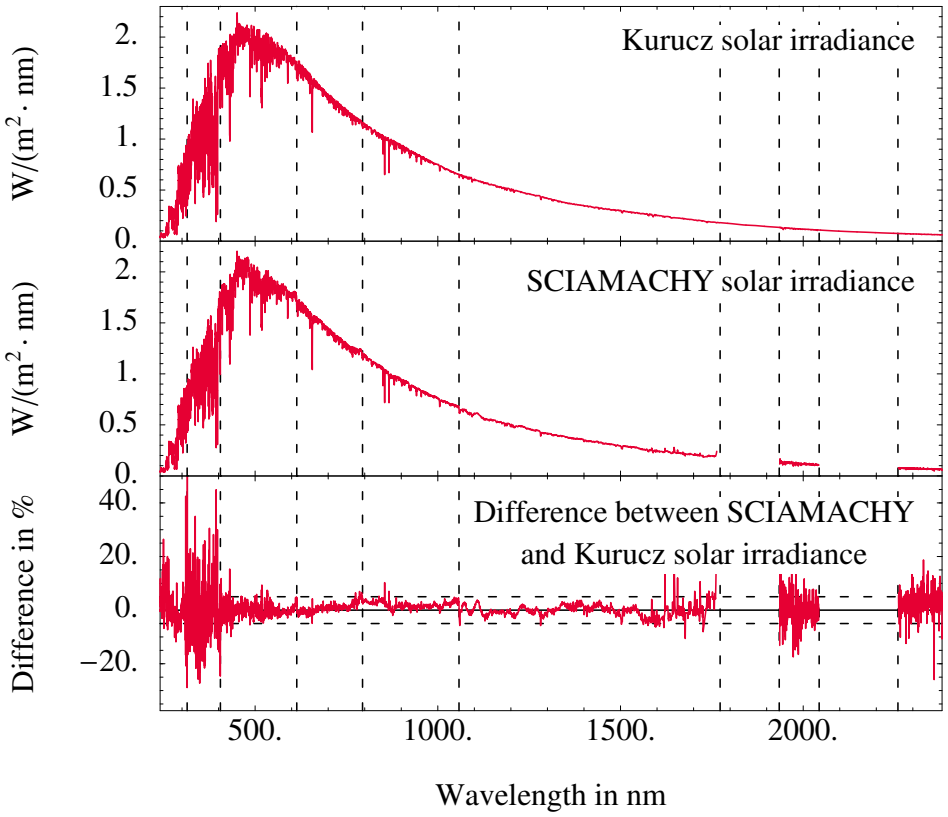
Level-1 Validation: Absolute radiometric accuracy (2)

- **Radiometric correction factors derived from a revision of the on-ground calibration (IUP Bremen)**
- **Analysis of on-ground and in-flight calibration measurements to derive instrumental characteristics (SRON)**
- **Improvement of calibration routines for:**
  Icing in channels 7 and 8, etalon correction, pixel exposure time of channel 6 (SRON, IUP Bremen)

⇒ **Validation of improvements before implementation in 0-1 processing**

Level-1 Validation: Absolute radiometric accuracy (3)

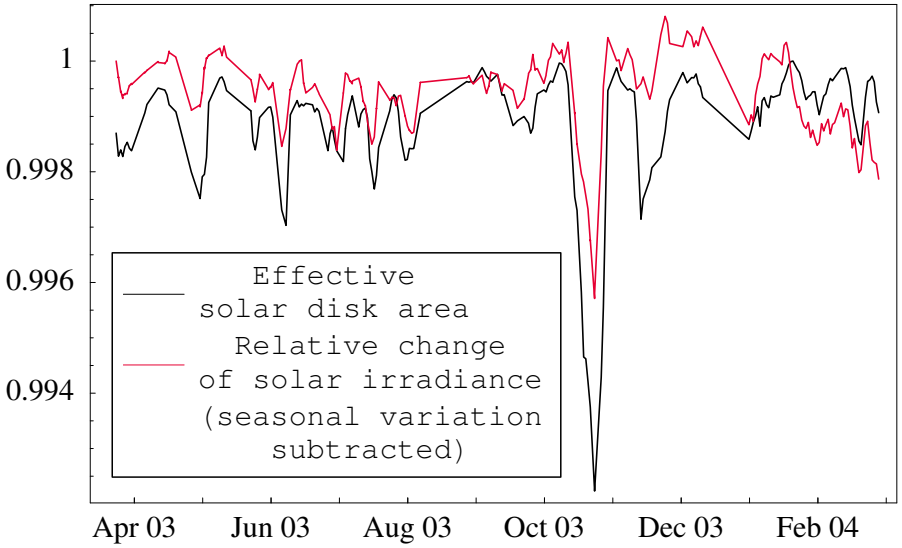
Current status of improved radiometric calibration:



⇒ **Compared with Kurucz spectrum mean absolute radiometric accuracy better than 2–3 % for whole wavelength range 240–2380 nm**

- **Comparisons with Wehrli & E490 spectra and with spaceborne instruments like SOLSPEC, SOLSTICE & SUSIM give comparable results**

Level-1 Validation: Relative radiometric accuracy



(relative change of SCIAMACHY solar irradiance in the wavelength range around the solar irradiance maximum, ≈500 nm, SCIAMACHY channel 3)

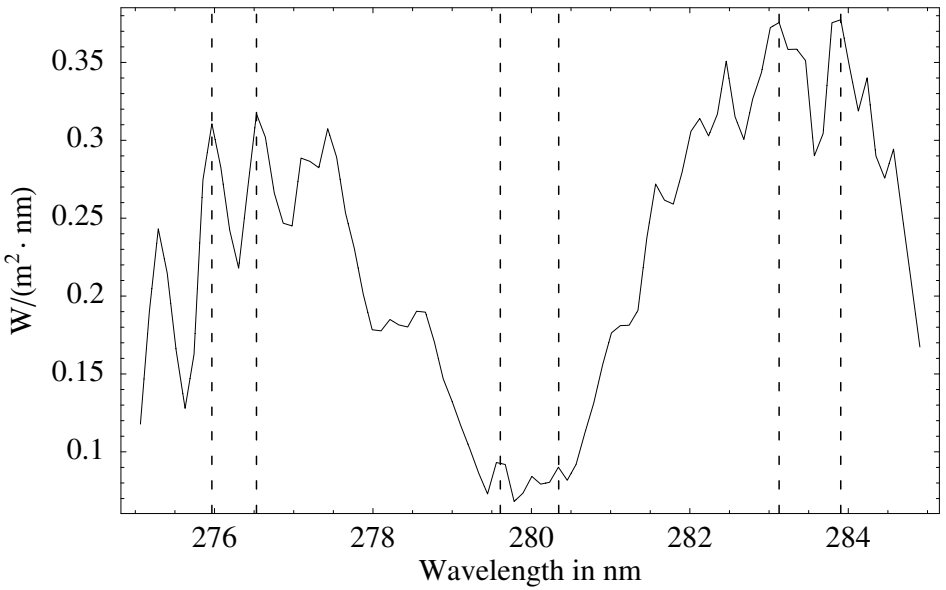
- **In VIS sun spots lead to a reduction of the effective solar disk area**

⇒ **Correlation coefficient of 0.798**

⇒ **SCIAMACHY is capable to measure relative changes of the solar irradiance in the 10^{-3} range**

Level-1 Validation: Sensitivity for spectral features (1)

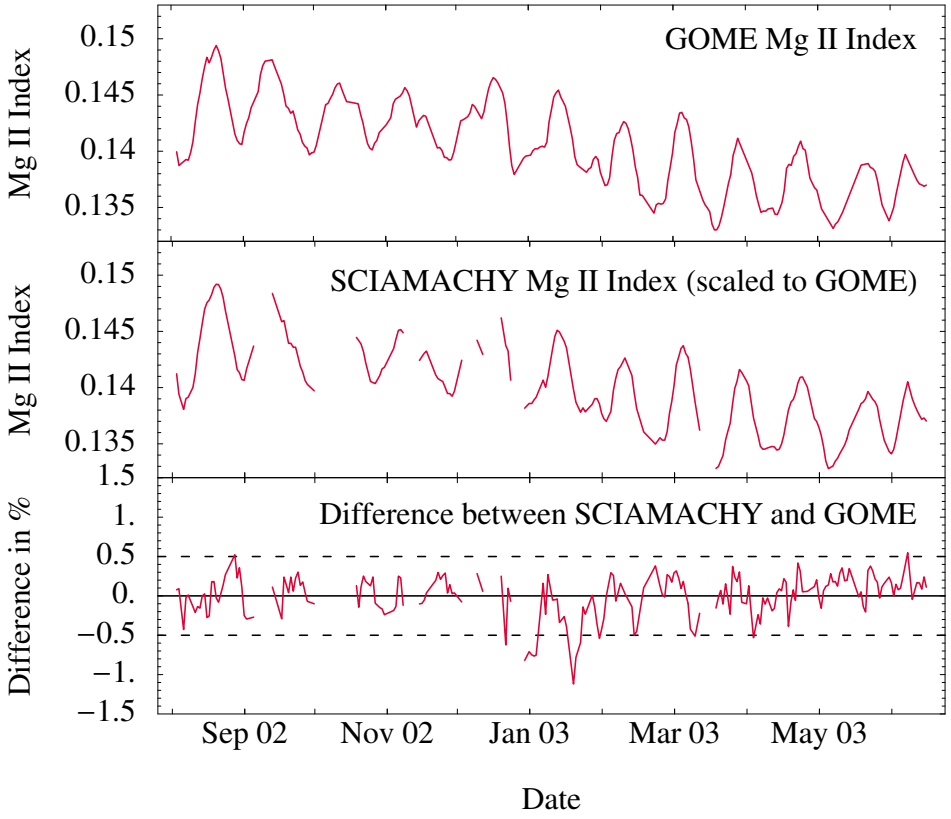
Fraunhofer line at 279.9 nm:



- **Mg II index: Solar proxy indicator given by the core-to-wing ratio of Fraunhofer line at 279.9 nm**
- **Mg II index successfully used as a proxy for spectral variation in the extreme UV and far UV region during solar cycle**

Level-1 Validation: Sensitivity for spectral features (2)

SCIAMACHY & GOME Mg II index:



⇒ **Differences between GOME and SCIAMACHY mostly below ±0.5 % with a very high correlation coefficient of 0.995**

- **Comparison with NOAA Mg II index gives comparable results**

⇒ **Spectral structures in solar irradiance are measured accurately and with long term stability**

Level-1 Validation: Selected publications

- J. Skupin, S. Noël, M. W. Wuttke, H. Bovensmann and J. P. Burrows; Calibration of SCIAMACHY in-flight measured irradiances and radiances – first results of level 1 validation (CASIMIR, Envisat AOID 406). *Proceedings of the Envisat Validation Workshop (SP-531)*, ESA Publications Division, 9.–13. December 2002
- J. Skupin, S. Noël, M. W. Wuttke, H. Bovensmann, J. P. Burrows, R. Hoogeveen, Q. Kleipool and G. Lichtenberg; In-flight calibration of the SCIAMACHY solar irradiance spectrum. *Adv. Space Res.*, Vol. 32, No. 11, S. 2129–2134, 2003
- J. Skupin, K. Gerilowski, S. Noël, M. W. Wuttke, H. Bovensmann, and J. P. Burrows; Improvement of the SCIAMACHY radiometric calibration and its validation on solar irradiances in the spectral range from 240 to 2380 nm. *Proceedings of the ENVISAT & ERS Symposium (SP-572)*, ESA Publications Division, 2004
- J. Skupin, M. Weber, H. Bovensmann, and J. P. Burrows; The Mg II solar activity proxy indicator derived from GOME and SCIAMACHY. *Proceedings of the ENVISAT & ERS Symposium (SP-572)*, ESA Publications Division, 2004
- J. Skupin, M. Weber, H. Bovensmann, and J. P. Burrows; The SCIAMACHY solar Mg II index compared with GOME/ERS2 and NOAA/SBUV2 indices. In: J. P. Burrows and U. Platt (Editors): *Probing the atmosphere in three dimensions for SCIAMACHY,* ACP - Special Issue, 2004: submitted
- J. Skupin, S. Noël, K. Gerilowski, M. W. Wuttke, H. Bovensmann, and J. P. Burrows; The SCIAMACHY solar irradiance compared with data from Kurucz, SOLSPEC, SOLSTICE, and SUSIM. In: J. P. Burrows and U. Platt (Editors): *Probing the atmosphere in three dimensions for SCIAMACHY,* ACP - Special Issue, 2004: submitted
- J. Skupin, S. Noël, M. W. Wuttke, M. Gottwald, H. Bovensmann, M. Weber, and J. P. Burrows; SCIAMACHY Solar Irradiance Observation in the Spectral Range from 240 to 2380 nm. *Adv. Space Res.*, 2005: submitted
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