Intercomparison of MultisPEctral data over Test Sites: IMPETuS

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Objectives and Challenges

1. Extraction of SCIAMACHY spectra over Test Sites (in support to CEOS WGCV)
2. Intercomaparison of MERIS and SCIAMACHY (long term)
3. Development of SNO technique
4. Understanding of uncertainty sources

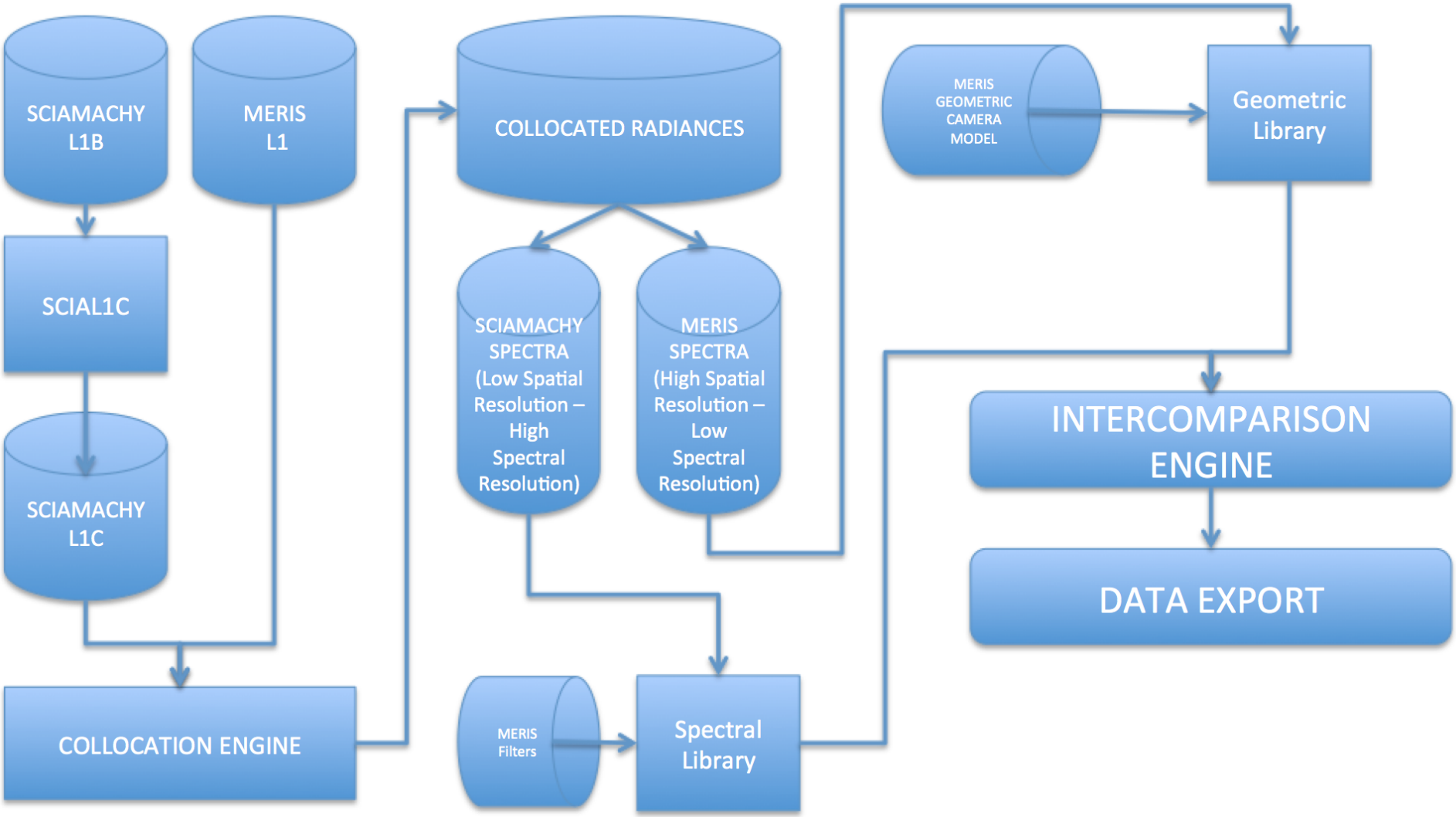
Some challenges:

- Access to data (Very Large Dataset)
- Different "logic" organisation of data – how to handle them? (SCIAMACHY is "spectrally" oriented and organized, MERIS is image oriented)
- Calibration and understanding of SCIAMACHY is not trivial
- Some processing issues have to be addressed (parallelization?)
- The problem is complex: you have to address content and engineering

Some info

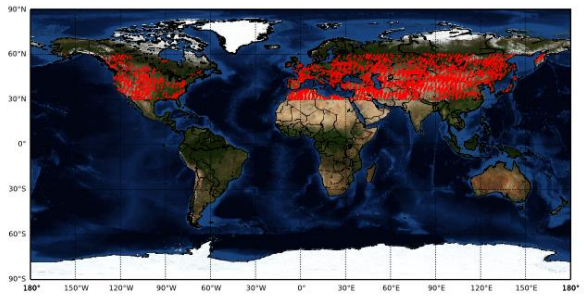
1. Why IMPETuS? Everything with a name exists! … and I wanted to pay tribute to ancient Latin
2. Not to be considered:
    a. Investigation on who's the best (it is not a contest!)
    b. There will be no winner.. Anyway
3. To be considered:
    a. A tool for understanding trends, differences, behavior of sensors along the mission
    b. Quantification of differences… Numbers!
4. Dataset:
    a. SCIAMACHY V7.04 (L1B)
    b. MERIS MEGS-PC 8.0 (L1)
    c. 1st and 15th of each month, from 2004 to 2012 (~3000 orbits)
    d. Output in Netcdf (CF convention where possible), so results can be easily shared and processed

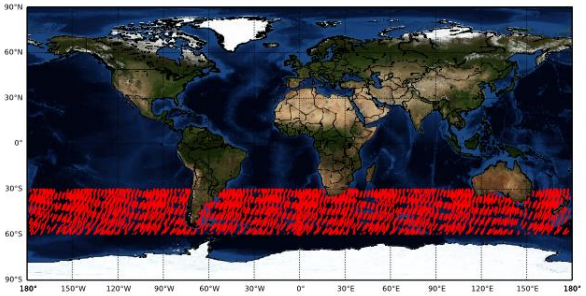
Processing Flow

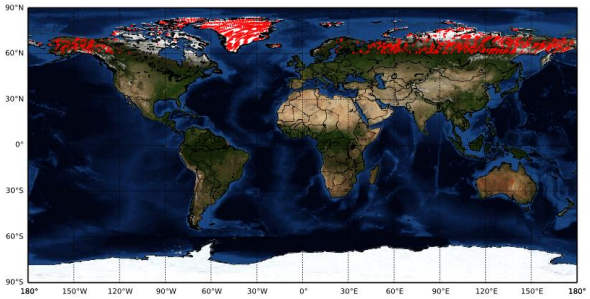


Processing Options available

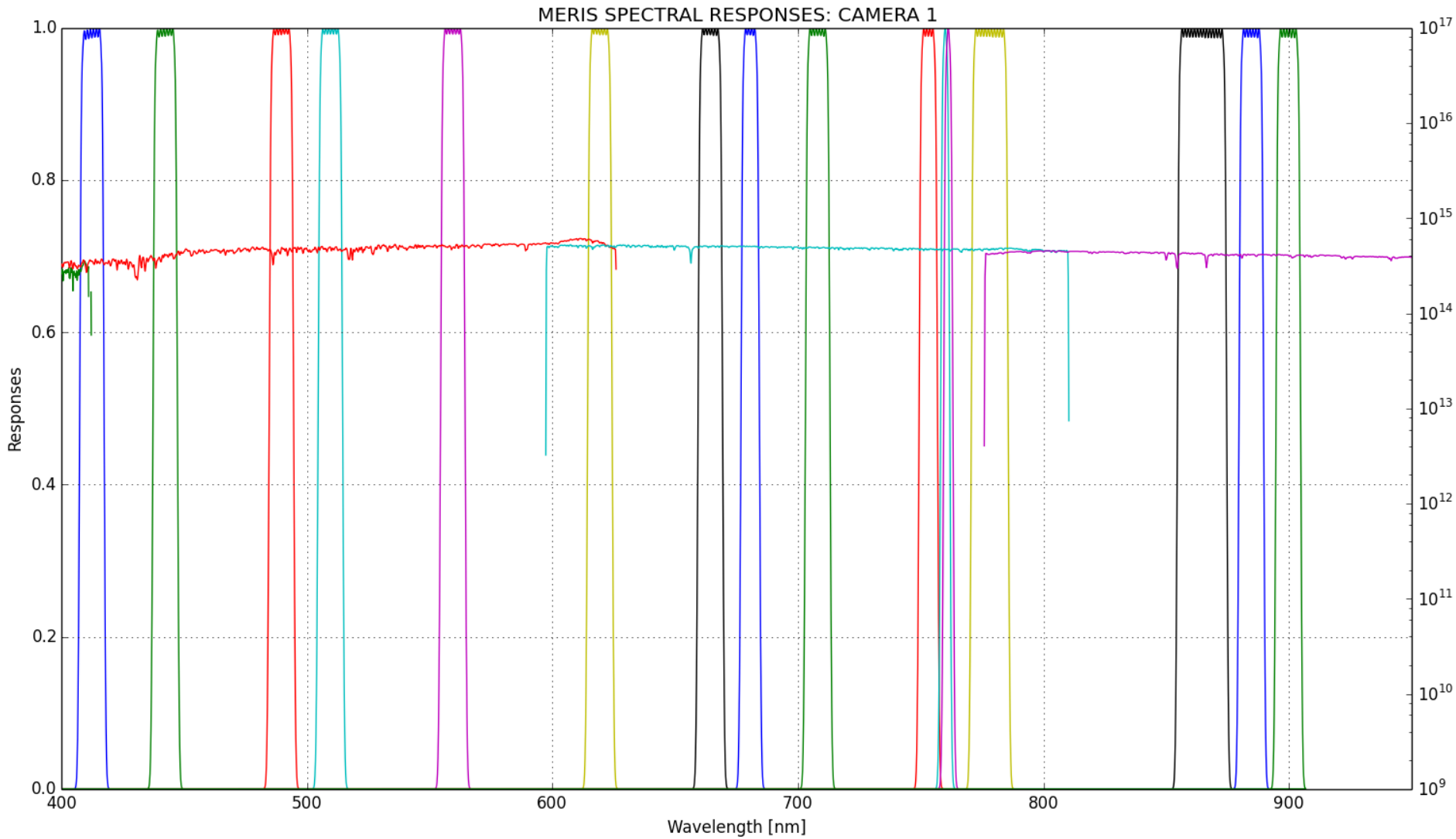
1. Processing on Target Area (Tunable by Land/Water/Mixed Mask or by Region of Interest)
2. Spectral Library handles general spectra
3. Sensors are modeled by “Filter Functions” (config file) and Camera Model (config file)



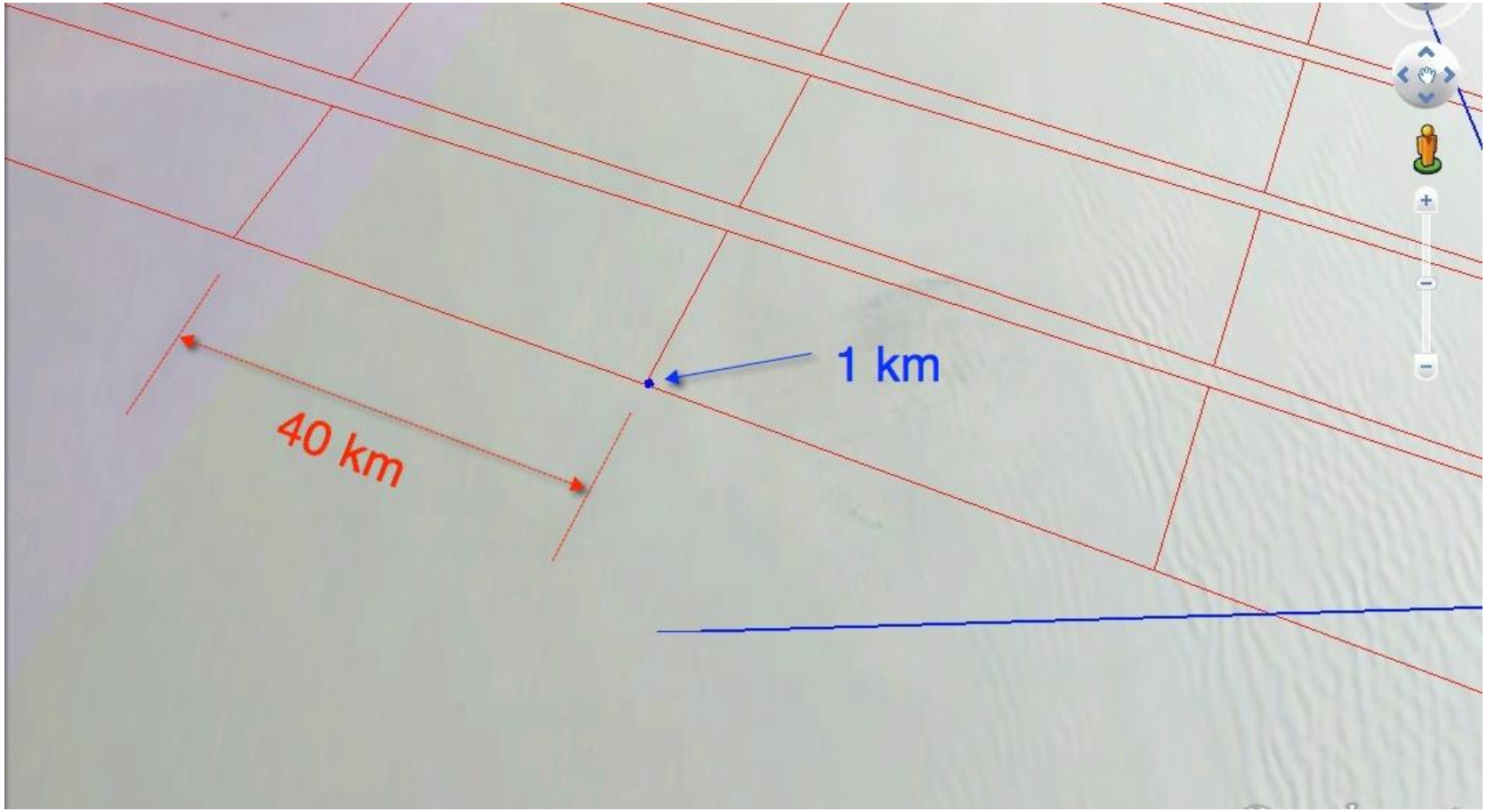




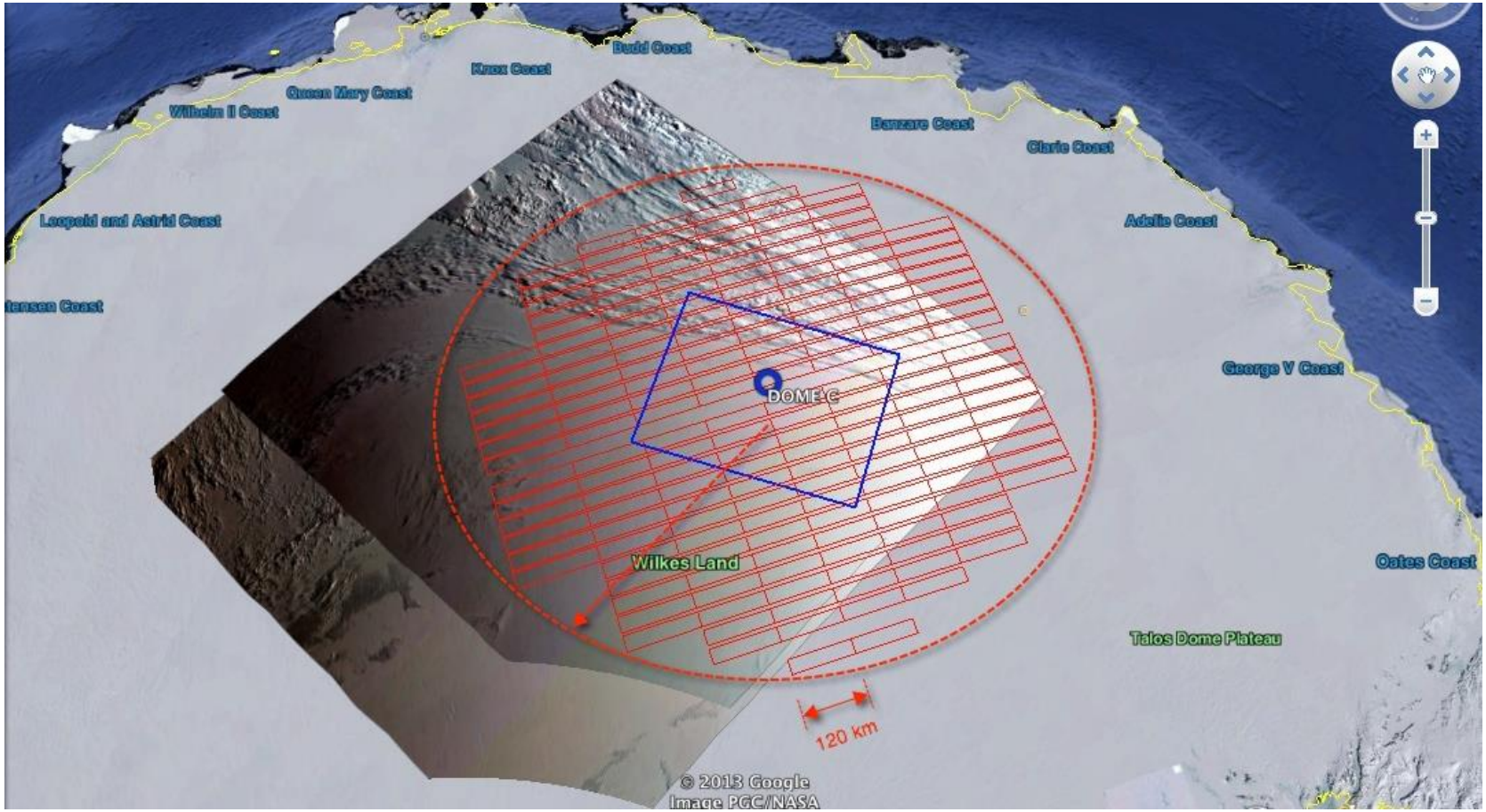
SCIAMACHY Solar Spectra and MERIS Spectral Response Functions



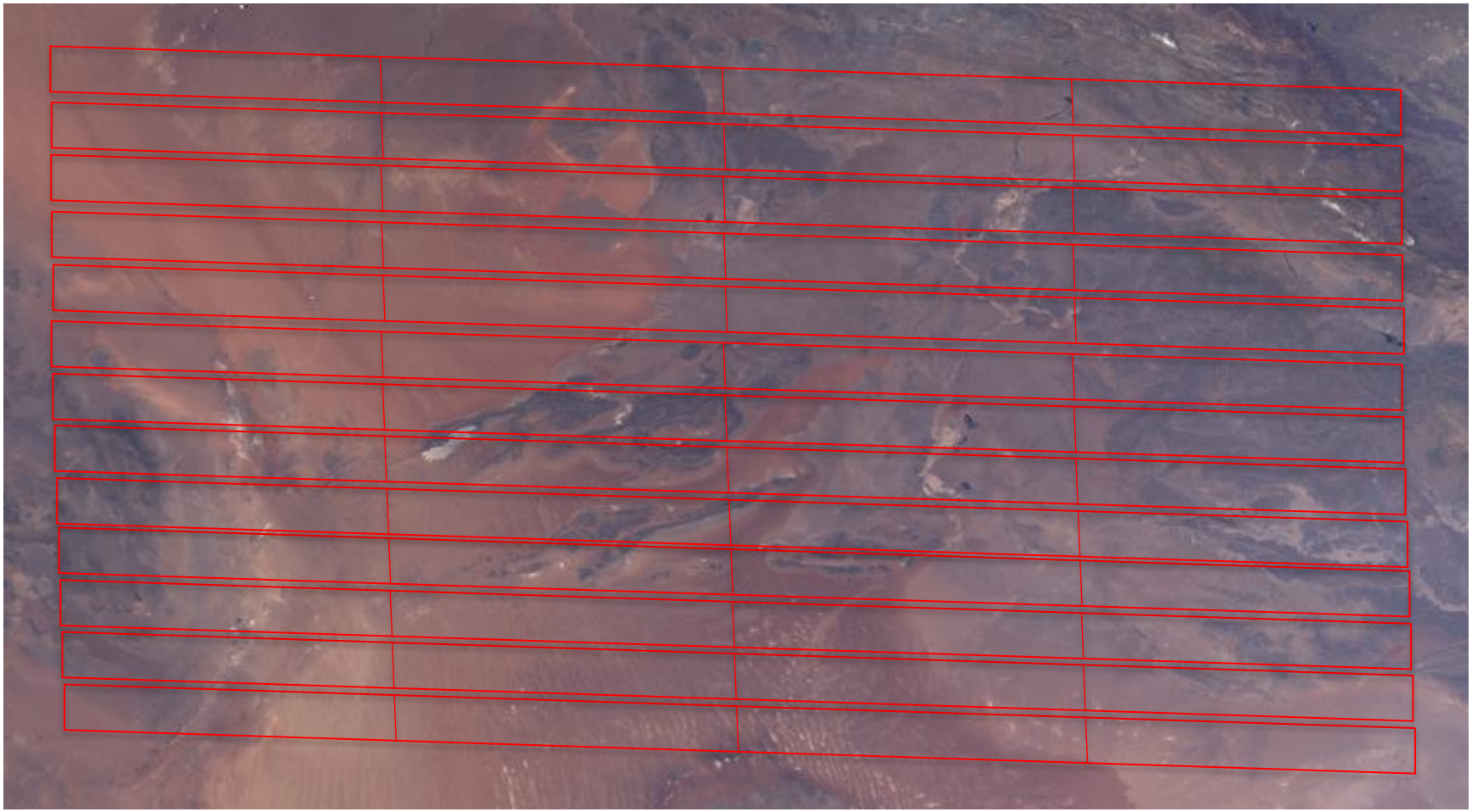
SCIAMACHY vs MERIS: Pixel Dimensions



SCIAMACHY (highest resolution) vs Meris over DOME-C

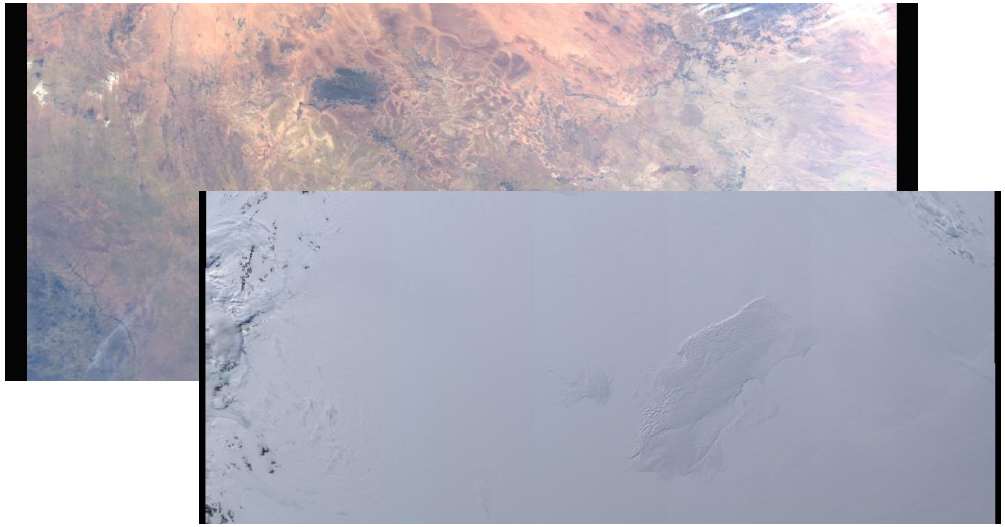


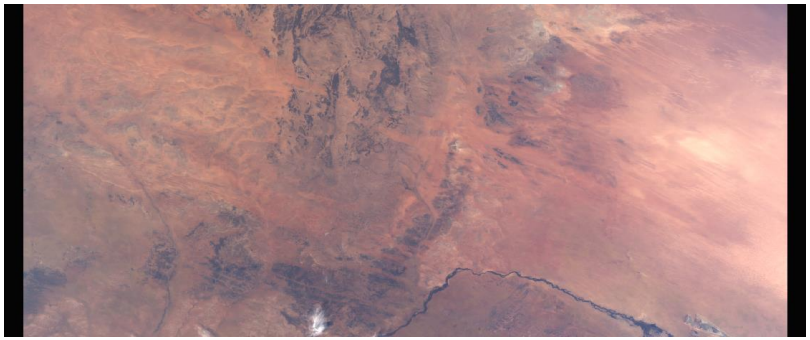
MERIS Target with SCIAMACHY Footprint overlay

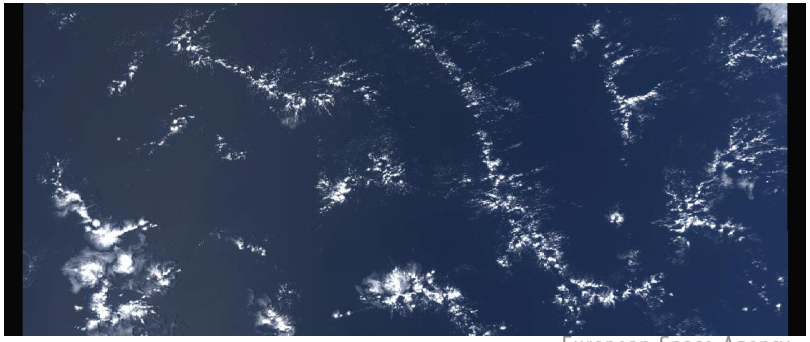


Selection Criteria

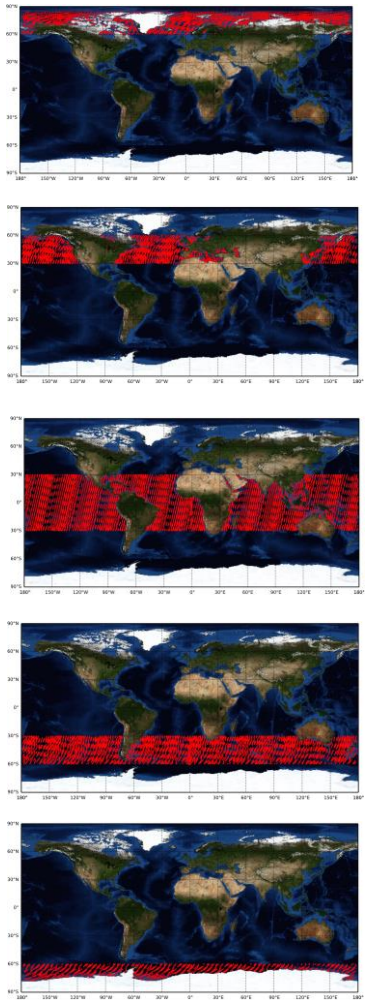
1. Matches have been selected under the following criteria:
    a. Solar Zenith Angle < 70
    b. High Spatial Homogeneity. (Relative STD <10%. MERIS radiances contained into a SCIAMACHY pixel)

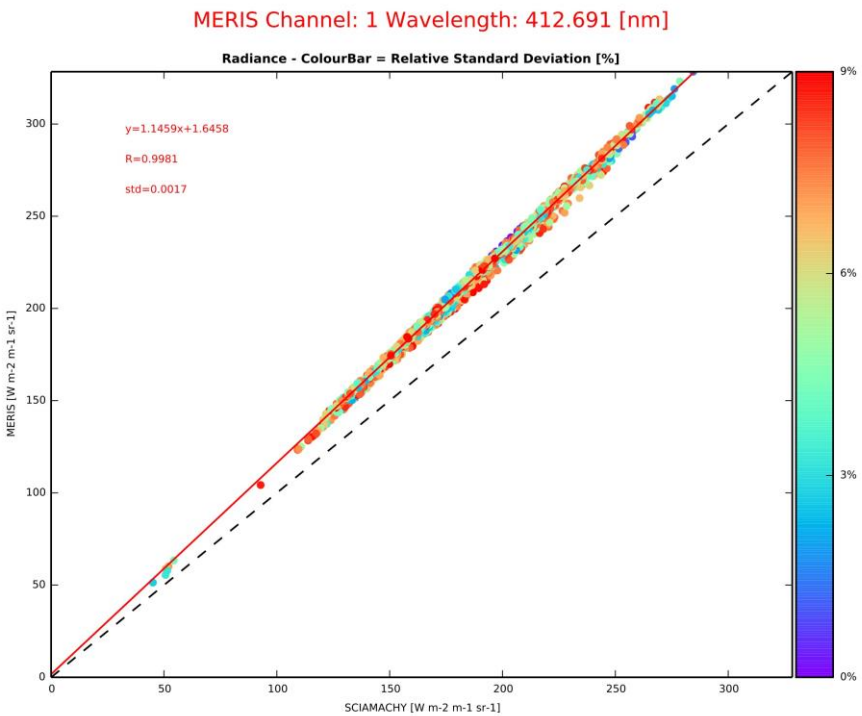






A first approach, from the north to the south!

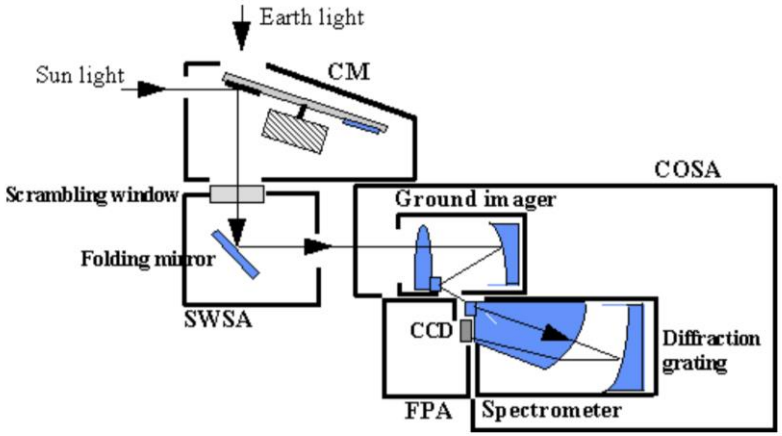




~2.5% travelling from North to South! Y: 2009 Polarization?

Considerations

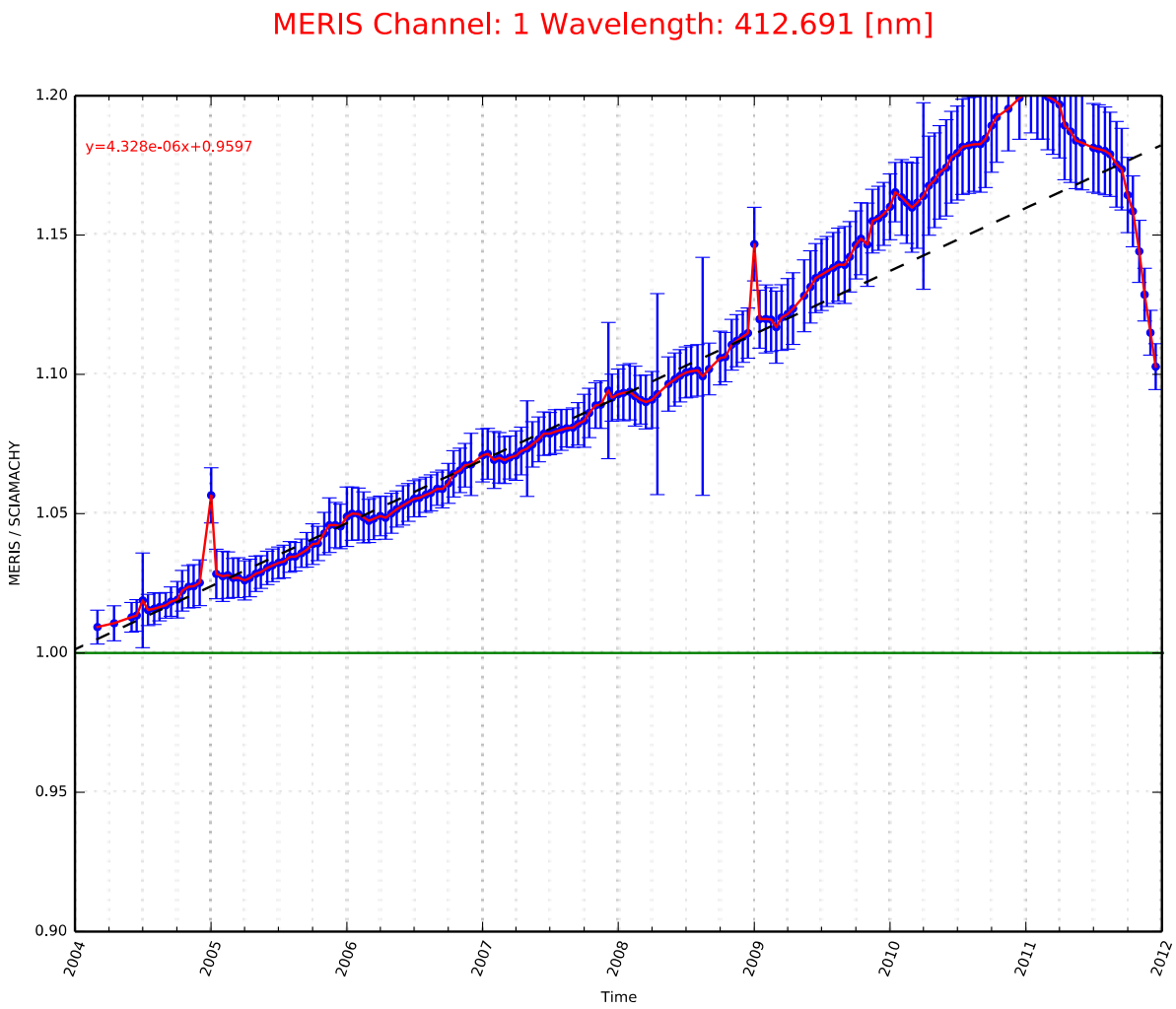
1. 1st processed dataset (2009) has been used to test the robustness, performances and reliability of IMPETuS processor.
2. SCIAMACHY data have been calibrated but NOT corrected with m-factors (monitoring factors)
3. Differences are wavelength dependent and affect more the visible bands (1-5, 3rd SCIAMACHY detector)
4. MERIS has a "scrambler" right before the camera optic assembly (to minimize the effect of polarization). SCIAMACHY is actually uses polarization for some of its measurements.



A new objective: long term monitoring

1. The initial dataset has been expanded: 2004 – 2011
    a. Why 2004? Not 2003? Data from 2003 and partially from 2004 often crash due to geolocation error. Problem not investigated.
2. Low Spatial resolution (highest integration time) -> selection of homogeneous targets.
3. Analysis of SCIAMACHY data in 2 scenarios:
    a. Full Calibration Procedure applied
    b. Full Calibration + Monitoring Factors Applied (Instrument drift and Mirror degradation)

Full Time Series Analysis (2004-2012)



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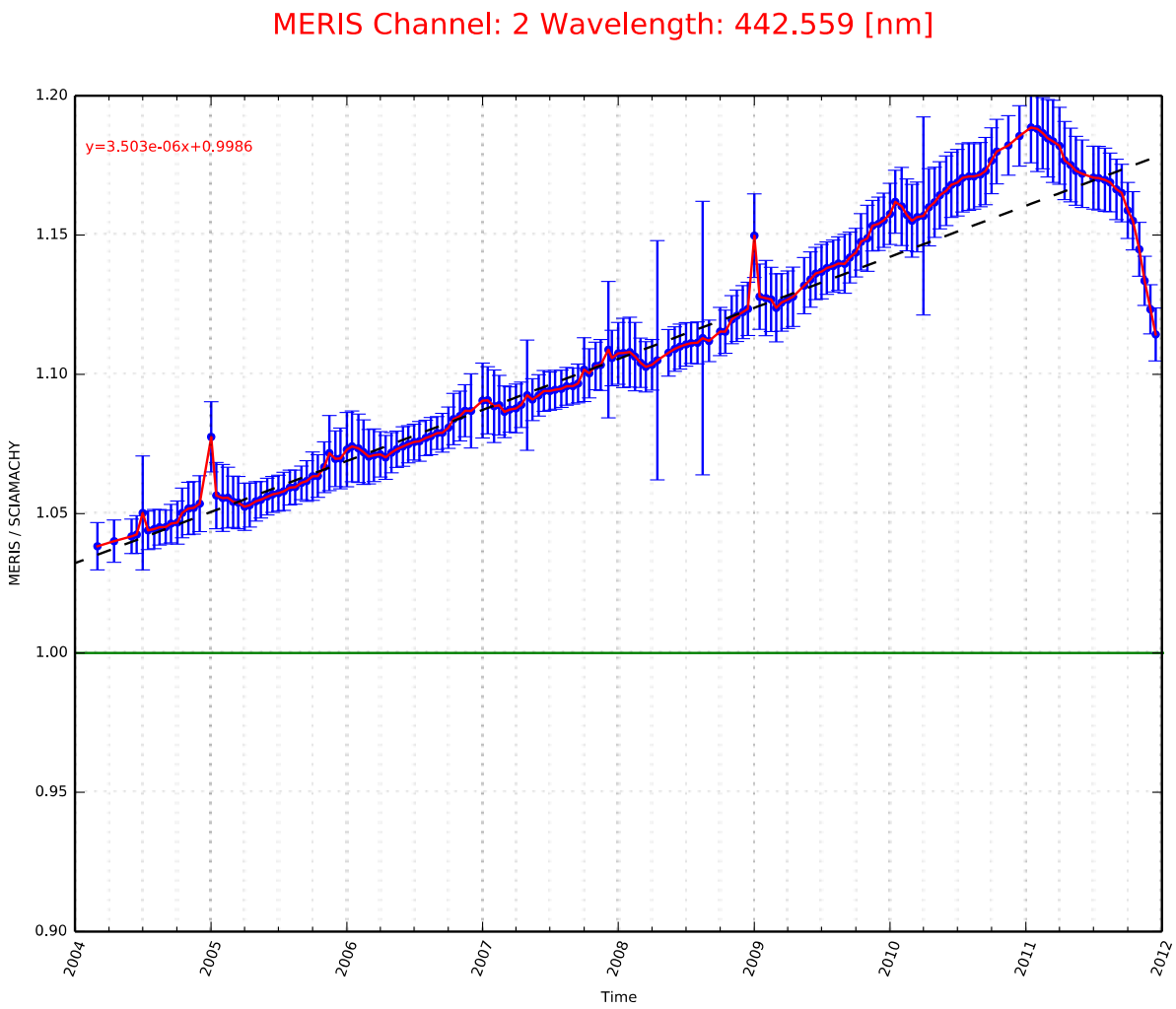

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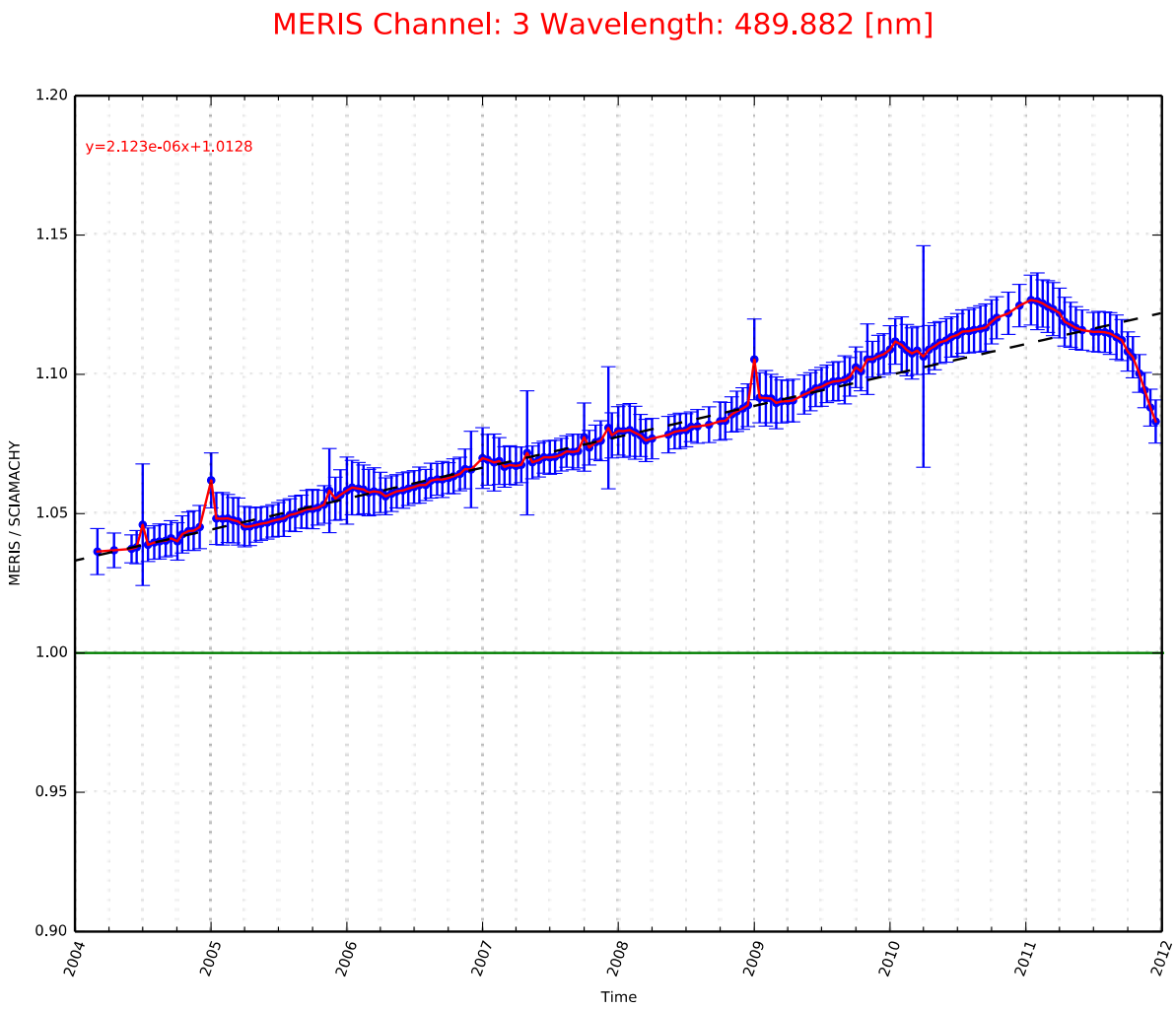

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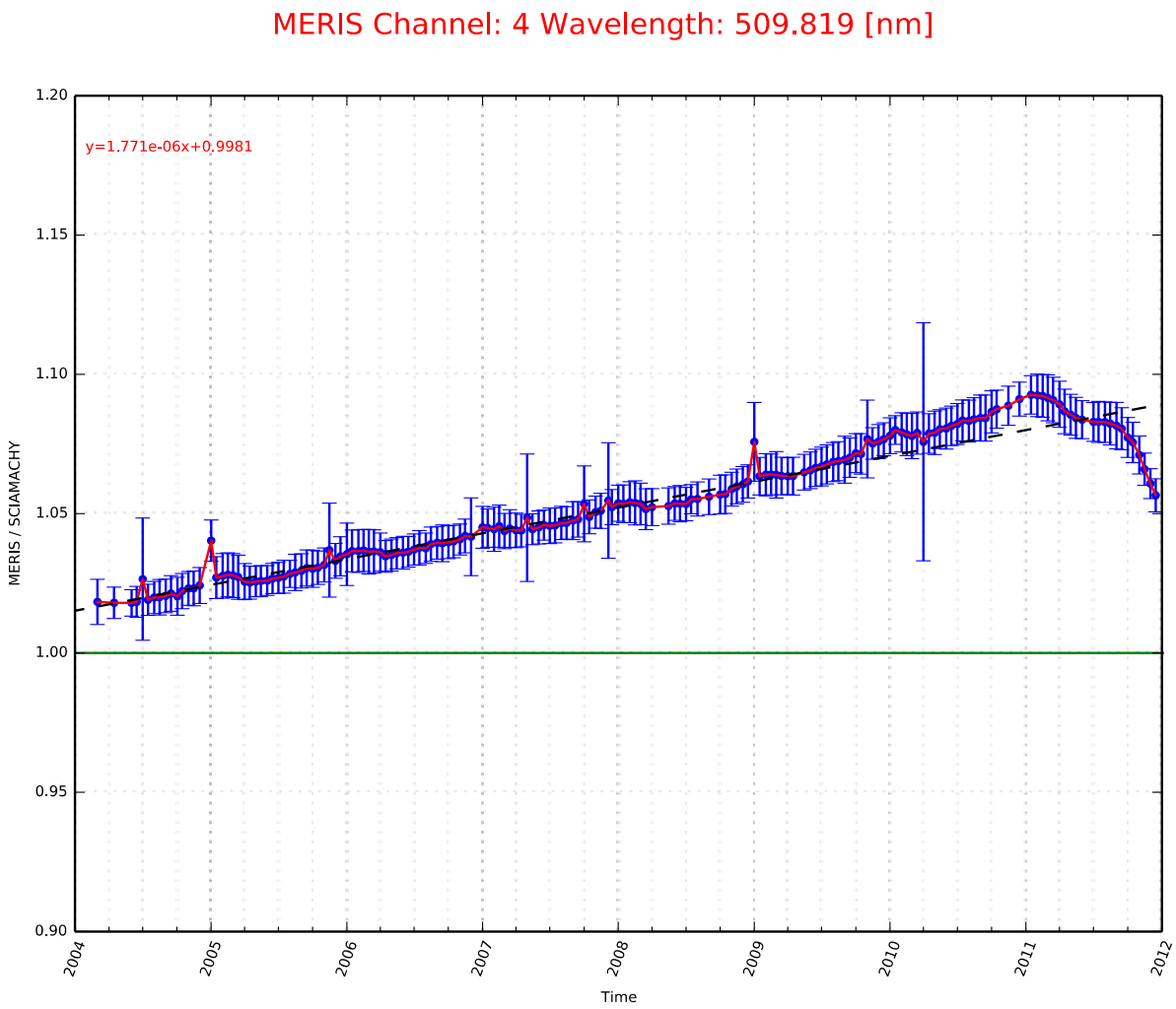

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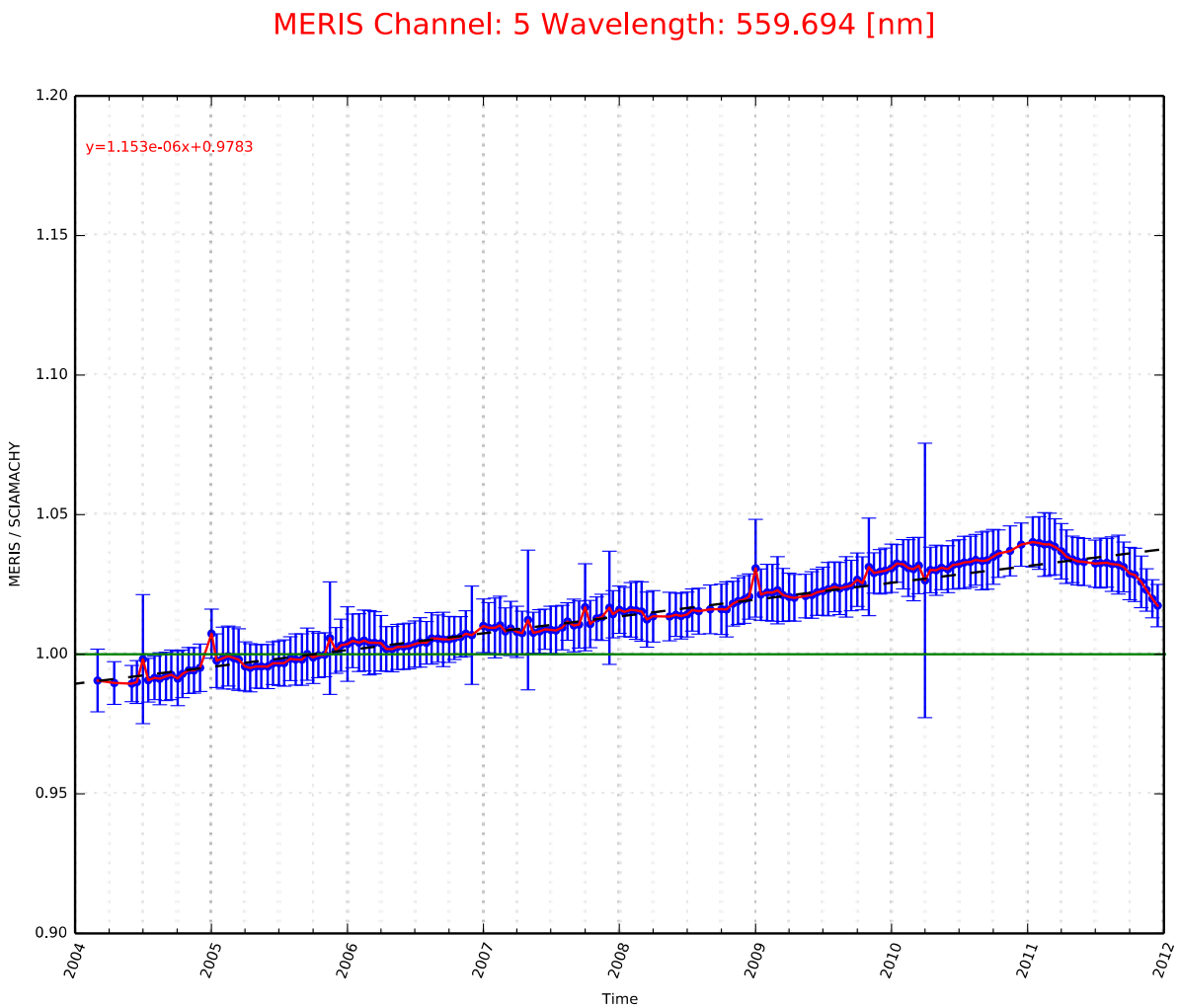
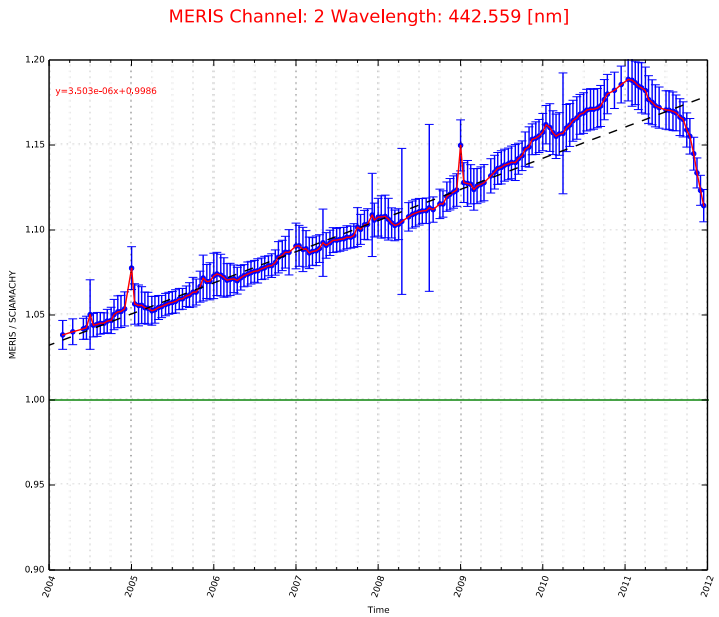
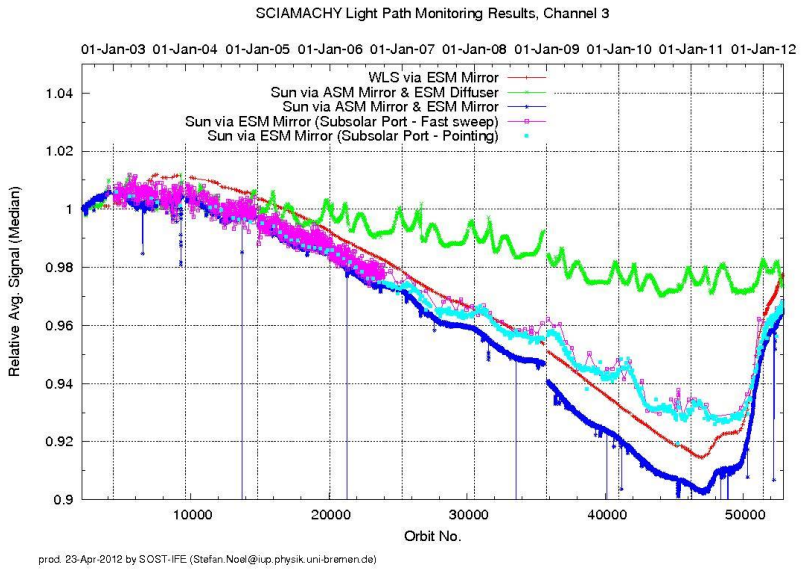


Full Time Series Analysis (2004-2012)

Impetus Result for band 2



SCIAMACHY Light Path Monitoring (Univ. of Bremen)



http://www.iup.uni-bremen.de/sciamachy/LTM/LTM.html

Full Time Series Analysis (2004-2012)

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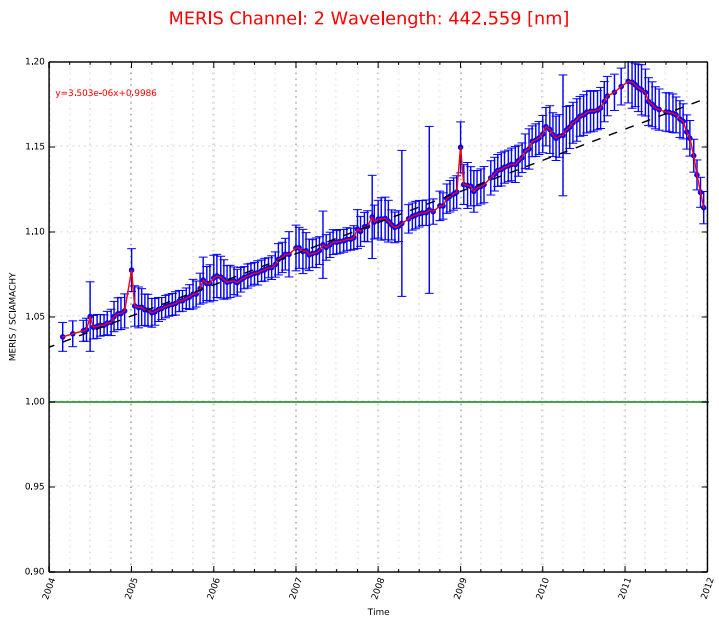
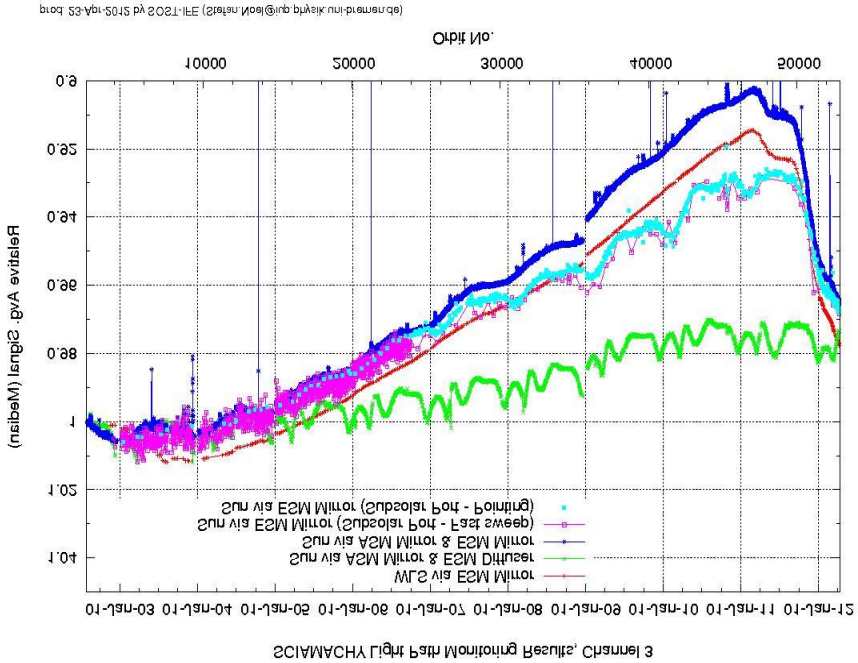
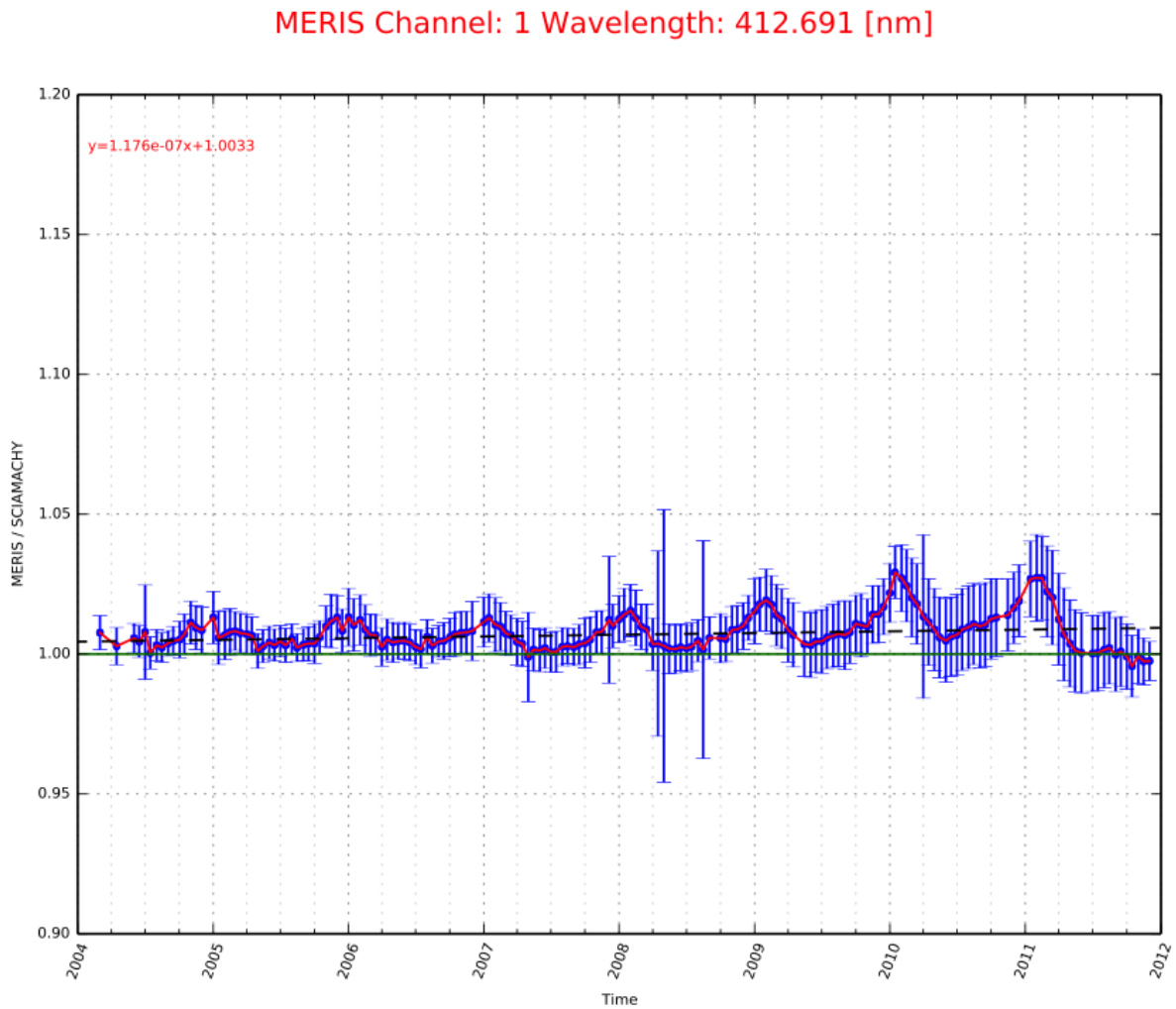


SCIAMACHY Light Path Monitoring (Univ. of Bremen) FLIPPED



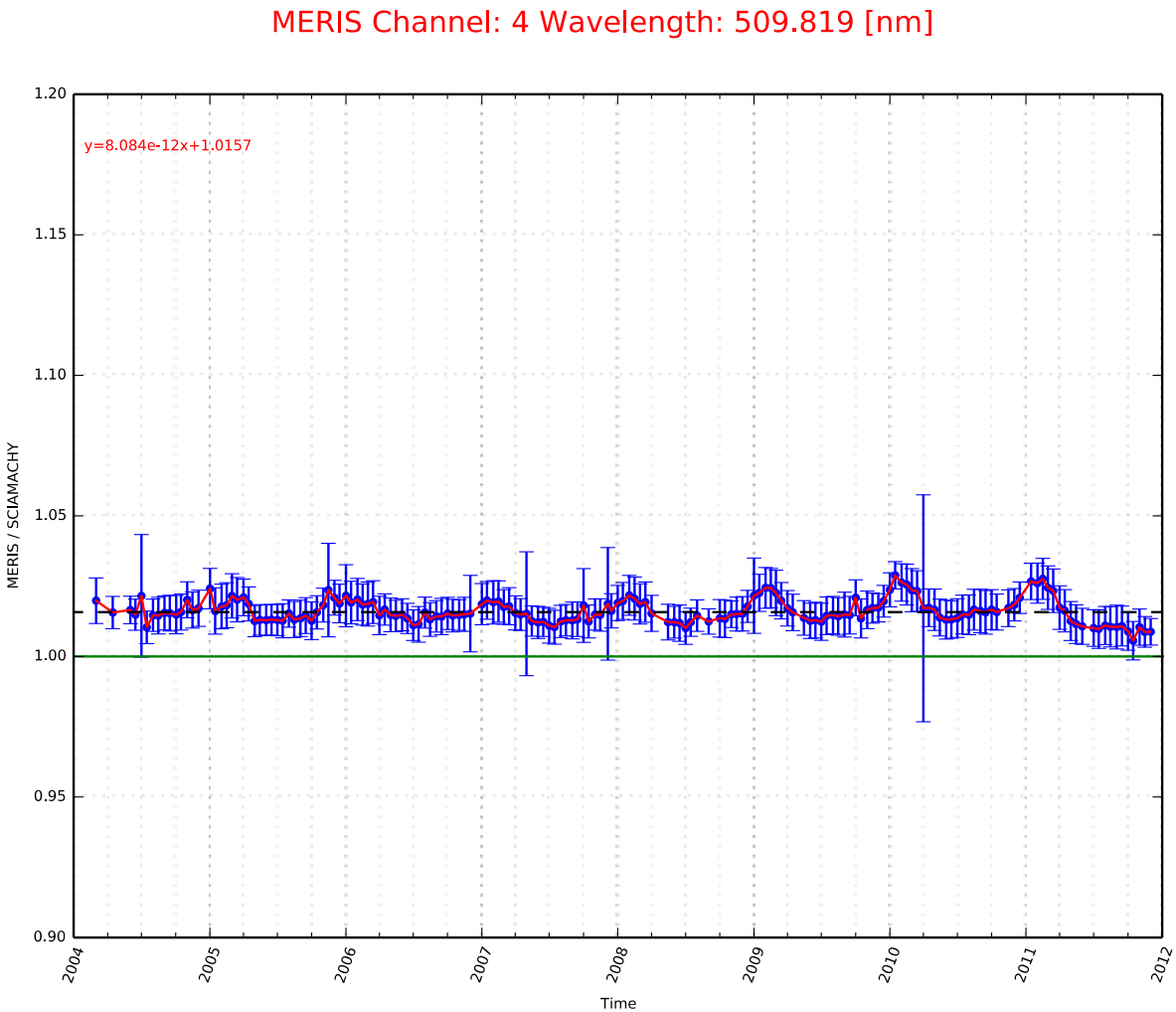
What does it happen if M-Factors are applied?

Full Time Series Analysis (2004-2012)



M-Factors Applied

Full Time Series Analysis (2004-2012)



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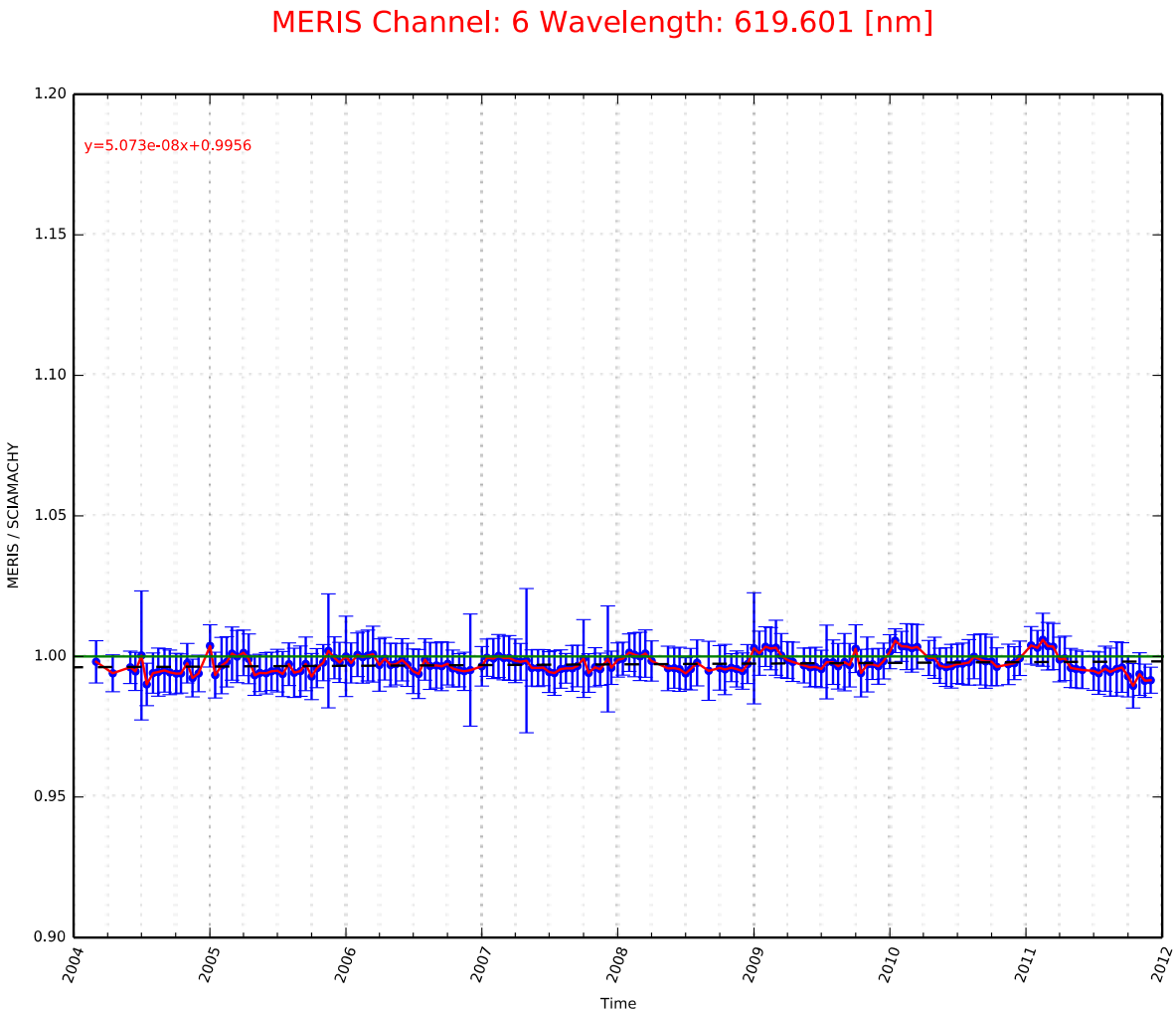

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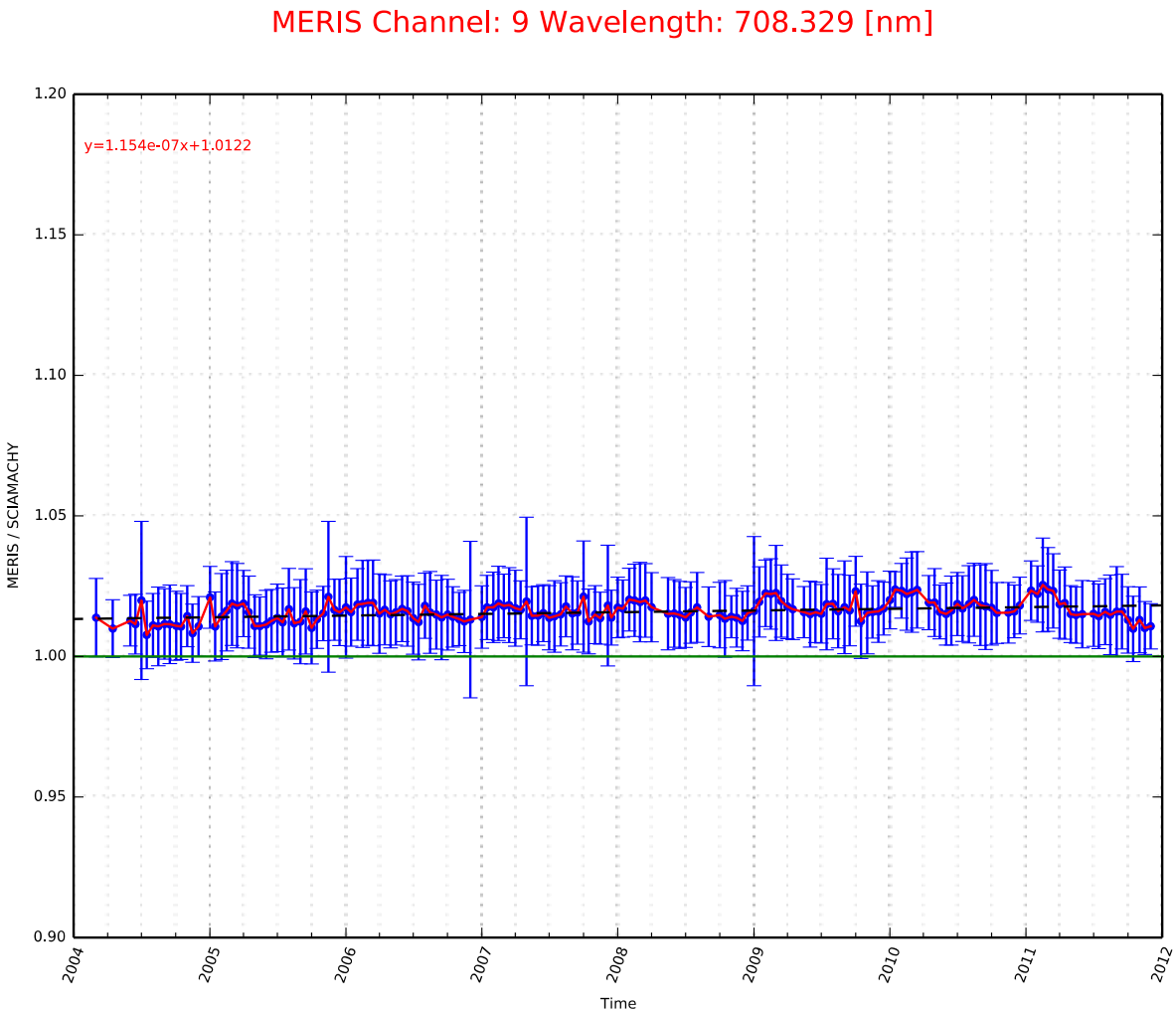

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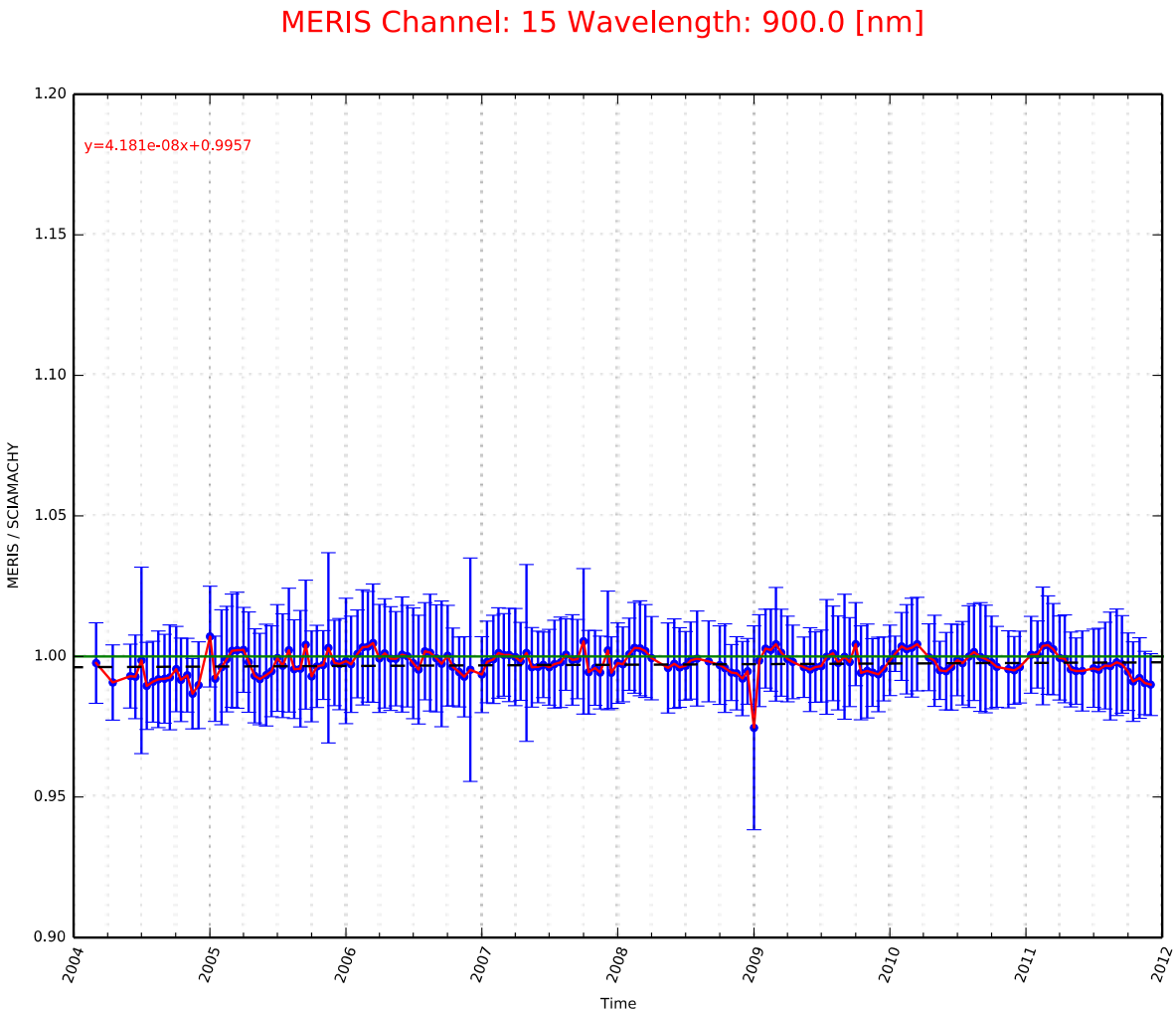

Conclusion and way forward

1. Tool is in place, fully tested with parallel processing setup.
2. Long Time series analyzed with different calibration scenario applied (m-factors)
3. To be done (before Xmas): Re-processing of dataset with the exact calculation of Reflectance (hope this will correct the modulation in the visible)
4. Results are very promising … BTW, I have more questions than answers!
5. Next step (it needs some coding): Analysis of AATSR dataset (IMPETuS solves a general problem, but some work is anyway needed)
6. To be done: Publication.