



TROPOMI

Status of TROPOMI calibration & L01b processor development & operations

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Netherlands
Space
Office



Royal Netherlands
Meteorological Institute
Ministry of Infrastructure
and Water Management

SRON

Netherlands Institute for Space Research

 **AIRBUS**
DEFENCE & SPACE

TNO innovation
for life

80+ man-years by the KNMI L1b team and partners





Beginning of L1b development



Tropomi L0->L1b processor

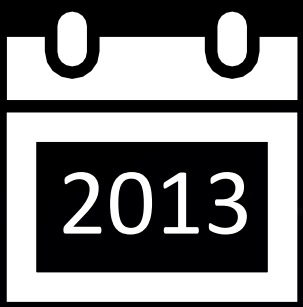
+ Overview Activity Issues Spent time Gantt Calendar News Documents Wiki Files Repository Settings

tropi01b / trunk / core @ 3

Name	Size	Revision	Age
> src		3	about 11 years

Latest revisions

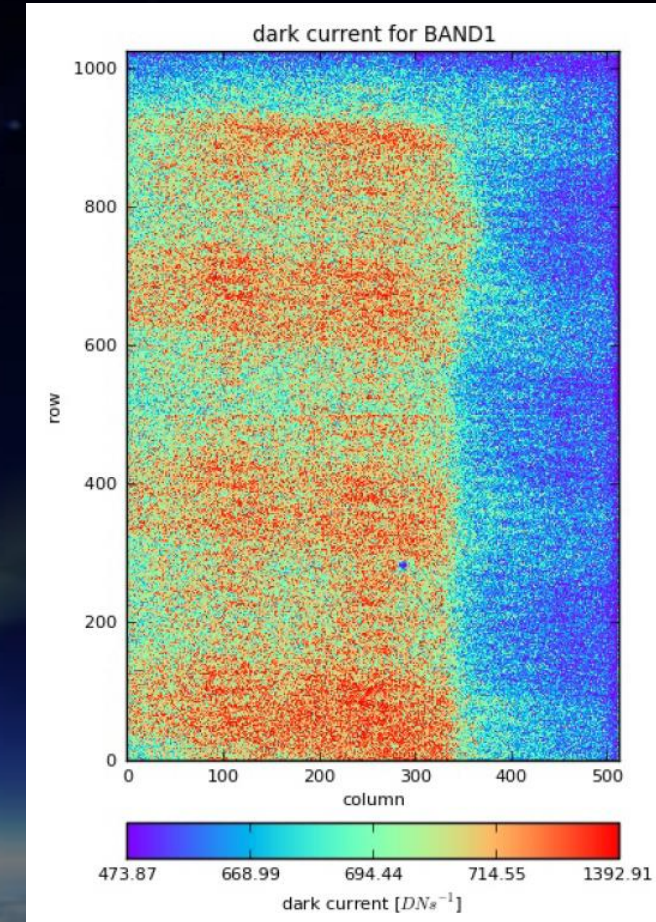
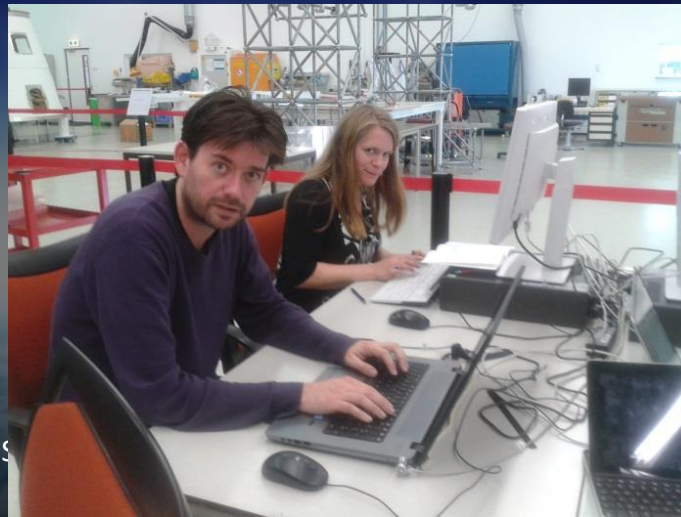
#	Date	Author	
3	08/26/2011 01:20 PM	Nico Rozemeijer	Initial version of the core



First tests with the electrical functional model



- Learning how to define instrument settings
- Using L01b processor
- First “calibration” data
- First try with integral approach: Define L1b, calibration & operations consistently
- Close collaboration with Airbus Defense & Space in Leiden





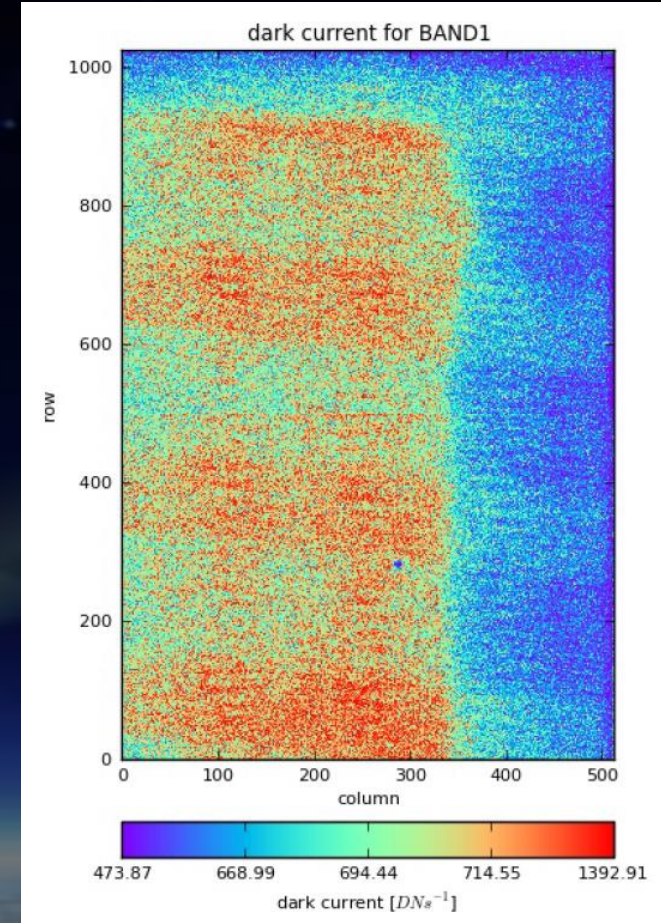
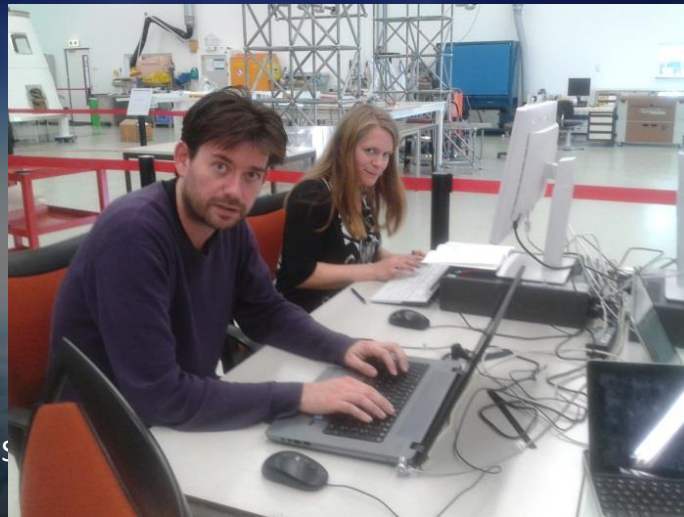
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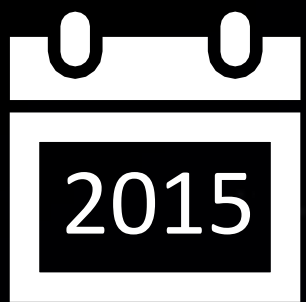


- Learning how to define instrument settings
- Using L01b processor
- First “calibration” data
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→ Next talk:
“Calibration features in the TROPOMI L0-1b data processor”
Nico Rozemeijer

collaboration with Airbus Defense & Space





On-ground calibration 2014/2015



KNMI on-site team



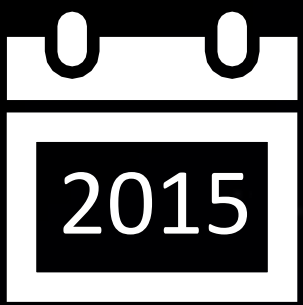
+support from
SRON for SWIR



ADSNL operator team



- One team approach: industry, L1b&cal team and NSO/ESTEC
- Calibration team on site in Belgium & analysis team at KNMI
- Self-consistent derivation of calibration data with L1b processor
- Very fast feedback: measurement -> analysis -> improved measurement



On-ground calibration & aftermath

Optical engineers from: ADSNL, CSL, TNO, VSL



On-ground calibration: done



- 118 measurement days (24/7)
- ~ 30 optical setups
- ~ 20 Tb raw data
- ~ 100 Tb analysis data
- 30 calibration reports for all subjects / key data

<https://doi.org/10.5194/amt-11-6439-2018>



Delta calibration for NIR out-of-band straylight December 2016 - January 2017



- Small close-knit team: industry (ADSNL), joint project team (ESTEC & NSO), L1b&cal team (KNMI)
- Instrument on satellite, warm detectors
- Adapter for Earth port to couple in laser light

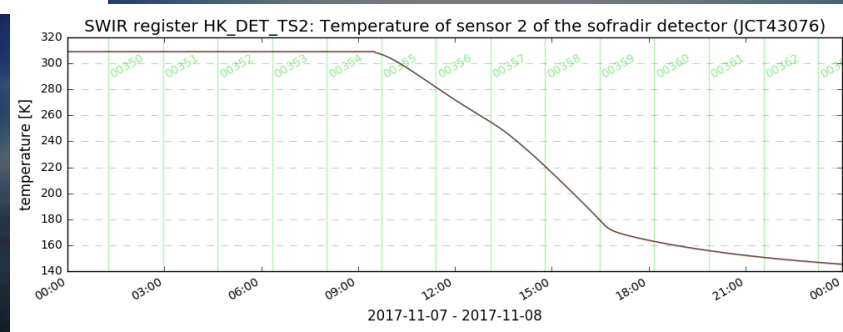
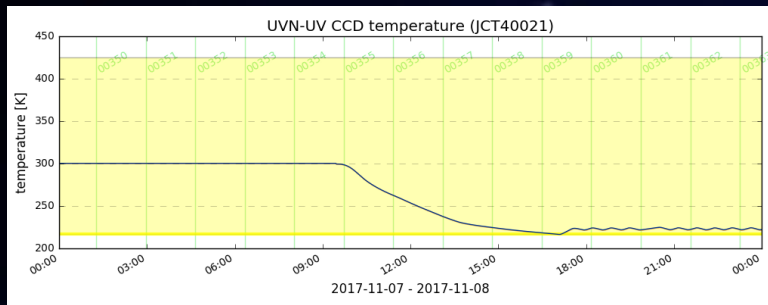
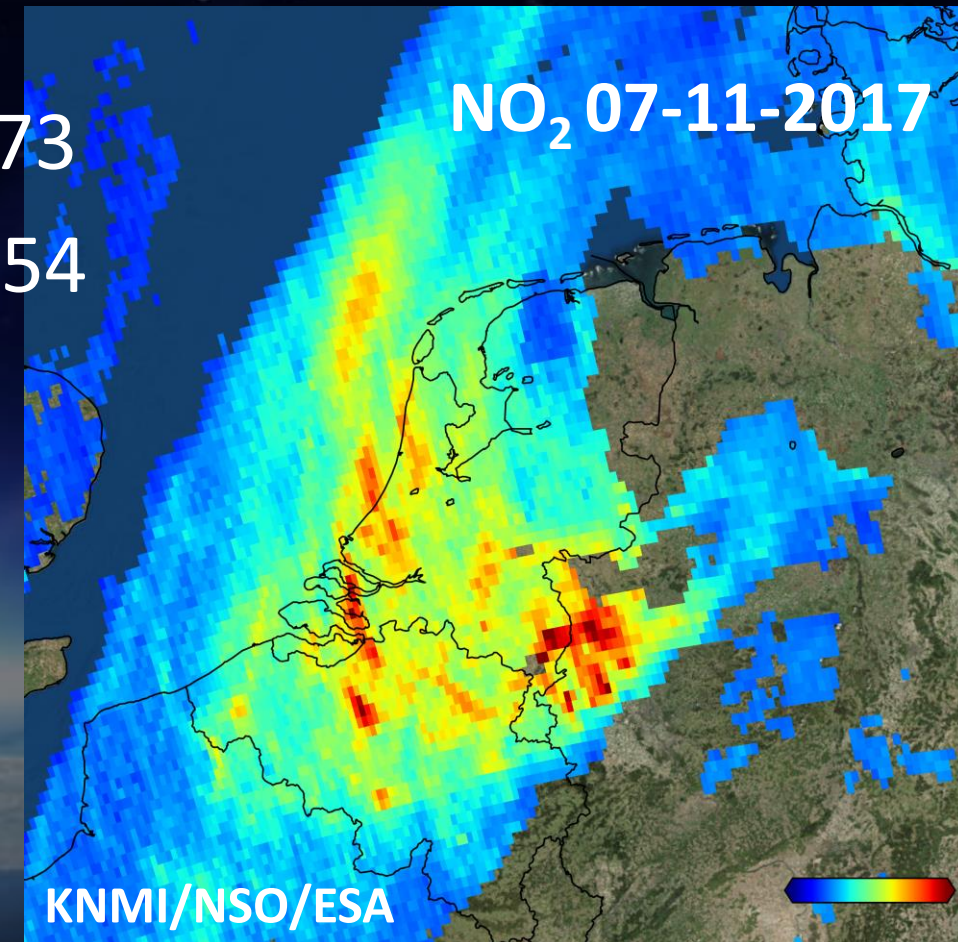




Launch and commissioning phase: L1b v 0.12-0.14



- Fully functional processor with consistent calibration data before launch
- First post launch data processed in orbit 73
- First light = first L2 retrievals from orbit 354

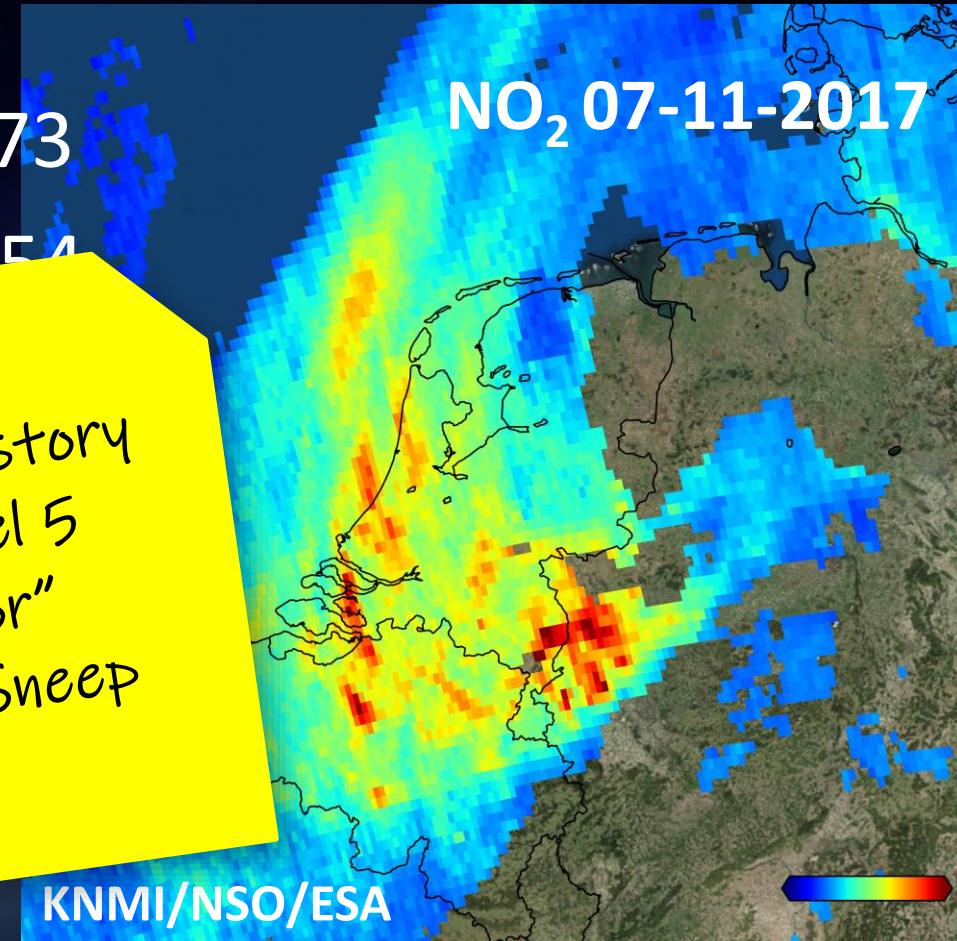




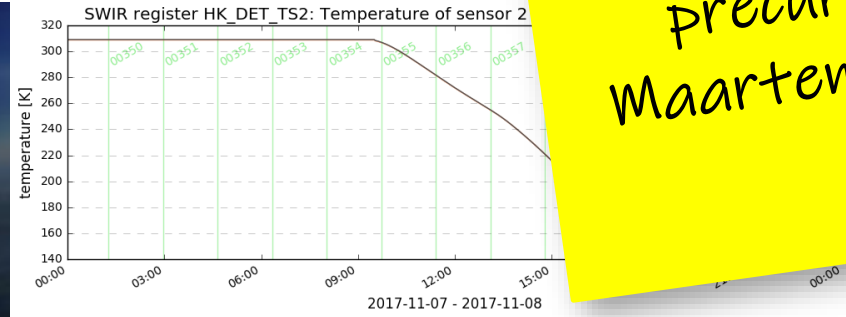
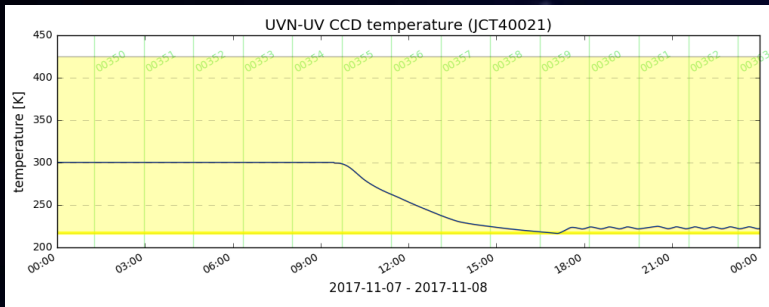
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→ Talk:
"The inside story
of Sentinel 5
precursor"
Maarten Sneep

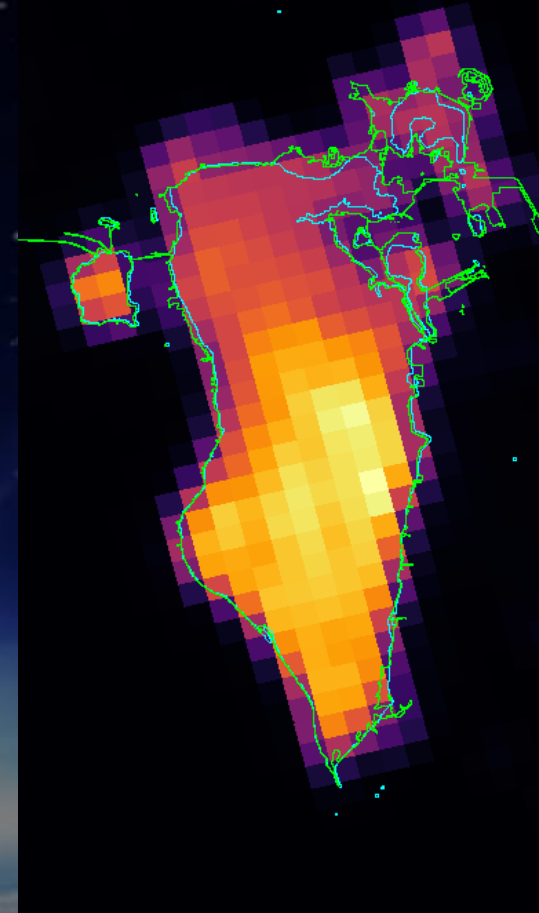


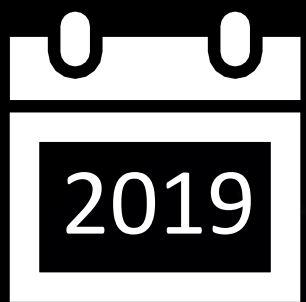


Start of E2 phase with L1b version 1.0 & updated operations



- Yaw angle correction for geolocation in L01b
- Metadata changes
-
- In-flight calibration measurements adapted to match processor
- Instrument settings tested & improved
- Operational baseline validated





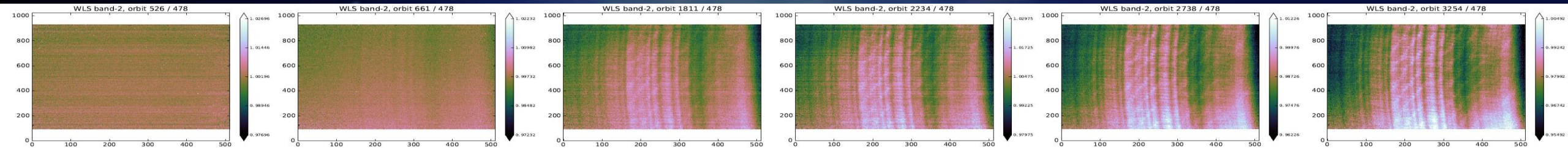
L01b processor Version 2.0 July 2019



All insights from commissioning included:

- Accounts for degradation & gain drifts in UVN
- Updates to irradiance calibration bands 1-4
- Algorithm for transient detection
- Time dependent calibration key data
- ...

<https://amt.copernicus.org/articles/13/3561/2020/amt-13-3561-2020.html>



WLS signal ratio in band-2 trend over 3000 orbits vs. reference orbit 478



L01b processor Version 2.0 July 2019

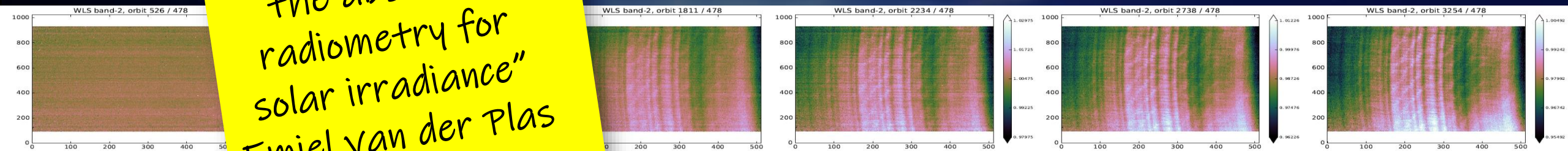


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- Accounts for degradation & gain drifts in UVN
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→ Poster 1:
"Calibration of
the absolute
radiometry for
solar irradiance"
Emiel van der Plas

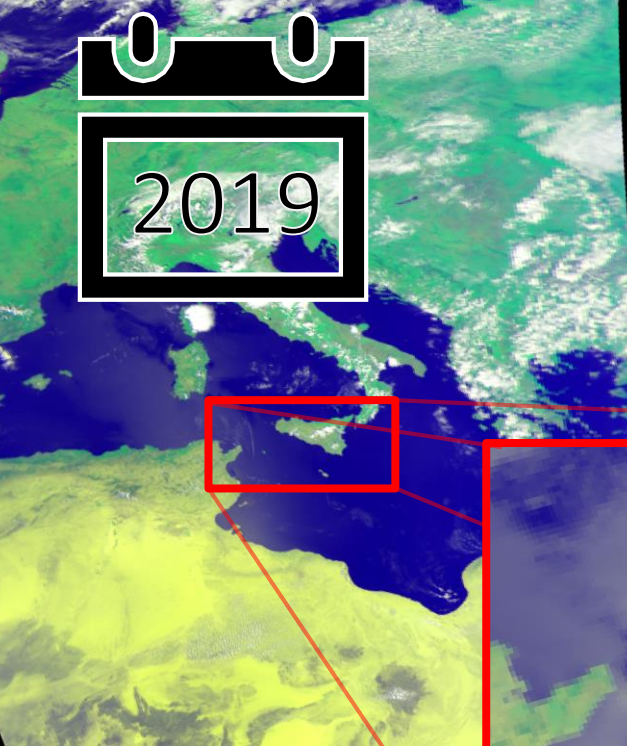
<https://www.gfdl.noaa.gov/articles/13/3561/2020/amt-13-3561-2020.html>



WLS signal ratio in

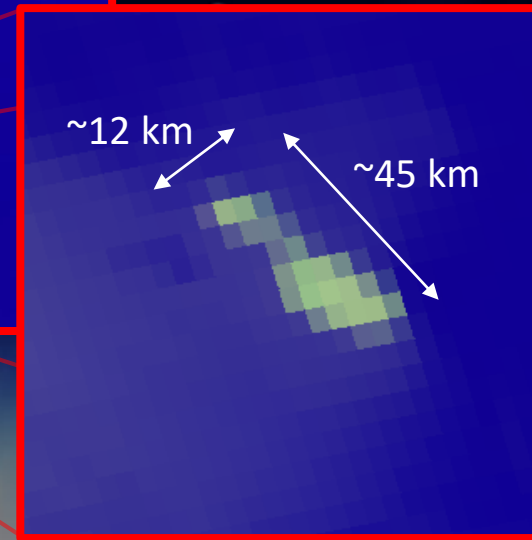
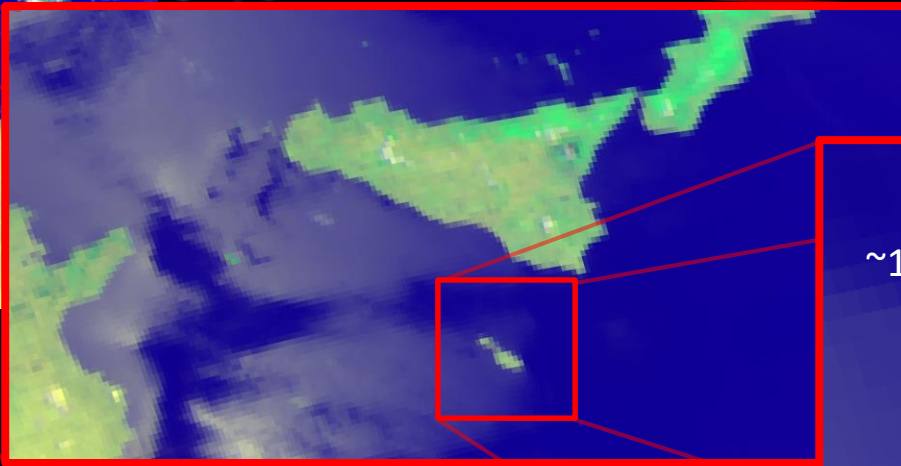
orbits vs. reference orbit 478

TROPOMI operations: smaller groundpixels



Sicily

Malta



TROPOMI
groundpixel
@nadir

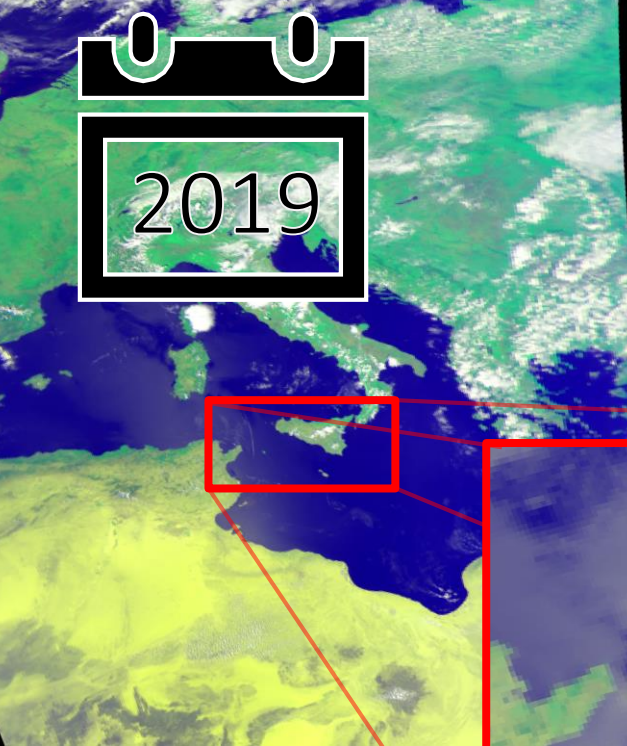
5.5 x 3.5 km for
UVN

since 6th of August
2019



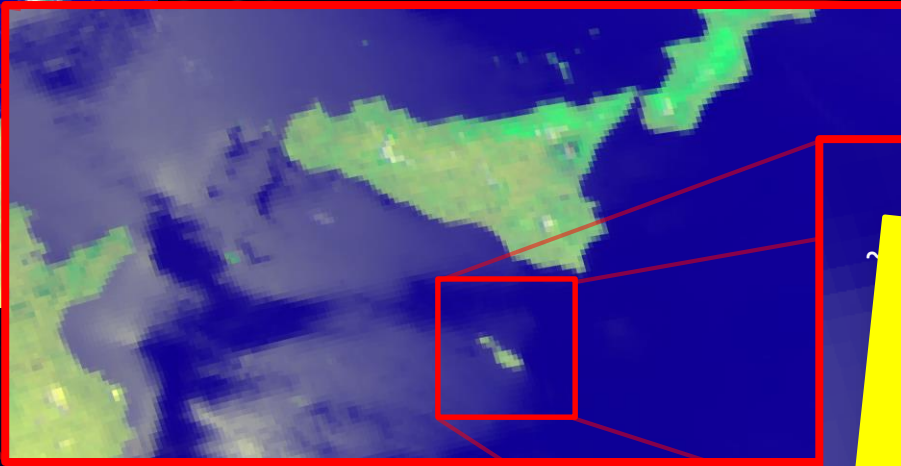
OMI 13 x 24 km
groundpixel

TROPOMI operations: smaller groundpixels



Sicily

Malta



TROPOMI
groundpixel
@nadir

→ Poster 36:
"Small ground
pixels for great
science"
Mirna van Hoek

5 x 3.5 km for
/N

nce 6th of August
019



OMI 13 x 24 km
groundpixel

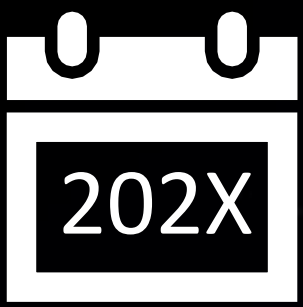


Autumn: degradation also in radiance



- Optical degradation becomes noticeable also in radiance
- Correction algorithm already included in L1b version 2
- Only calibration key data update needed
- Start various checks and tests with L2

→ Poster 10 :
"Optical
degradation"
Erwin Loots



Future developments



- Keep degradation & drift corrections up to date
- Investigate straylight behaviour
- Investigate improvements for radiometric calibration
- Keep monitoring instrument behaviour and determine L1b correction & calibration data if new features appear





Conclusion ?

It works very well:



- Integrated approach of L01b processing & calibration & operations
- Close collaboration between joint project team (ESTEC & NSO), industry (ADSNL) and L1b&cal team (KNMI)
- Operational processor before launch
- Changes in the instrument can be corrected in L1b

