SCIAMACHY Level 1 validation

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Overview

- The present radiometric calibration of SCIAMACHY
- Intercomparison with other studies
- Revisions due to:
  - Polarisation
  - Detector Effects
  - IR detector anomalies
  - ....
- Summary and Conclusions

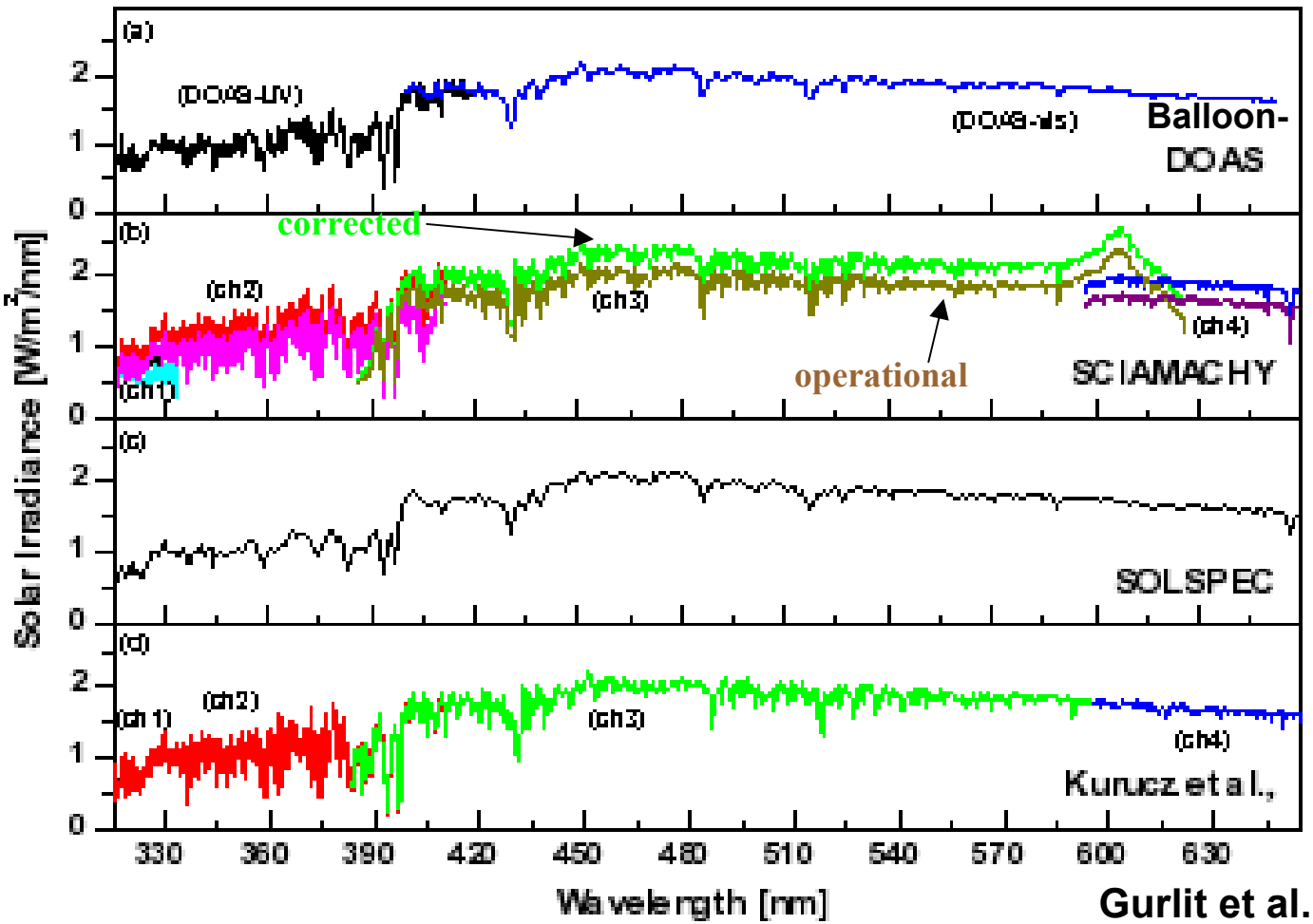
Radiometric Calibration - Facts

- Solar irradiance $S_o(\lambda)$ is 8-20% too high compared to Kurucz et al., 1984, SOLSPEC, and with respect to $S_o(\lambda)$ measured on LPMA/DOAS (IFE, IUP-HD)
- Nadir reflectance is 15-25% too low compared to models and GOME, MERIS (KNMI, see poster Acarreta et al)
- SCIA-Limb reflectance not validated yet, but Limb radiance is being in-situ validated by mini-DOAS on LPMA/DOAS balloon flights (IUP-HD, IFE)
- The source of the offsets are the radiometric key data

Radiometric calibration – Possible Improvements

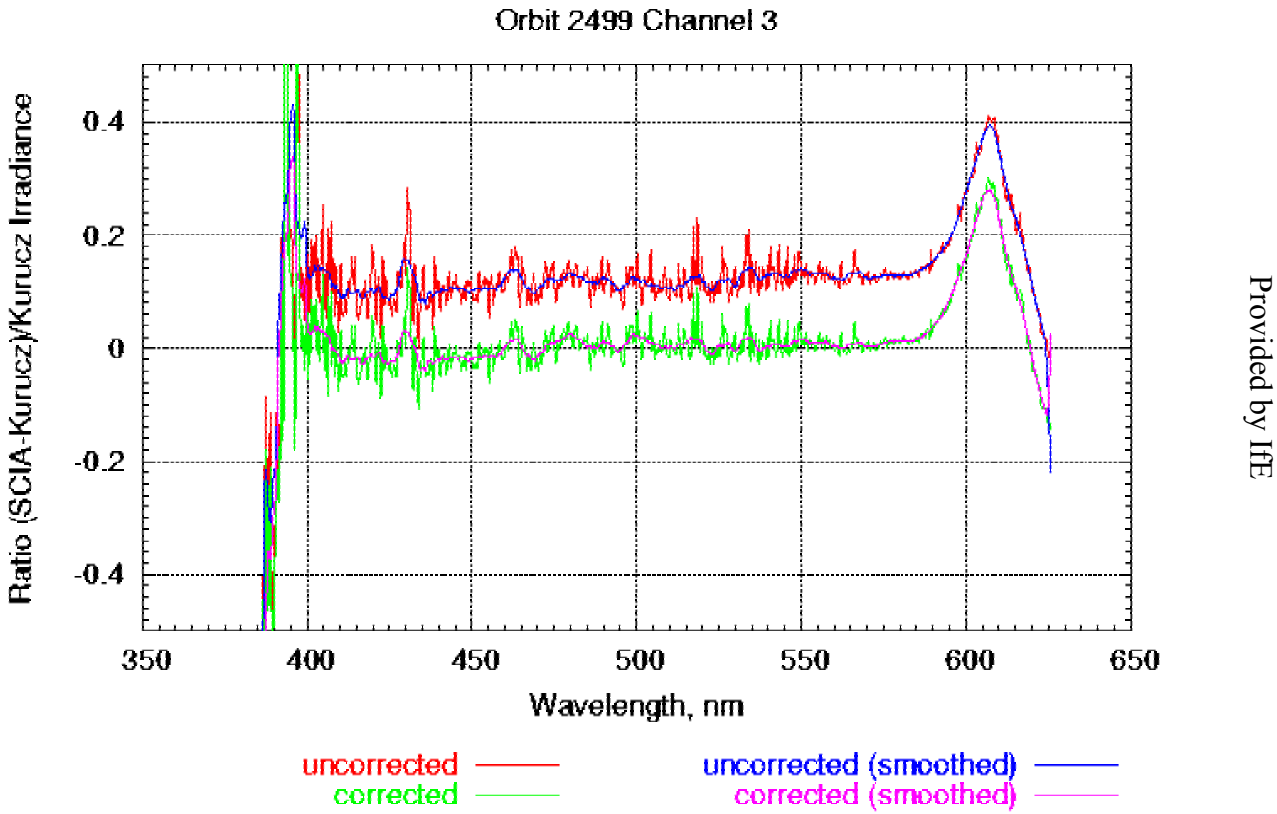
- Improvement of radiometric calibration is possible by applying:
  - Correction factors calculated from re-analysis of on-ground calibration data by IfE
  - Correction factors calculated from comparison with other satellite data (MERIS, GOME) and/or models by KNMI
- The correction factors have to be tested and the best solution will then be incorporated in the data processor or key data

Intercomparison of $S_o(\lambda)$



Gurlit et al., ACP, (in prep)

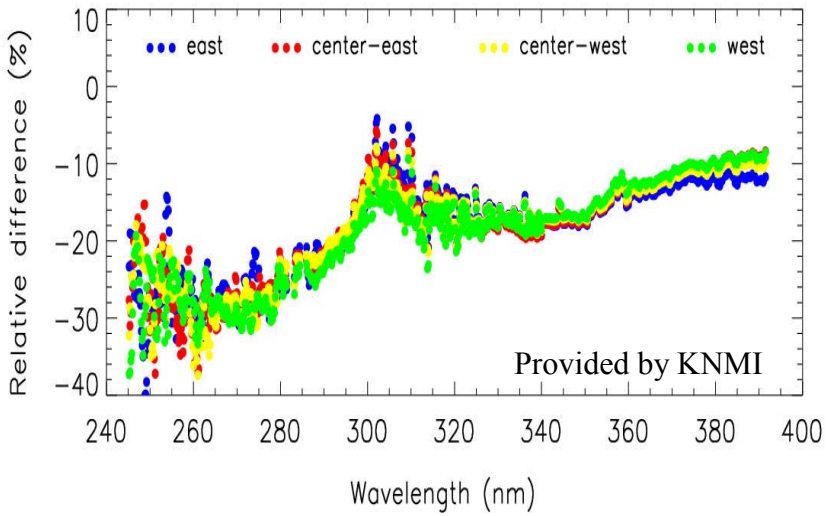
Intercomparison of Radiometric calibration – Irradiance (with and without IfE correction)

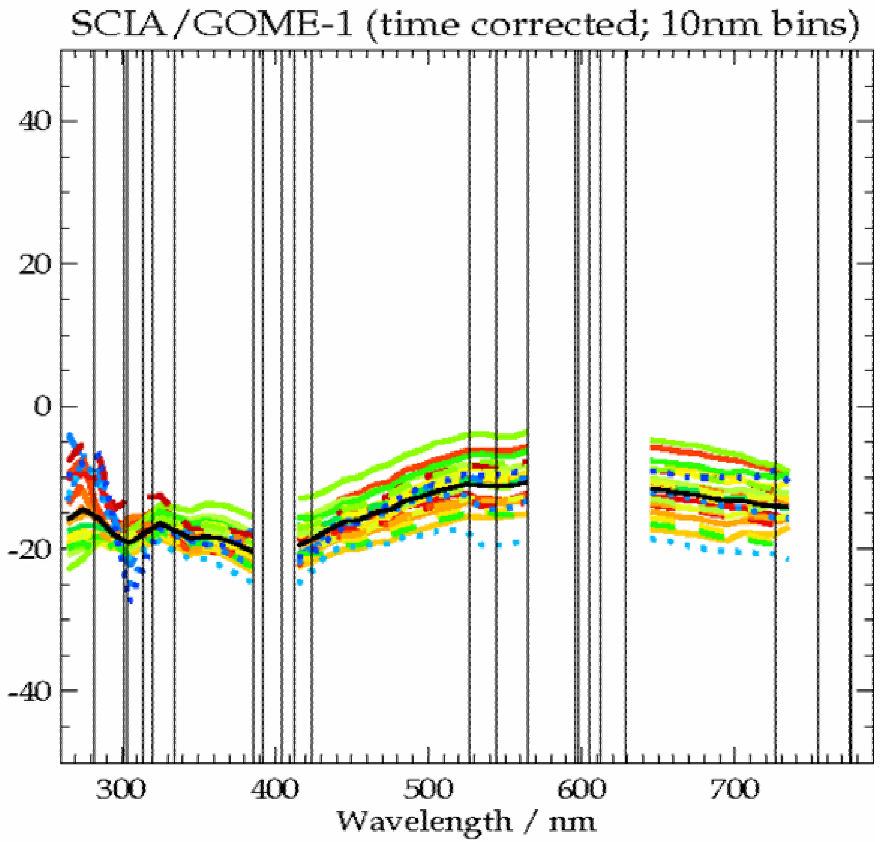


Provided by IfE

Intercomparison of Radiometric calibration - Reflectance

Comparison reflectance DAK, GOME and (operational) SCIAMACHY





Provided by R. Siddans(RAL)

Summary: Intercomparison of $S_o(\lambda)$

Preliminary studies suggest:

Agreement on several percent level for solar spectra from

- Kurucz et al., 1984,
- SOLSPEC Thullier et al., 1997
- $S_o(\square)$ measured on LPMA/DOAS (c.f., ASA, Oct. 9, 03)
- revised IFE-Bremen SCIAMACHY calibration

but disagreement (~15 %) with

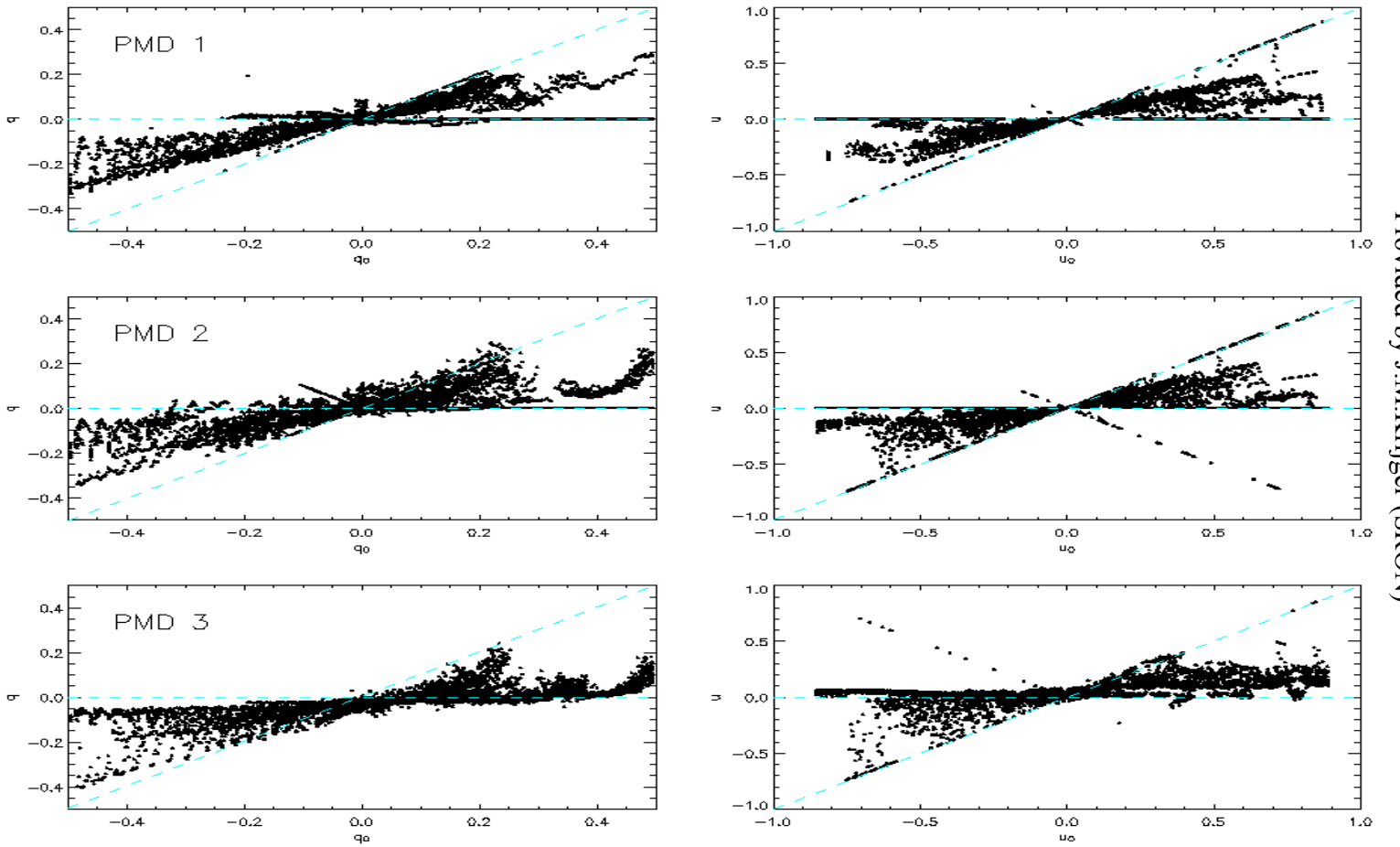
- present calibration of SCIAMACHY level 1 processor

A similar conclusion comes from intercomparison of GOME and SCIAMACHY reflectances done by KNMI and RAL

Revisions due to Polarisation - Facts

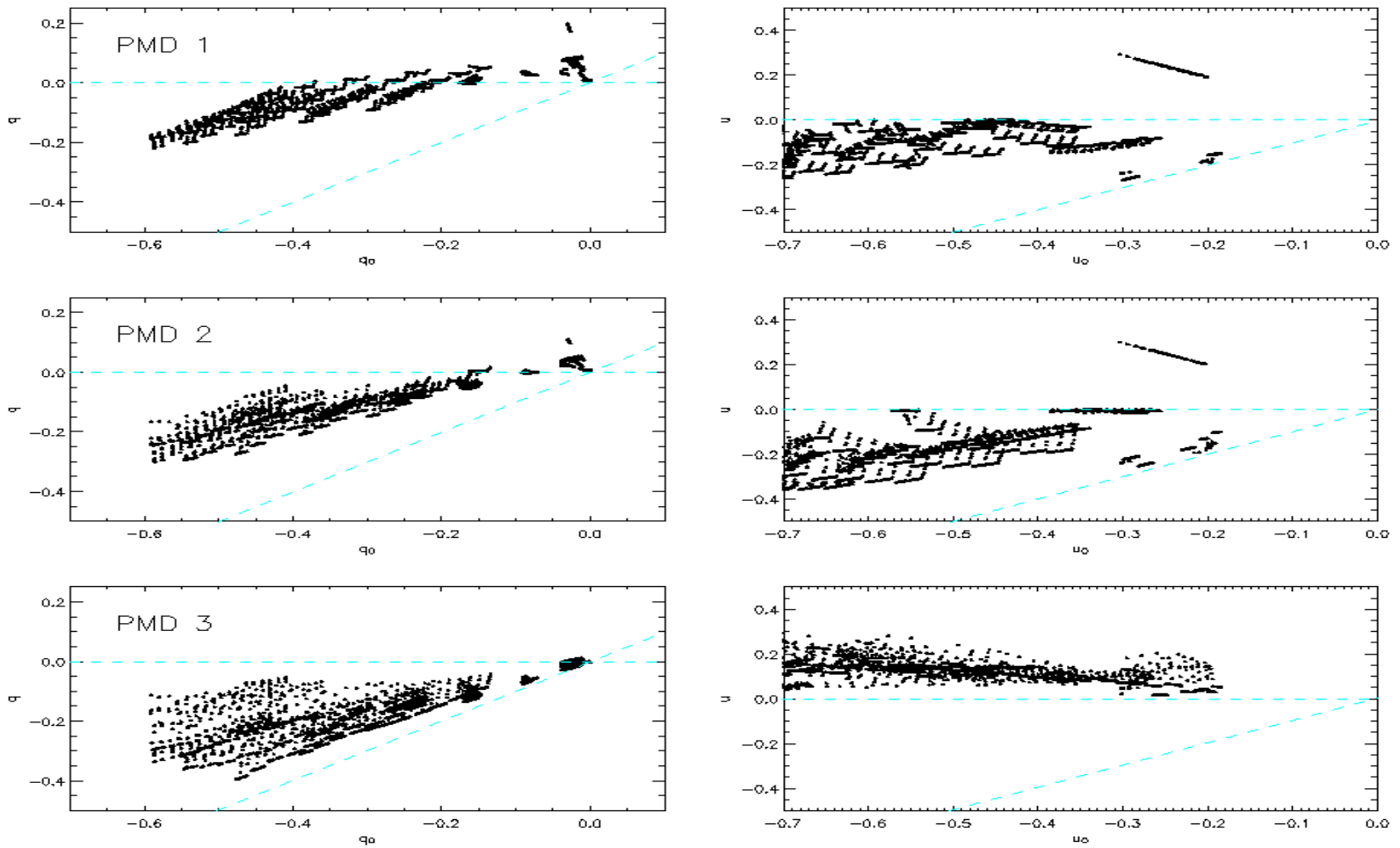
- DP adjustments led to large improvements
- PMD 1-3,5 polarisation fractions are better
- PMD 4/7 combination gives wrong results for U leading to errors for PMD 3, 5. Recommendation: Use theoretical U/Q values
- PMD 6 (IR) polarisation fractions are unusable due to noise problems and ice layer
- New key data calculations have removed remaining inconsistencies, but there is still room for improvement

Revisions due to Polarisation - Nadir



Provided by J.M.Krijger (SRON)

Revisions due to Polarisation - Limb



Provided by J.M.Krijger (SRON)

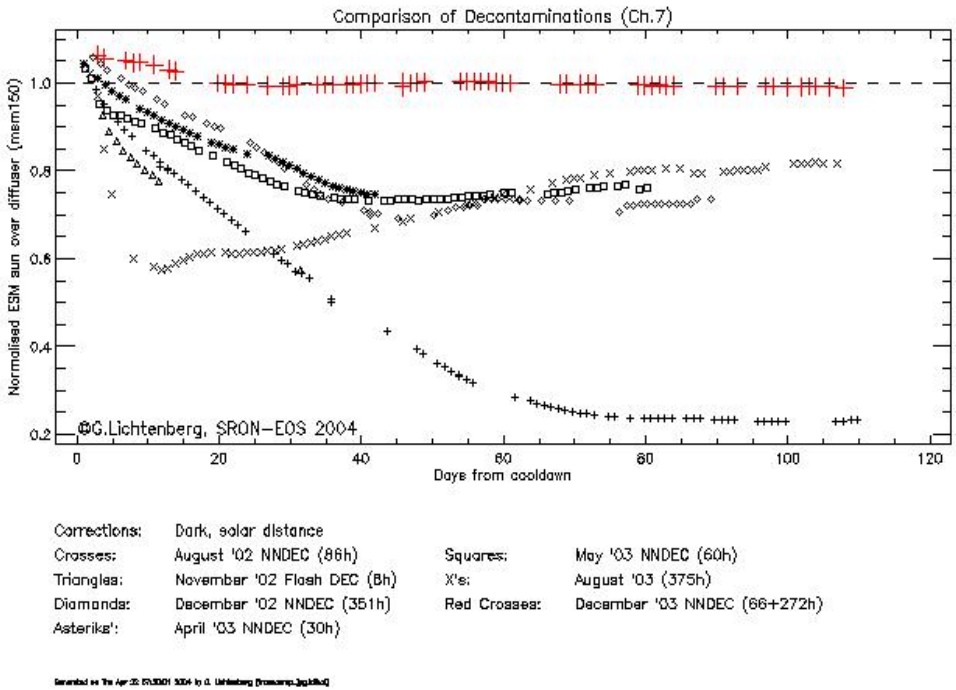
Revisions due to Detector Effects

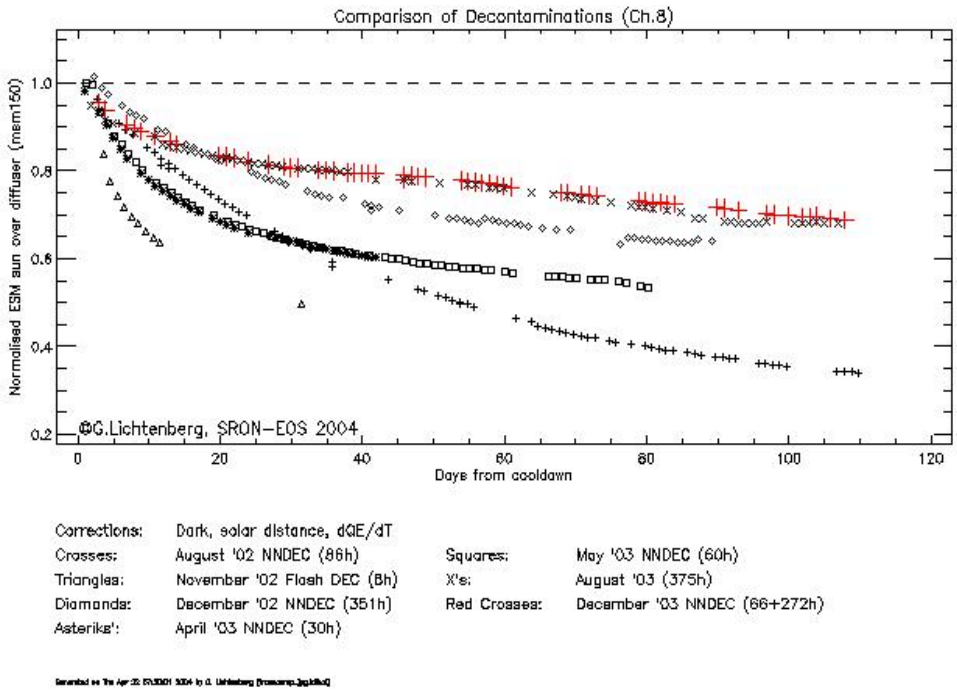
- New/improved corrections developed by SRON (to be implemented in next DP update) are available for
  - Memory effect (UV/VIS)
  - Non Linearity (IR)
  - Correction of orbital variation ch. 8
  - Dark Signal (orbital, IR)
  - Hot Mode dark (IR)
- First tests using a SRON L1 patch routine indicate improvements of IR scientific products (results from SRON and IUP Heidelberg)
- The patched products are available for validators

Revisions due to IR detector anomalies

- Ice layer in channel 7 & 8:
  - Transmission loss which reduces signal/noise ratio
  - Widening of the slit function which significantly changes retrieval results
  - Dark signal correction has to be done on basis of the dark msm's of the same orbit
  - Regular decontamination vaporises the ice layer, which then gradually grows until next decontamination. Long term improvement can be seen esp. in channel 7.
- Channel 7 has a light leak which increases the background

Revisions due to Detector anomalies – the Transmission loss over time

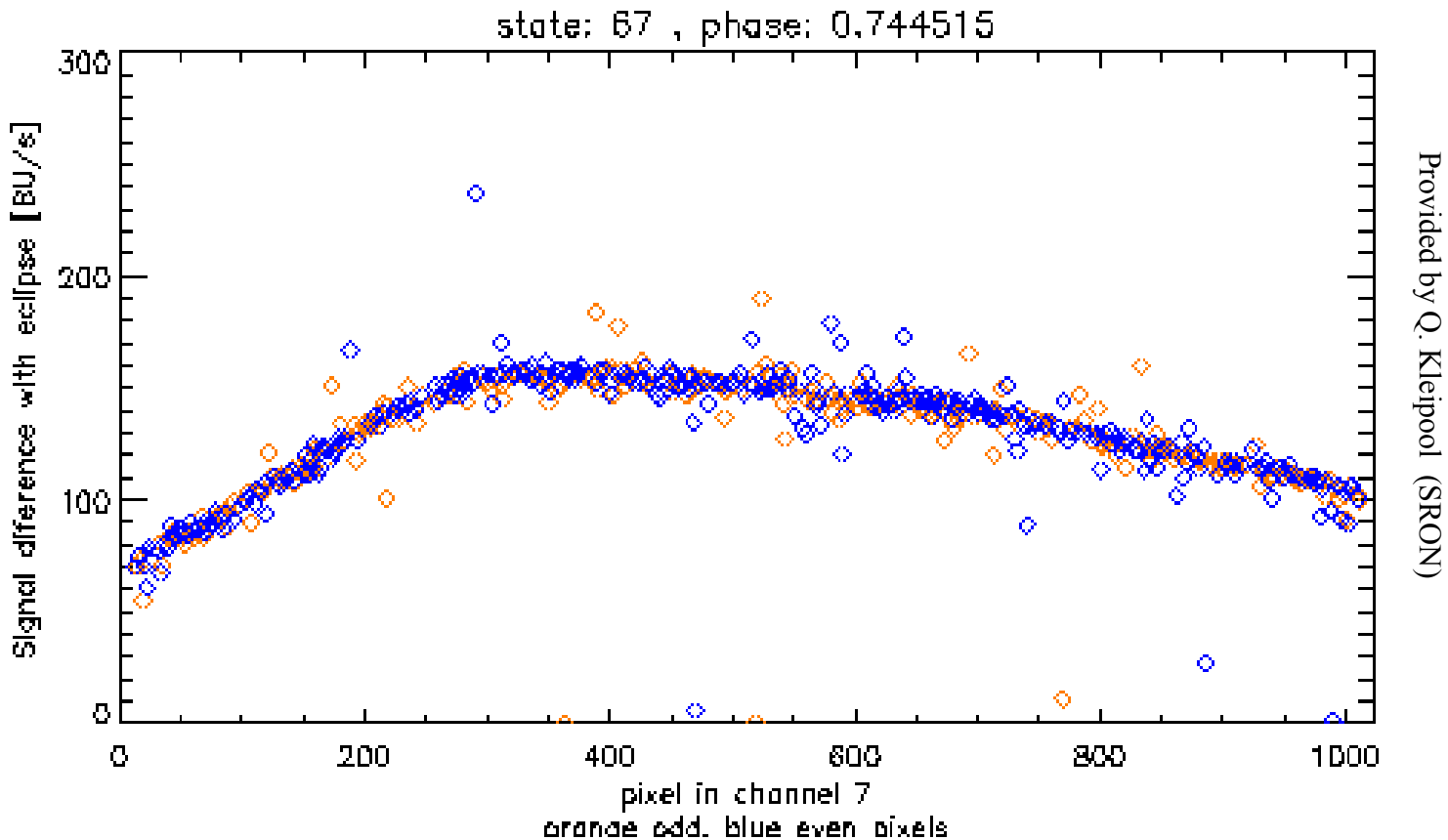




Daily updates available under www.sron.nl/~SCIA_CAL -> Resources -> Transmission ch 7&8

For preliminary monitoring results see www-iup.physik.uni-bremen.de/sciamachy/LTM/LTM.html

Revisions due to Detector anomalies- Light Leak Ch. 7



Outlook

- Preliminary results show that implementation of correction factors will improve radiometric calibration; to be implemented
- Polarisation is improved over previous results
- Improved correction for MEC, NL and dark signal are available and have to be implemented
- Transmission correction has to be implemented
- (Ice) Slit function correction algorithm is under development
- Light Leak channel 7 correction has to be developed
- Responsibility for key data will be transferred to SRON