On-ground to in-flight correction for SCIAMACHY Level 1b Version 9 based on WLS measurments

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24/25 February 2016

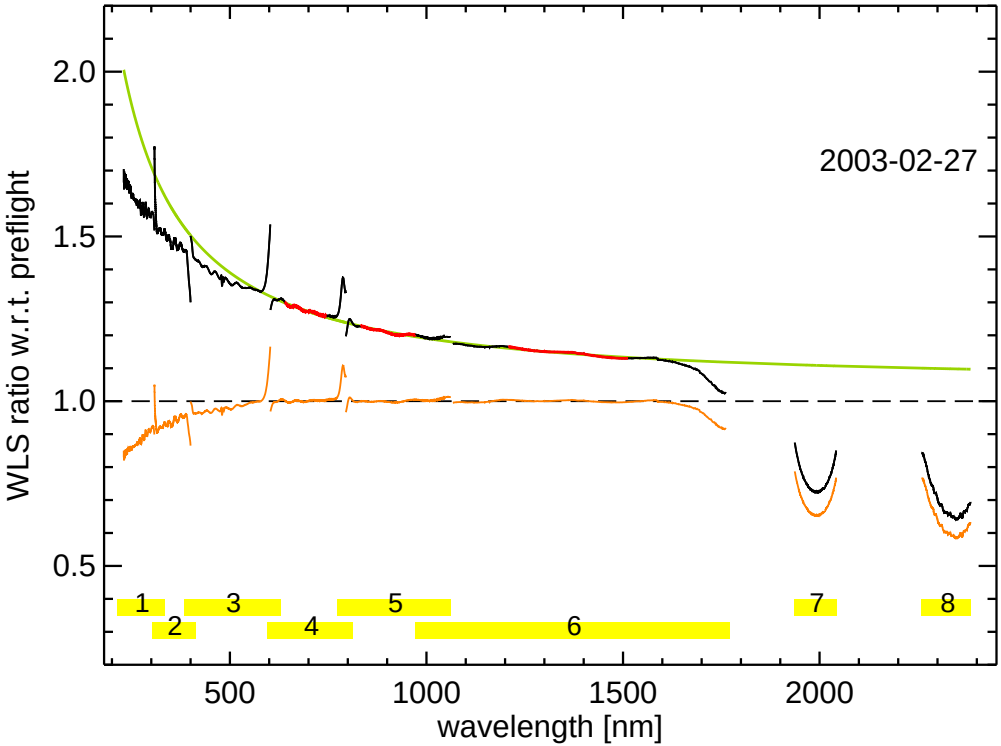
On-ground to in-flight correction

- Instrument changed from on-ground (ambient, gravity) to in-flight (vacuum, zero-gravity, ...)
- L1B V8 on-ground to in-flight correction: etalon correction for 11th Aug 2003 (m-factor reference day V8)
- Proposal V9: Correction based on ratio of on-ground and in-flight WLS measurements:
  - Originally proposed 2005 as improved etalon correction (Skupin, 2005).
  - On-ground WLS as described in Lichtenberg (2005).
  - In-flight WLS: 27 Feb 2003
  - WLS itself changes from on-ground to in-flight because of zero-gravity
  - WLS is modeled as gray body (black body with emissivity $\varepsilon \leq 1$
  - From on-ground, T and ε may change:

$$\text{correction}(\lambda) = a_{\text{fit}} \cdot \frac{\text{blackbody}(\lambda, T_{\text{on-ground}} + \Delta T_{\text{fit}})}{\text{blackbody}(\lambda, T_{\text{on-ground}})} \tag{1}$$

  - T_{fit} and a_{fit} are fitted from the WLS ratio
  - Assumption: correction(λ) describes change of WLS, remaining changes are instrument changes.

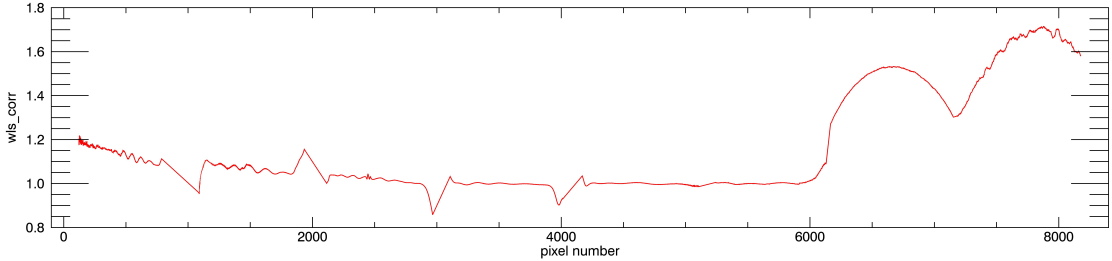
Fit



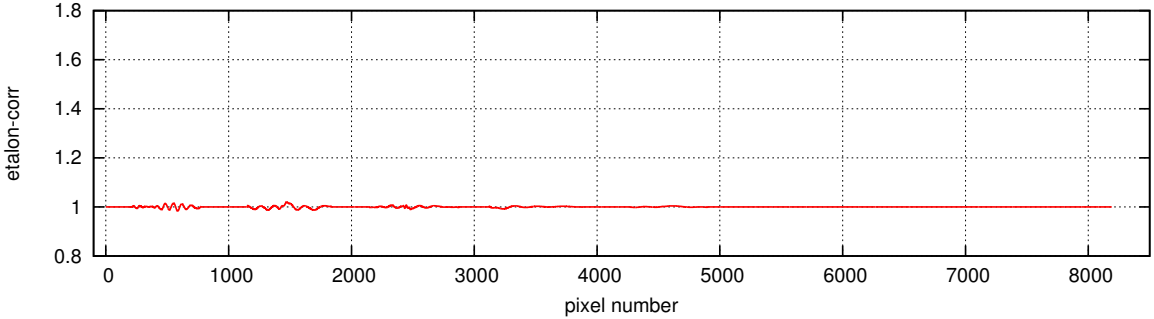
- black line: WLS ratio in-flight to on-ground
- red parts: data used in fit
- green line: fitted ratio of the two Planck curves (correction(λ))
- brown line: ratio measured(black) to modeled (green) WLS ratio.

Brown line is the on-ground to in-flight correction.

WLS correction factor

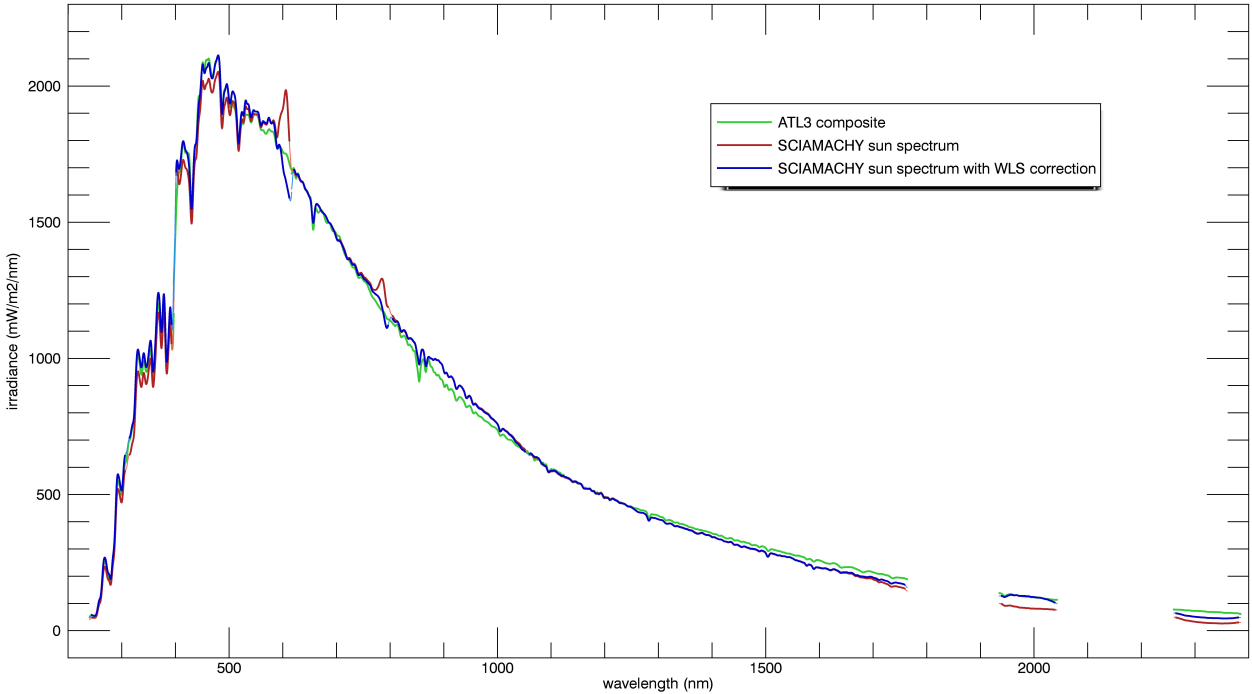


On-ground to in-flight correction factor derived from in-flight WLS measurement 27.02.2003



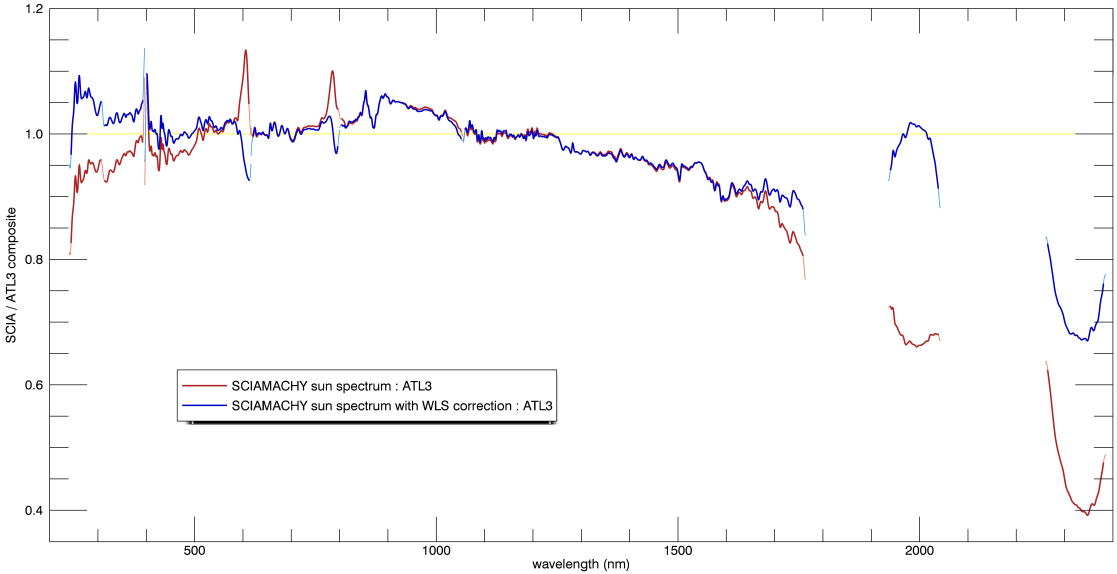
V8 on-ground to in-flight correction (etalon correction).

Comparison with solar reference spectrum ATLAS-3



Convolved spectra; resolution ≈5nm

Comparison with solar reference spectrum ATLAS-3



Ratio of SCIAMACHY sun spectra to ATLAS-3 composite, resolution ≈5nm

Improvements:

- channel boundaries improved
- icing in ch. 7/8 captured
- temperature dependance in 6+ improved
- radiometric calibration ch. 2/3 closer to ATLAS-3