The EUMETSAT Network of Satellite Application Facilities

NWC SAF

Support to Nowcasting and Very Short Range Forecasting

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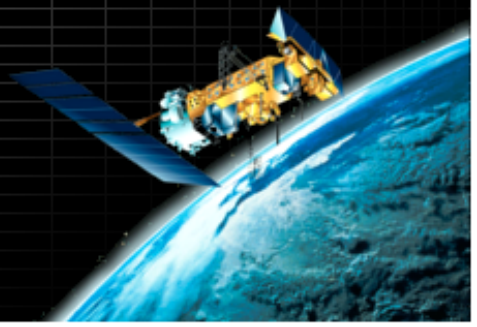
EUMETSAT Nowcasting SAF Direct Readout Package PPS - Status

Nina Håkansson, Ronald Scheirer, Sara Hörnquist, Adam Dybbroe, Anke Thoss, Karl-Göran Karlsson, Abhay Devasthale and Martin Raspaud



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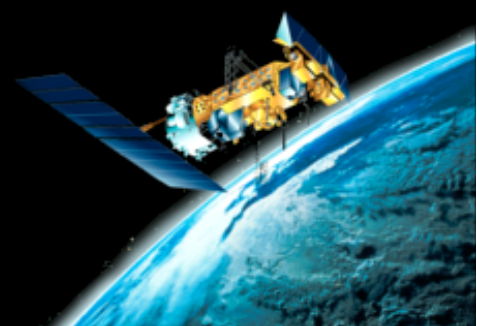
Outline

- What is PPS?
- User support and interaction
- Recent improvements
- Future



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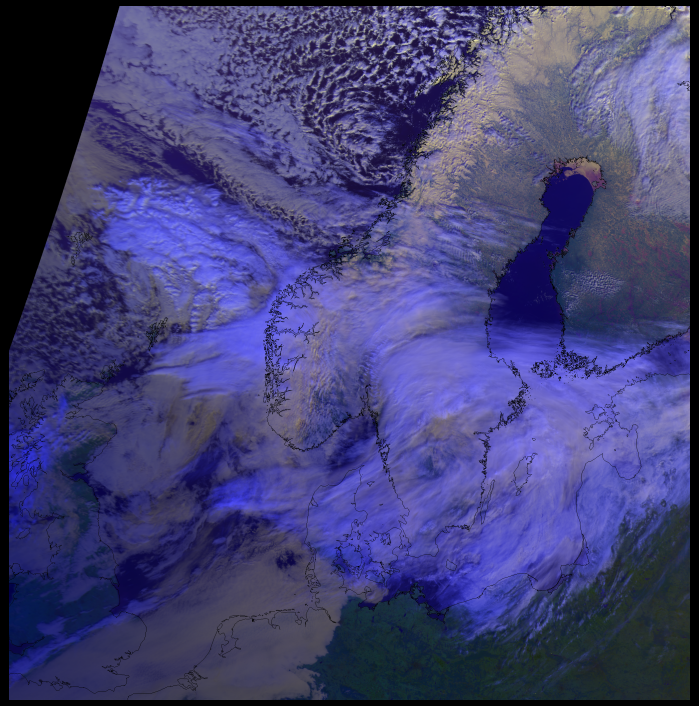
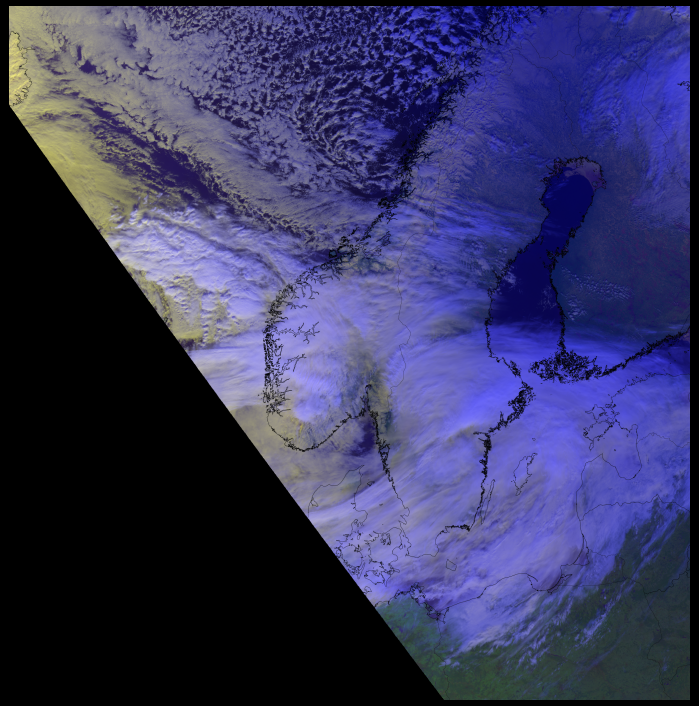
PPS stress tests – solar eclipse over Northeast Atlantic 20/3-2015

Southwest



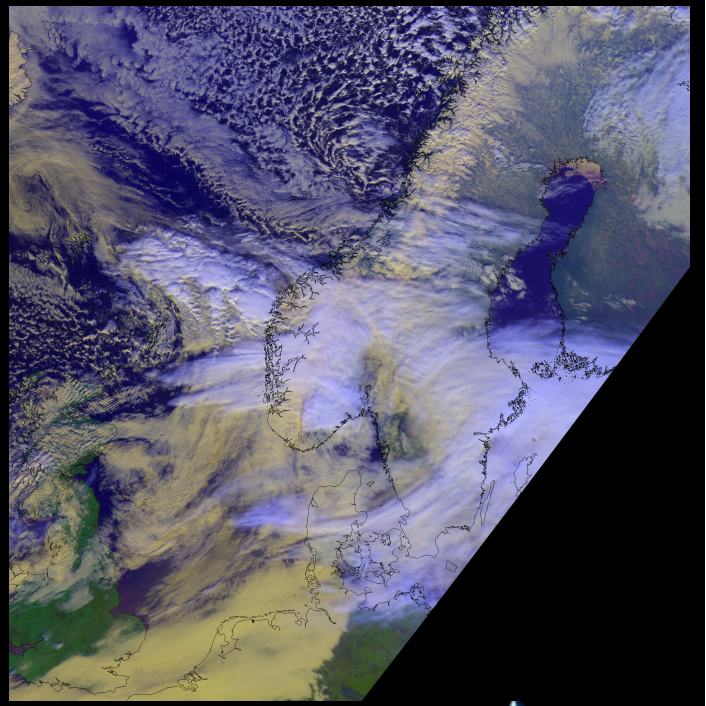
Metop-B 09:20 UTC

Northeast



S-NPP 10:13 UTC

Past



Metop-B 11:01 UTC

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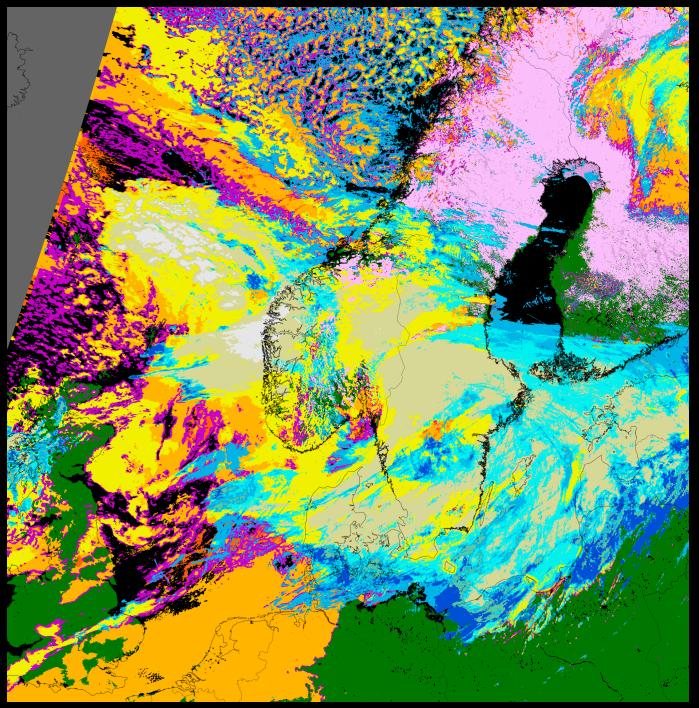
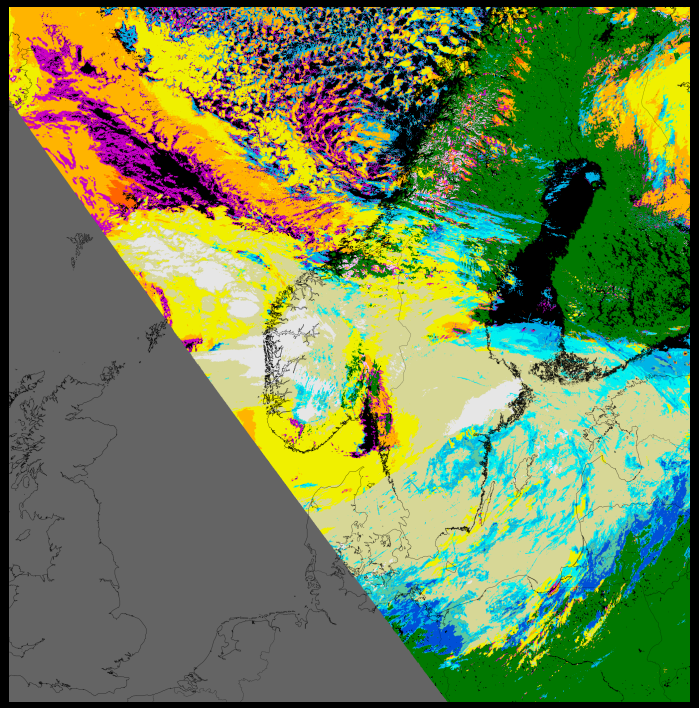
PPS “stress testing” – recent solar eclipse over Northeast Atlantic

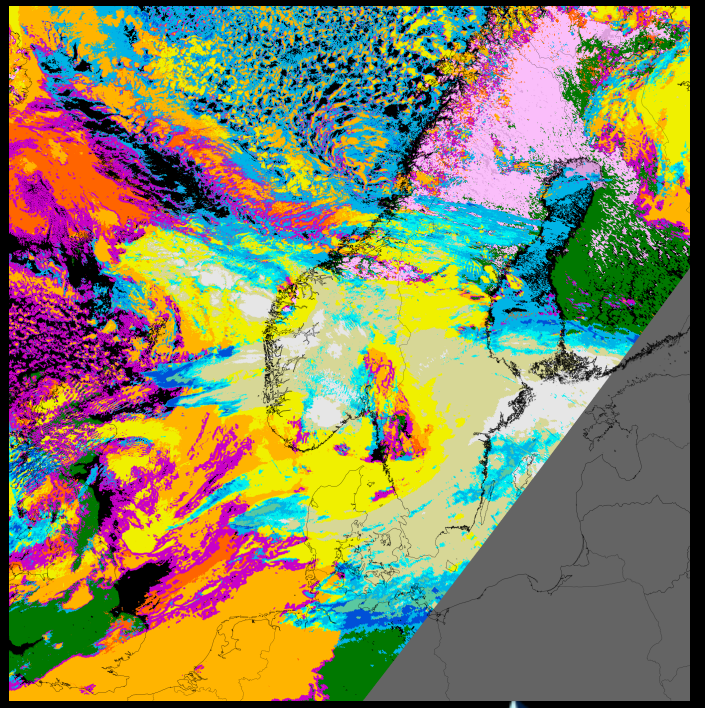
Southwest

Northeast

Past







Metop-B 09:20 UTC

S-NPP 10:13 UTC

Metop-B 11:01 UTC

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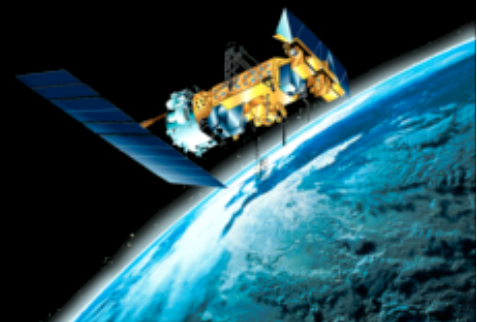
What is PPS?

- Processing package for cloud and precipitation products, developed by the NWCSAF
- Originally designed for local processing of Direct Readout data from AVHRR
- Adapted to other input formats, as for example AVHRR GAC
- ...and other platforms: S-NPP VIIRS and Terra/Aqua MODIS



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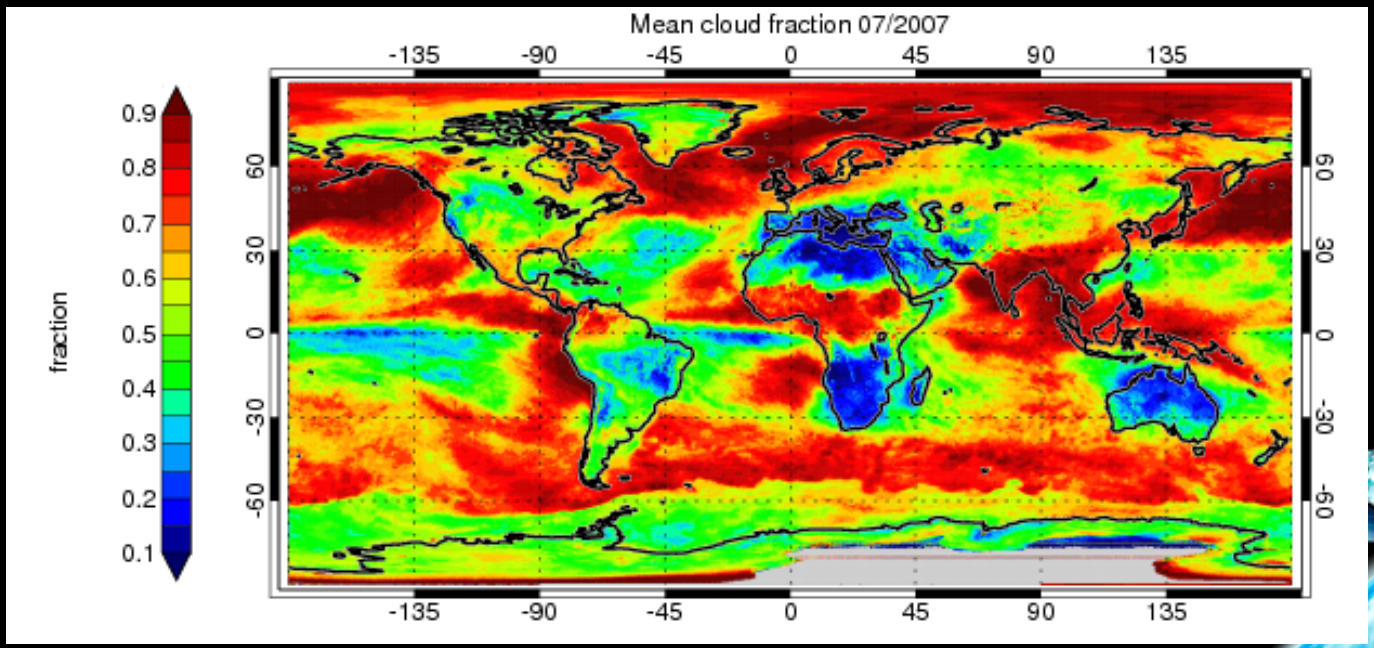
What is PPS?

- Used not only for Nowcasting, but also by CMSAF, OSI SAF and Land SAF

Mean cloud fractional coverage for July 2007, derived from NOAA 15, 16, 17 and 18:



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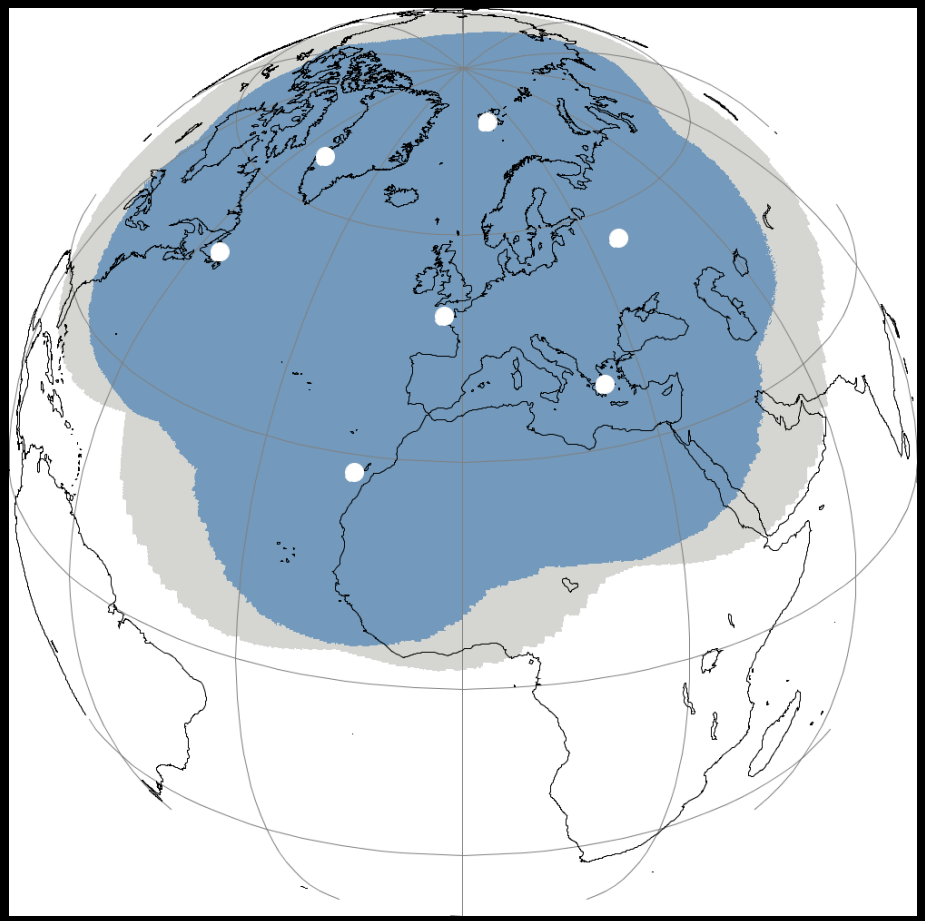
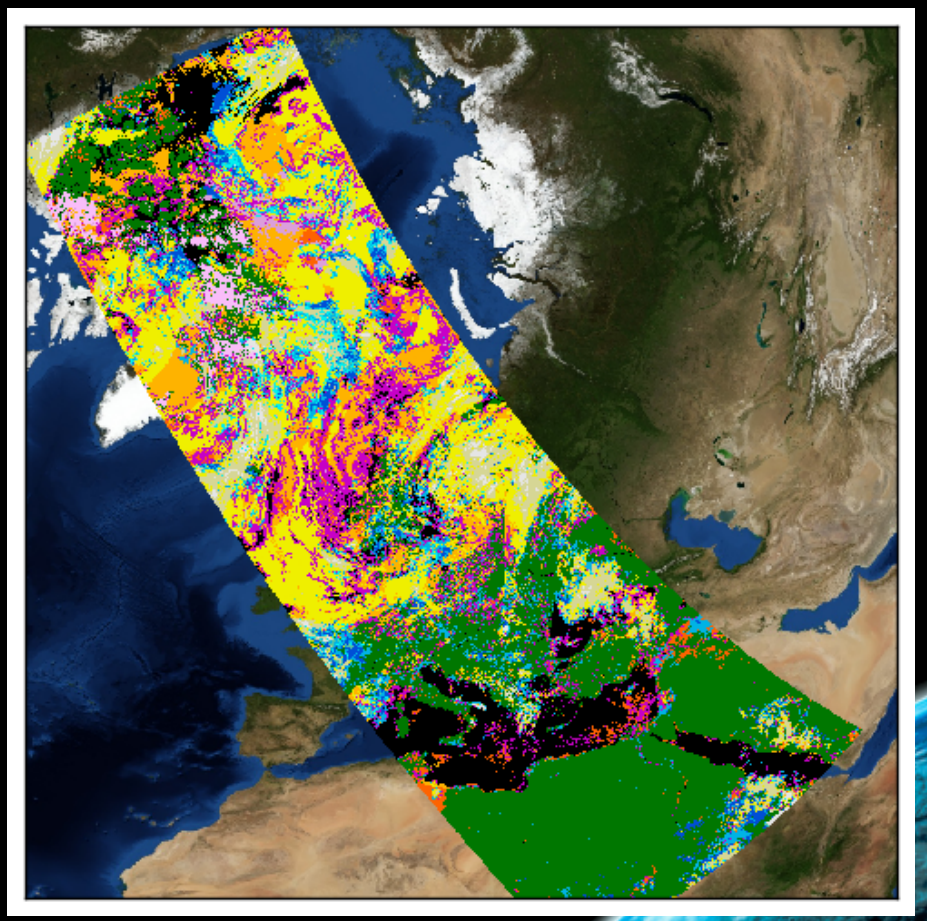
What is PPS?

- Also used for processing cloud products in the EARS-NWC service





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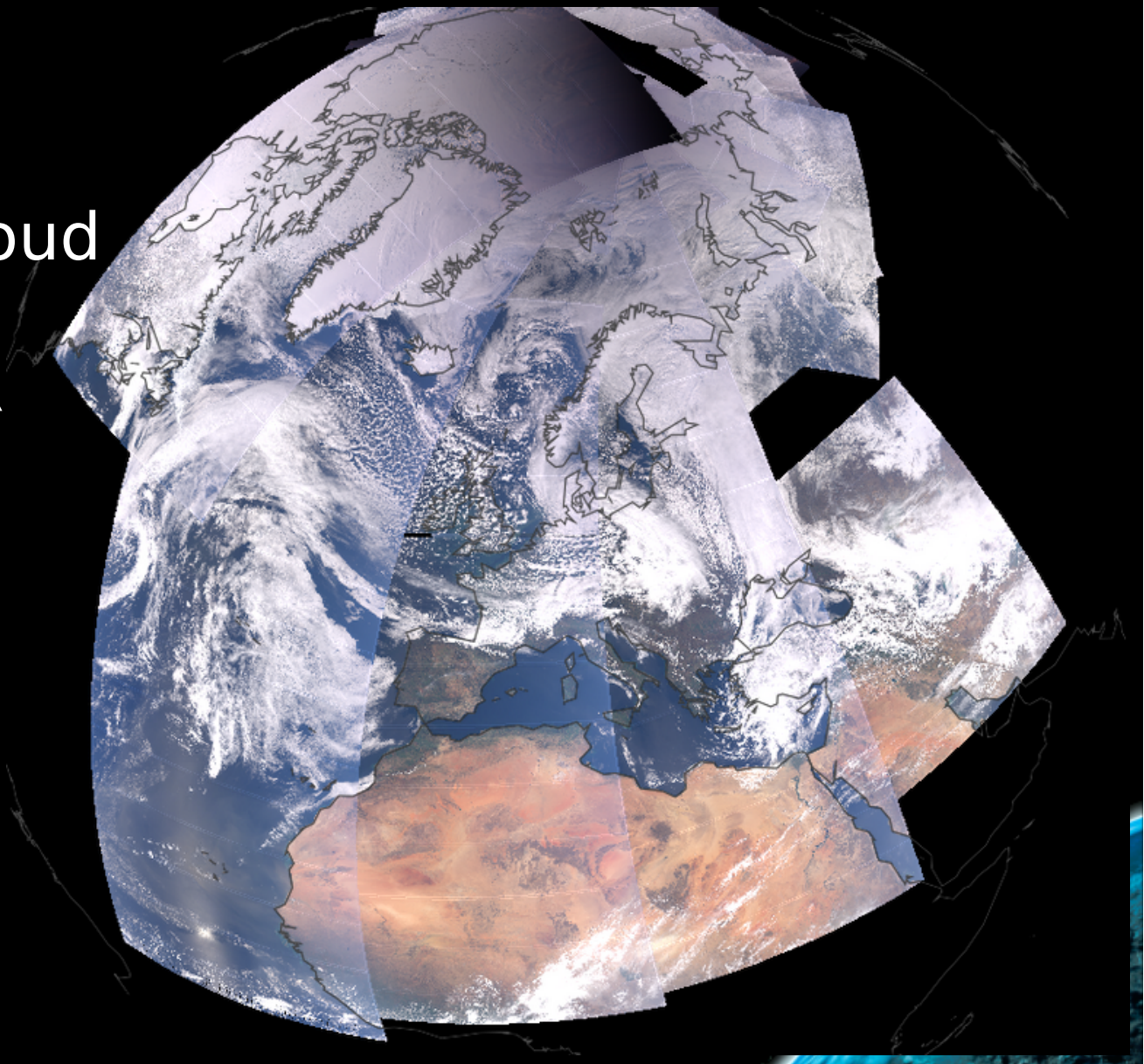
EARS-NWC extended to VIIRS

- Currently EARS-NWC provides PPS cloud mask, type and CTTH on AVHRR
- EARS team is preparing to extend this to VIIRS



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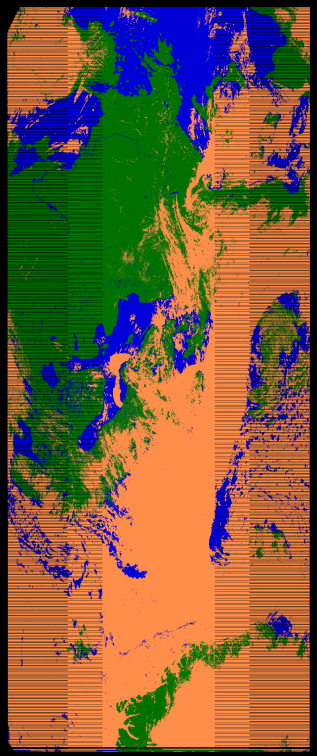
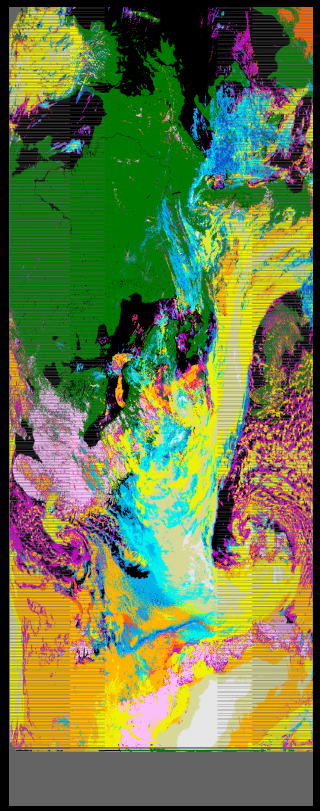
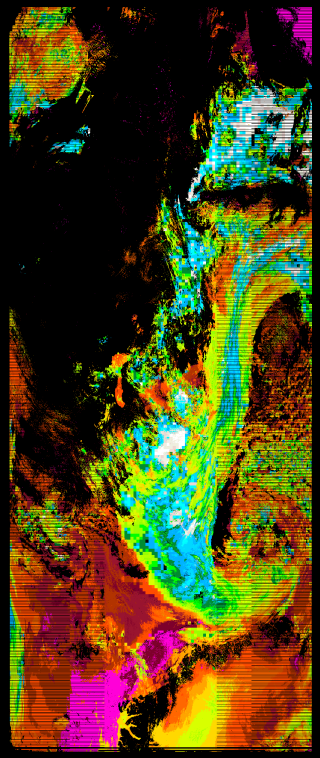
Parameters



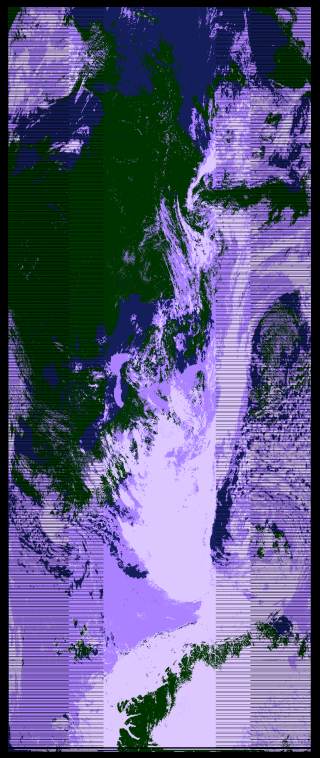
Cloud Mask



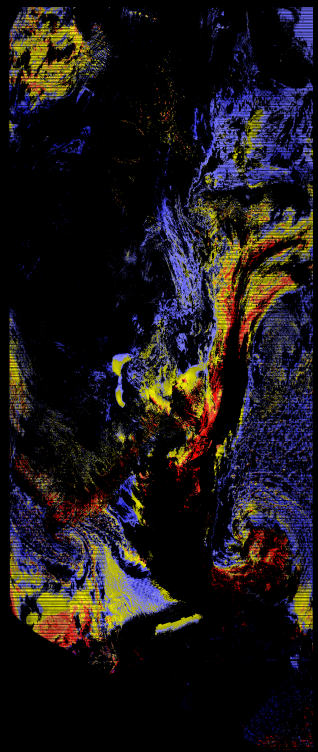
Cloud Type



Cloud Temperature and Height

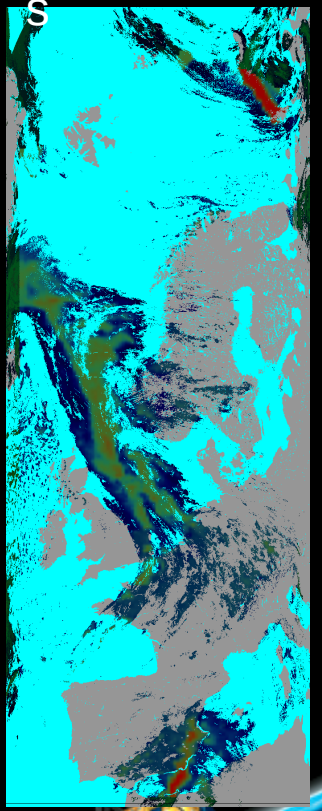


Cloud Phase



LWP

Likelihood for light, moderate and intense precipitation s



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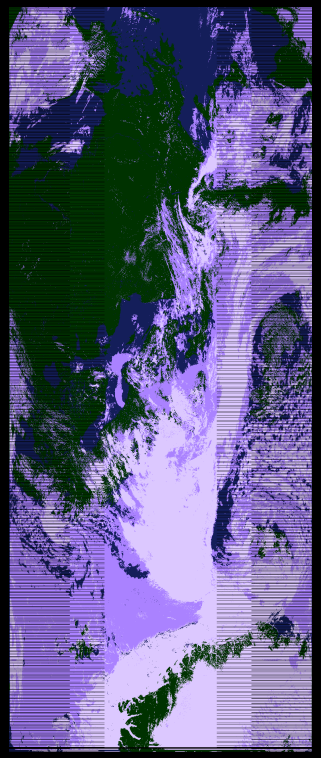
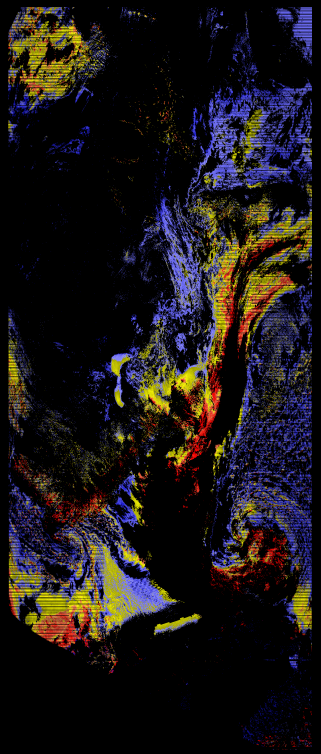
Cloud Microphysical Parameters

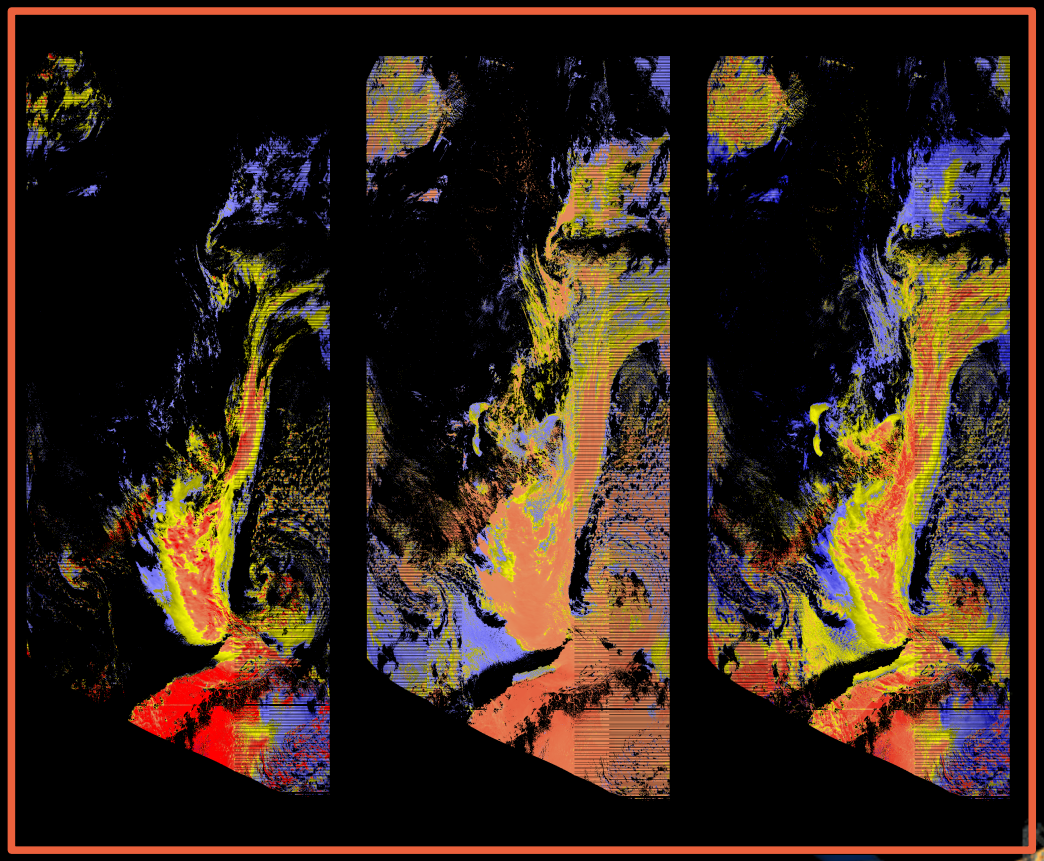


Cloud Phase



LWP

Extra products – not committed



IWP

Effective radius

Cloud Optical Thickness

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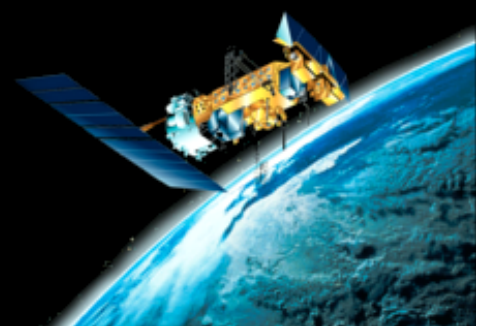
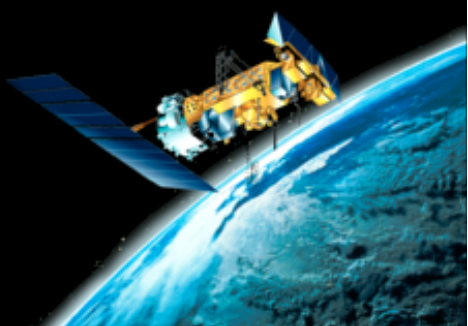
Support and release strategy

- Major releases every ~2-3 years
  - Subject to external reviews
  - Full validation
- Available via the Help Desk (www.nwcsaf.org)
  - Free registration



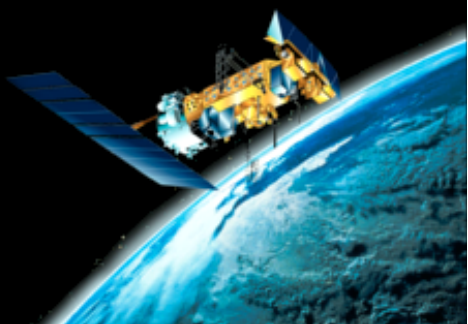
Support and release strategy

- Patches as necessary, e.g.
  - in case of bugs
  - new satellites
  - portability
- Bug reports and user support via mail-box on Help Desk
  - Usually answered within 24 hours



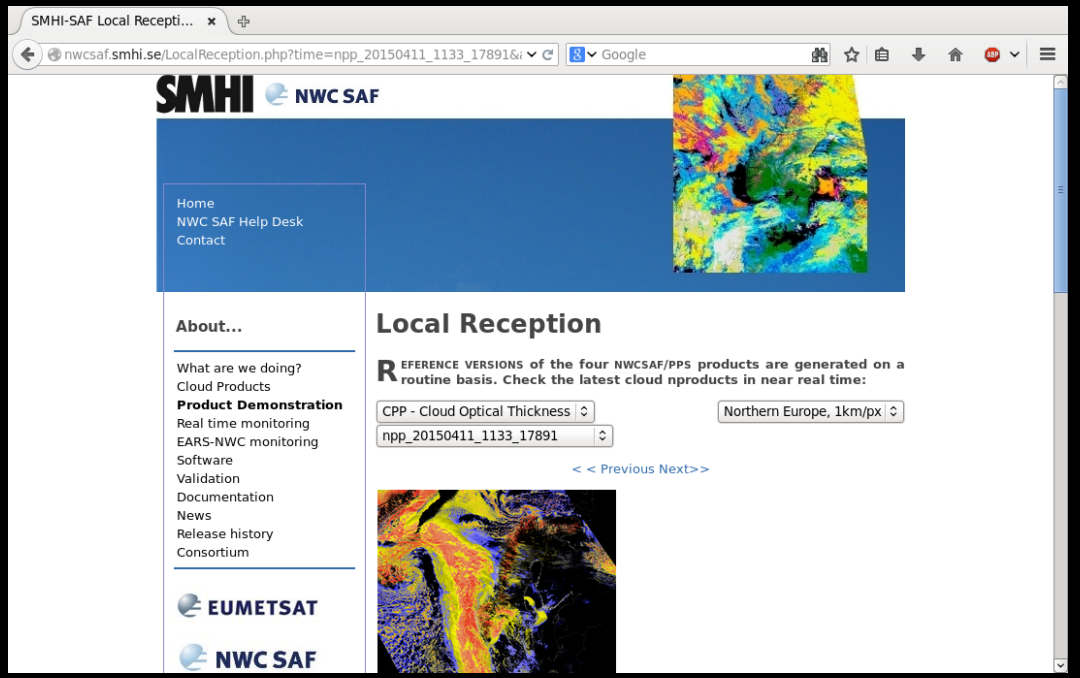
Support and release strategy

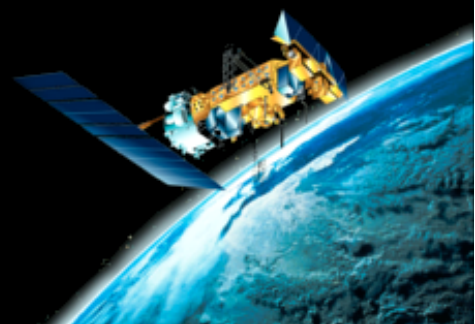
- All releases contain full source code
- ...and from v2014 ready built binaries for a few common Linux distributions:
  - CentOS-6/RHEL-6
  - SUSE SLES 11
  - Ubuntu Trusty
  - *...more depending on user needs*



Reference system

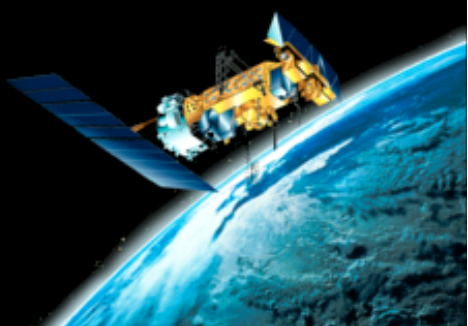
- nwcsaf.smhi.se
- Real time images
- Norrköping DR station





Recent releases

- v2014 released October 2014
  - Major upgrades to Cloud Mask, CTTH and CPP
- Patch released April 2015
  - Significant improvements to cloudmask
  - as a result of a CMSAF “feedback loop” for their CLARA-A2 preparations



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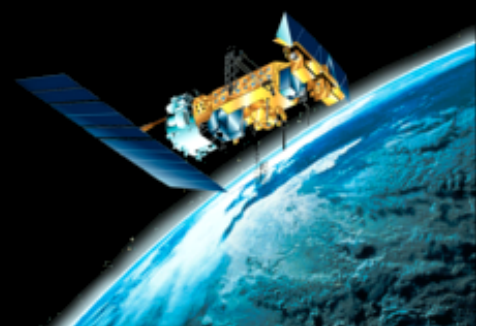
Recent improvements



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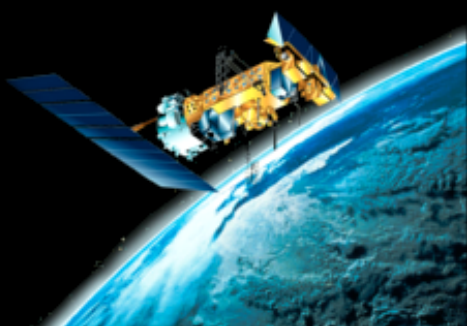
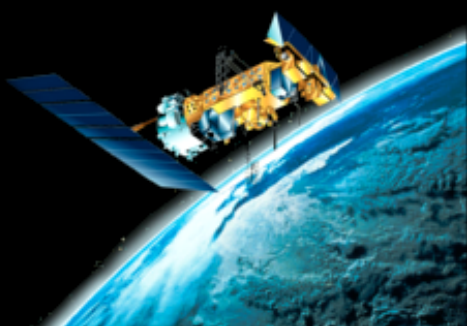
Summary of technical changes since v2012

- Binary distributions
- New output format (netCDF CF)
- Products in both netCDF and hdf5



Summary of improvements since v2012

- CPP:
  - New independent cloud phase algorithm
  - Phase product during night-time
  - New look-up tables

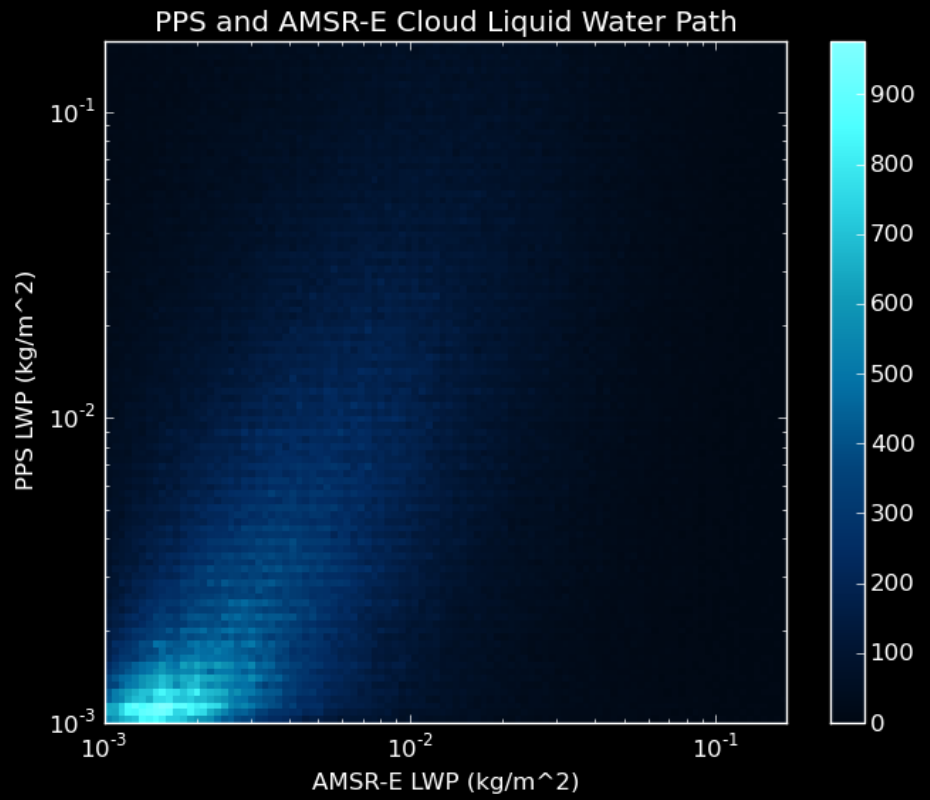


CPP validation

Cloud Phase validation	
POD Liquid	0.73
POD Ice	0.80
FAR Liquid	0.18
FAR Ice	0.30

CALIOP

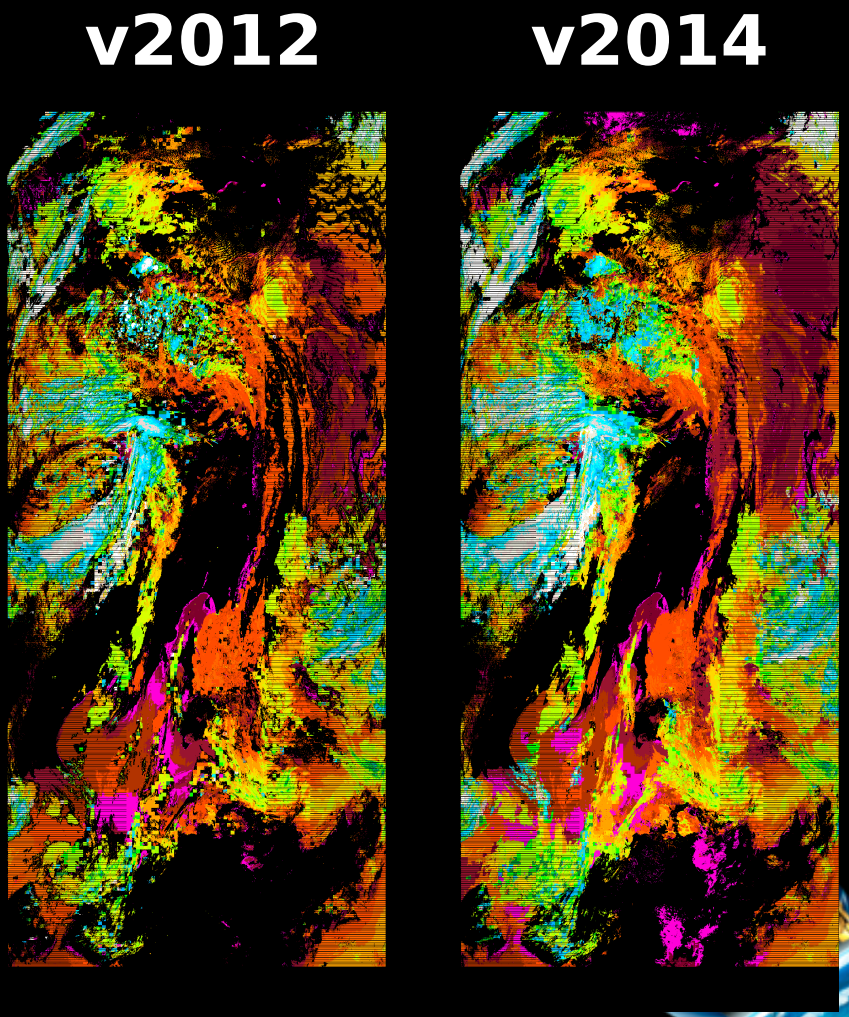
PPS LWP against AMSR-E over sea



RMS = 45.4 g/cm^2
BIAS = 3.4 g/cm^2

Summary of improvements since v2012

- CTTH:
  - Higher retrieval rates (~75% to ~98%)
  - More accurate
  - Faster



CTTH validation against CALIOP

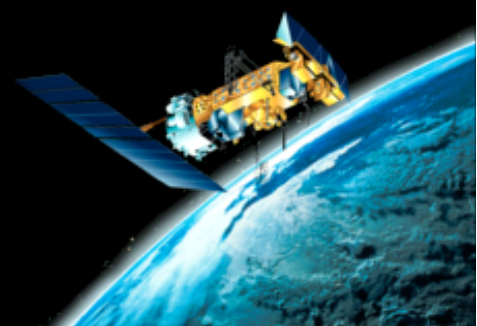
Semi transparent clouds

	All	Low	Medium	High
Bias (m)	148	951	724	-426
RMS (m)	1739	1532	1242	1977
bc-RMS (m)	1732	1201	1009	1931

Opaque clouds

	All	Low	Medium	High
Bias (m)	-186	424	-127	-1313
RMS (m)	1445	870	943	2294
bc-RMS (m)	1433	760	934	1881

Cloudmask improvements



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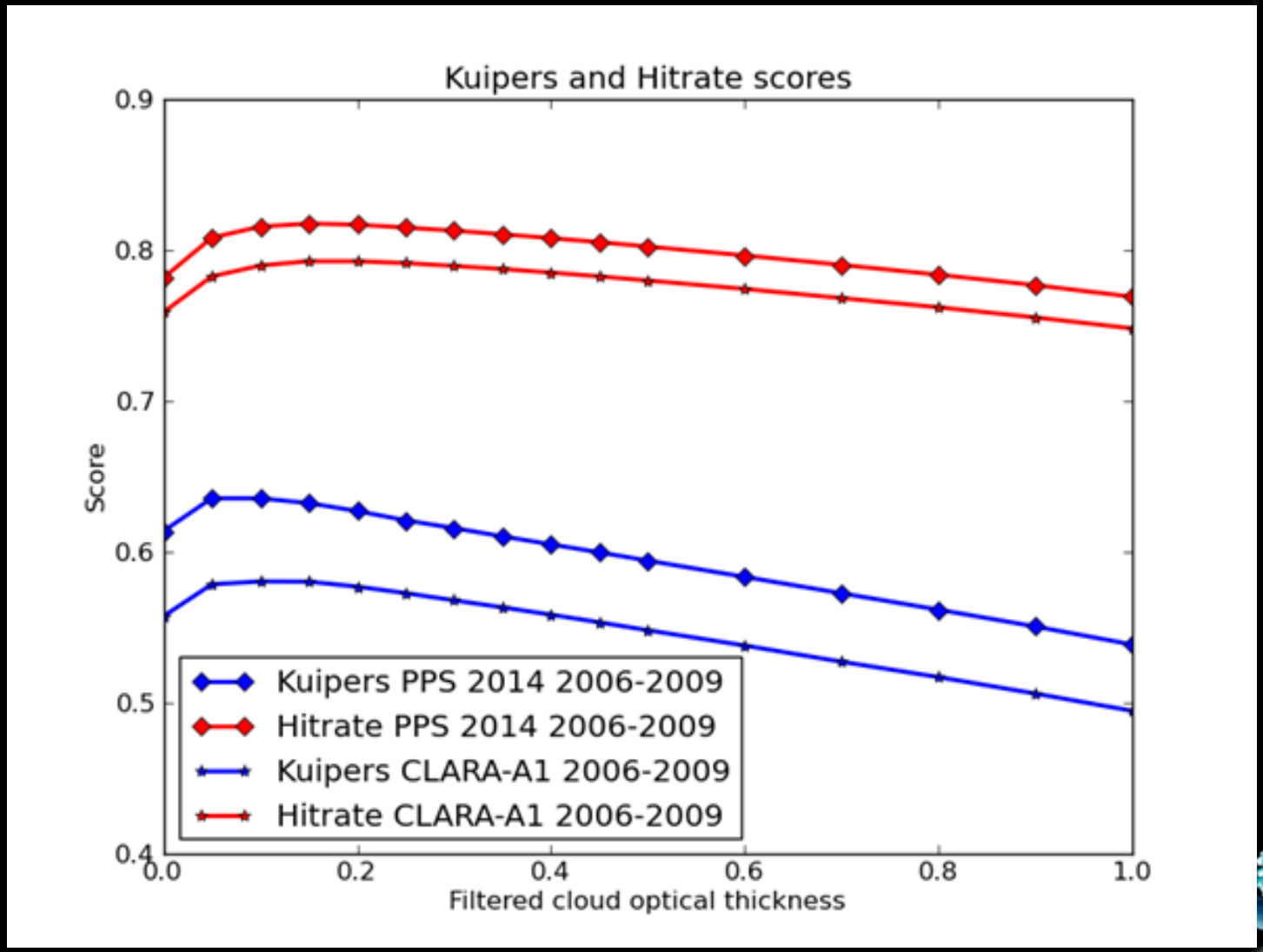
Cloud Mask validation against CALIOP



Version 2010/12 to v2014

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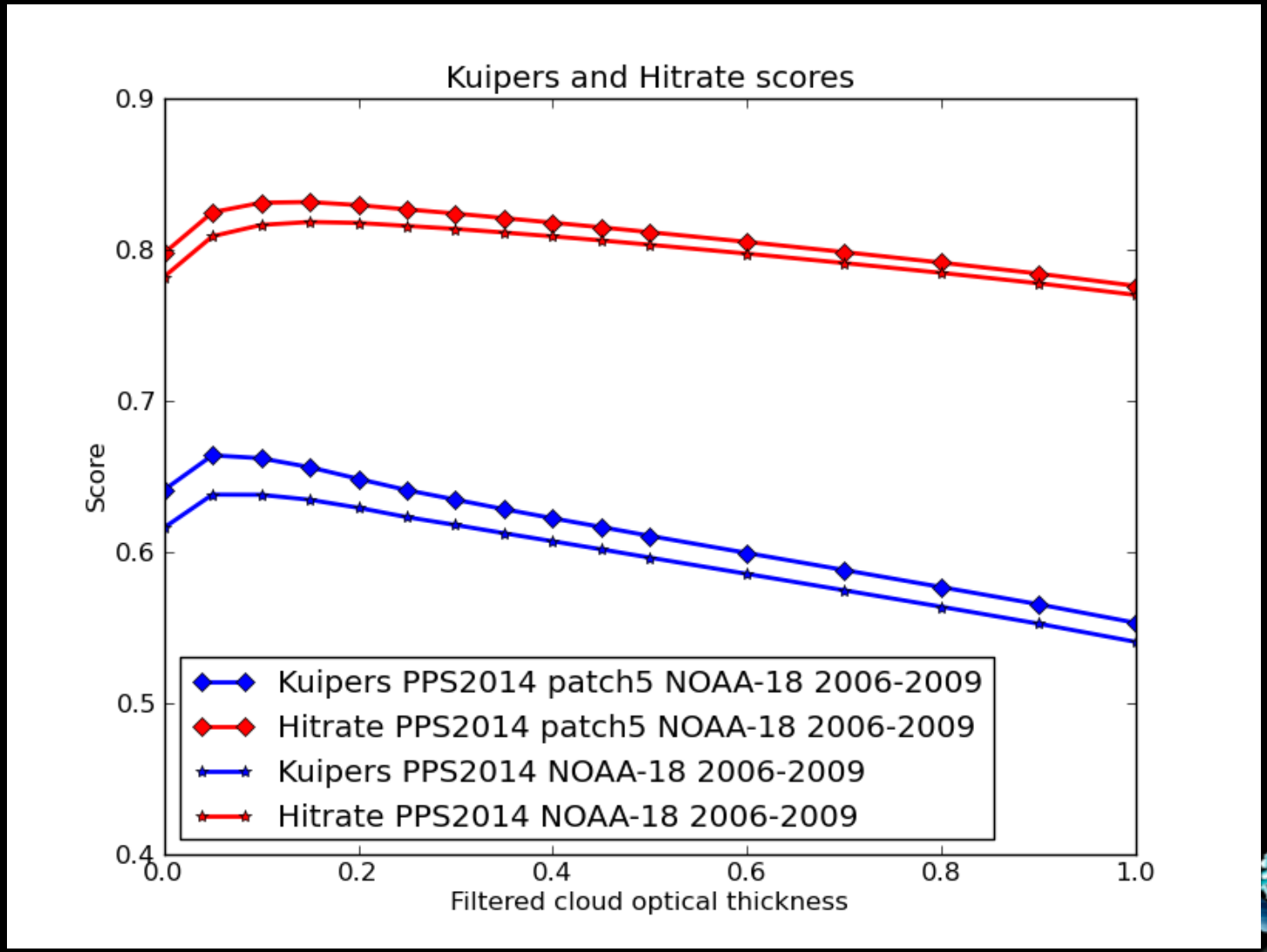
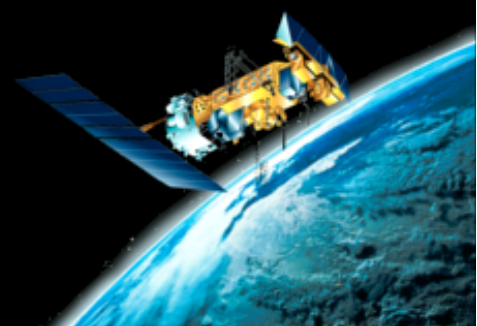
Cloud Mask validation against CALIOP



Version 2014 to v2014-patch

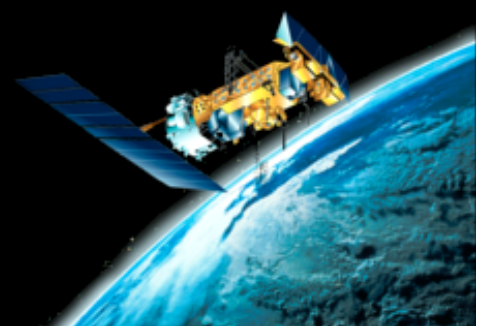
Summary of most prominent improvements

- Surface Infrared emissivity database upgraded
- ~~Explicit description of the solar contribution at 3.7 µm~~
- Roughness instead of elevation
- Re-tuning of the threshold offsets using CALIPSO

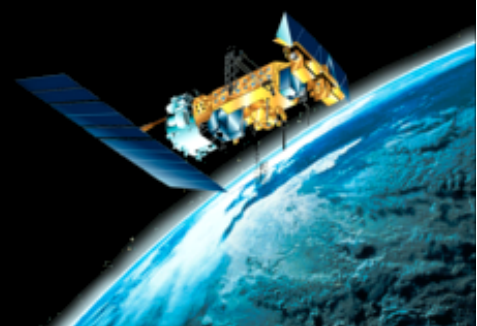


Summary of most prominent improvements

- Recalculated threshold tables
- Restructured logic
- New tests:
  - SST
  - Clear tests accounting for a changing land cover

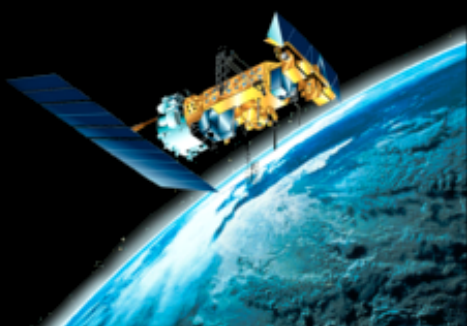


Outlook



Outlook:

- v2017 (2017/Q2)
  - netCDF only
  - Improved products
  - Continued focus to ease user site installations
    - Better encapsulation, e.g. Docker



Outlook:

- New sensors:
  - MERSI-2 (FY3-D/E/F)
  - SLSTR (Sentinel 3)
    - Proposal planned to include SLSTR according to OSISAF/CMSAF requirements, already in v2017
  - VII and MWI/ICI on EPS-SG
    - Plan to freeze current precipitation products, and prepare for precipitation, IWP and LWP products for release in CDOP4 (2023 TBC) based on MWI/ICI

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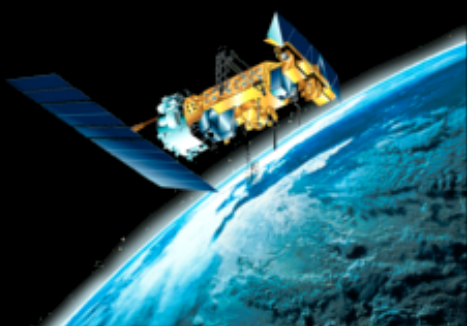
Next cloudmask version (v2017)

- Additional probabilistic output (CMSAF)
- VIIRS-I bands
- OSISAF/GHRSST SST
- Improve flag for heavy aerosol loads (dust, volcanic ash and smoke)
- Use of 1.38 for thin cirrus and snow/ice



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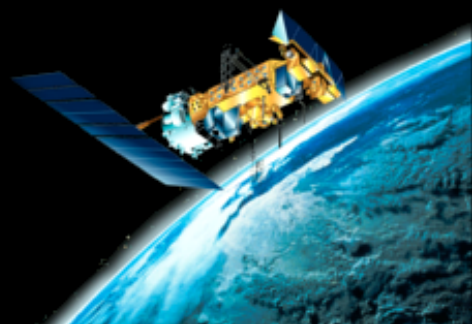
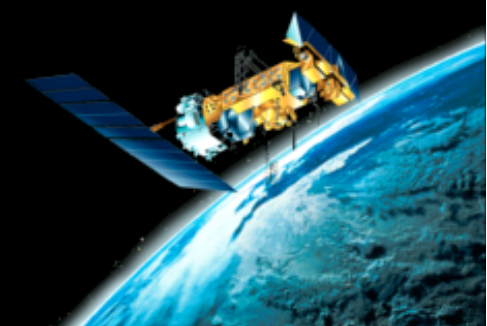
Thank you!

http://www.nwcsaf.org
http://nwcsaf.smhi.se

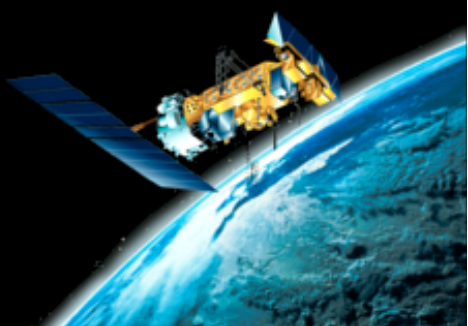


Backup slides



Upgrade of surface emissivity data

- Based on Aqua MODIS MYD11C3 product
- 10 year Climatological monthly means (2003-2012)
- Version 5
- Previously (≦ v2012) based on V4.1

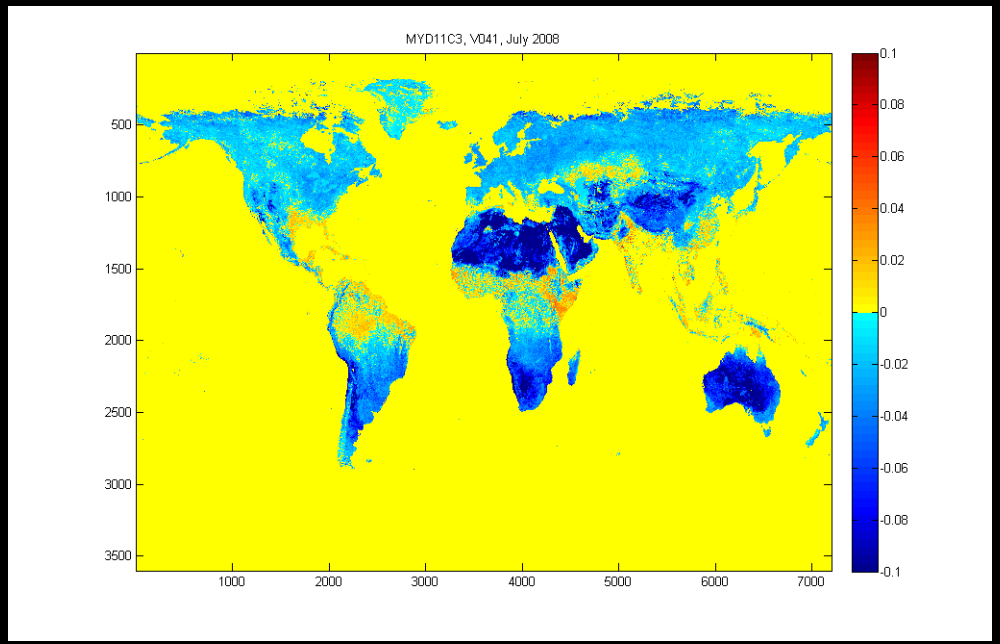


Upgrade using v5

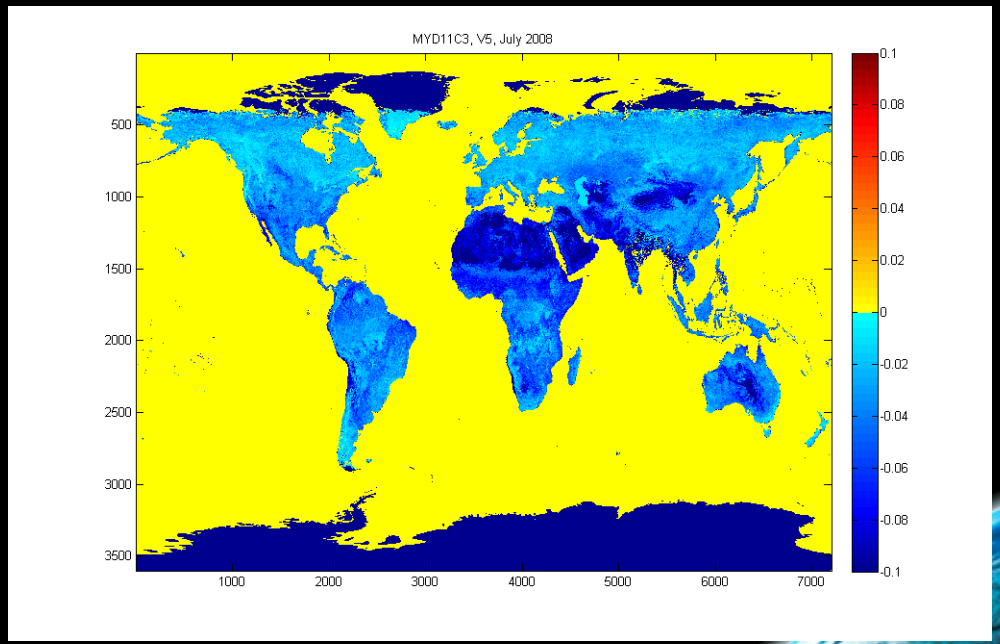
- v4.1 showed inconsistencies in 3.7 and 11 micron emissivity differences

e3.7-e11, July 2008

v4.1



v5



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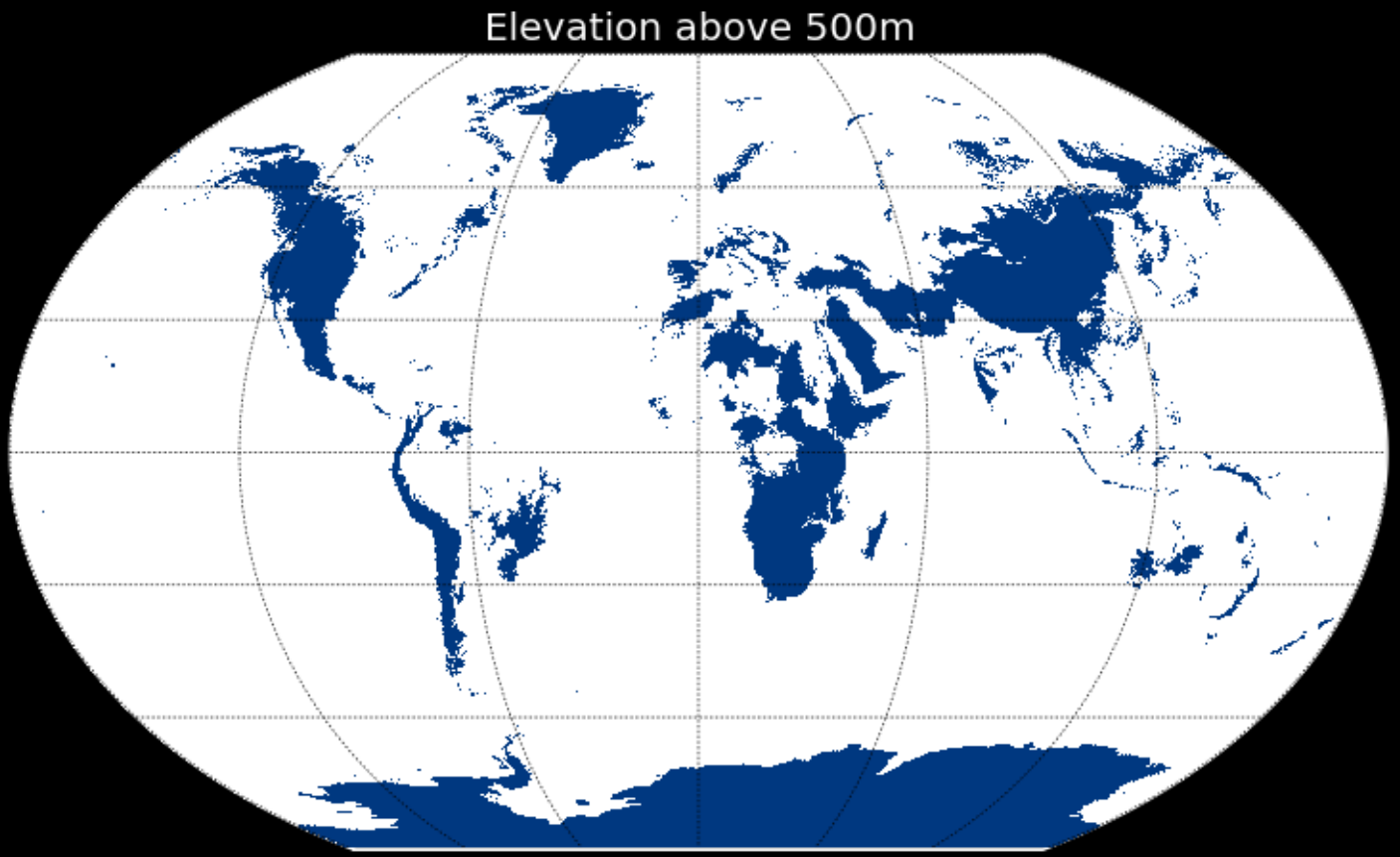
Roughness rather than elevation



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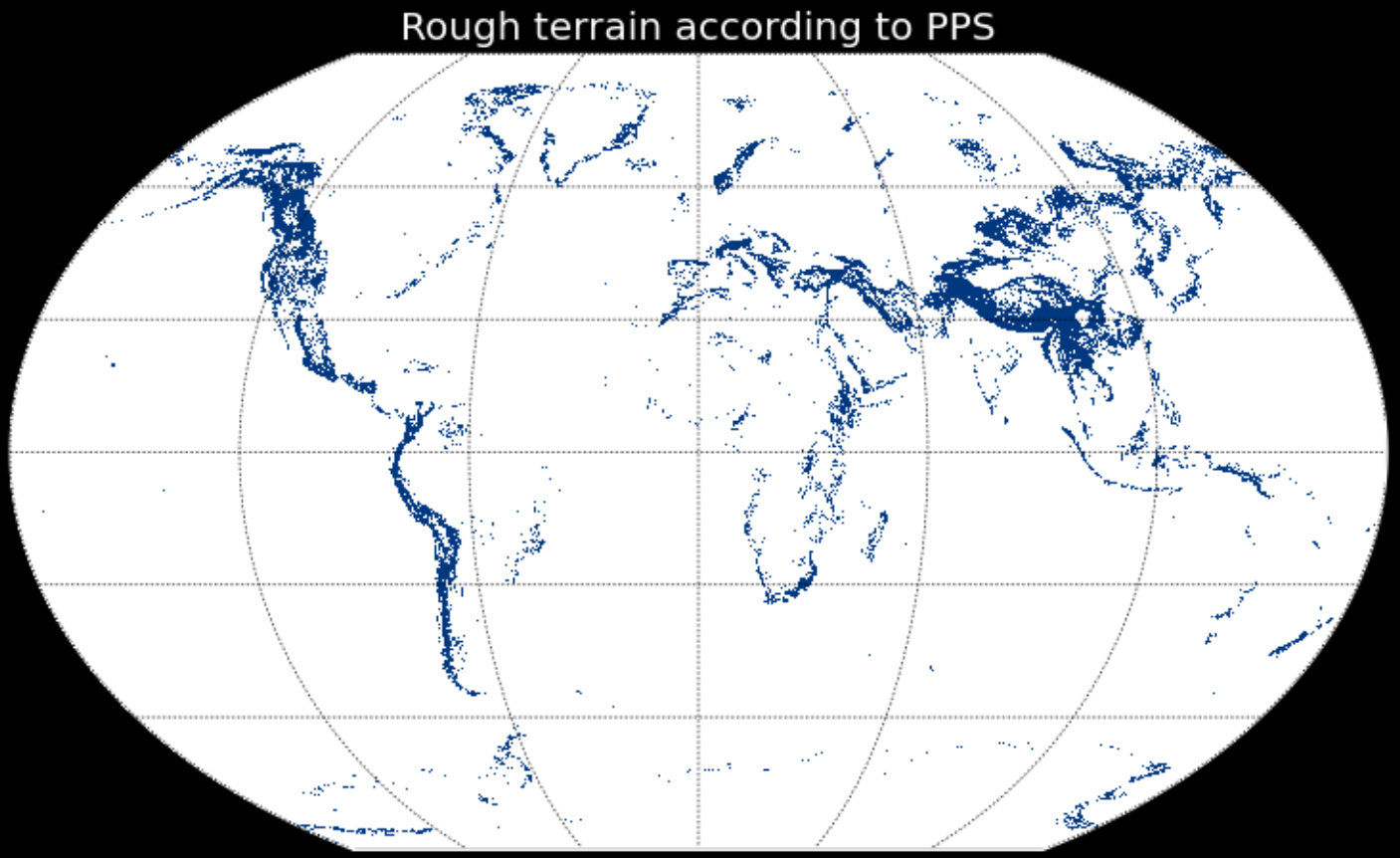
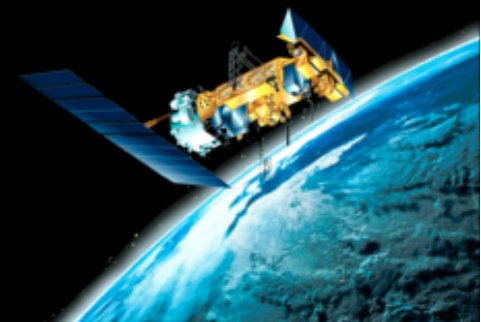
Roughness rather than elevation



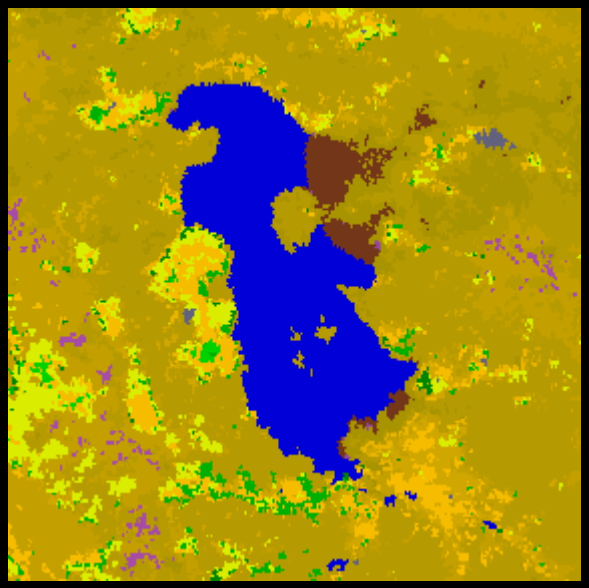


NWC SAF SMHI

Accounting for global change

- Salt lakes, irrigated land, dried out rivers and lakes, dams,...

USGS Land use

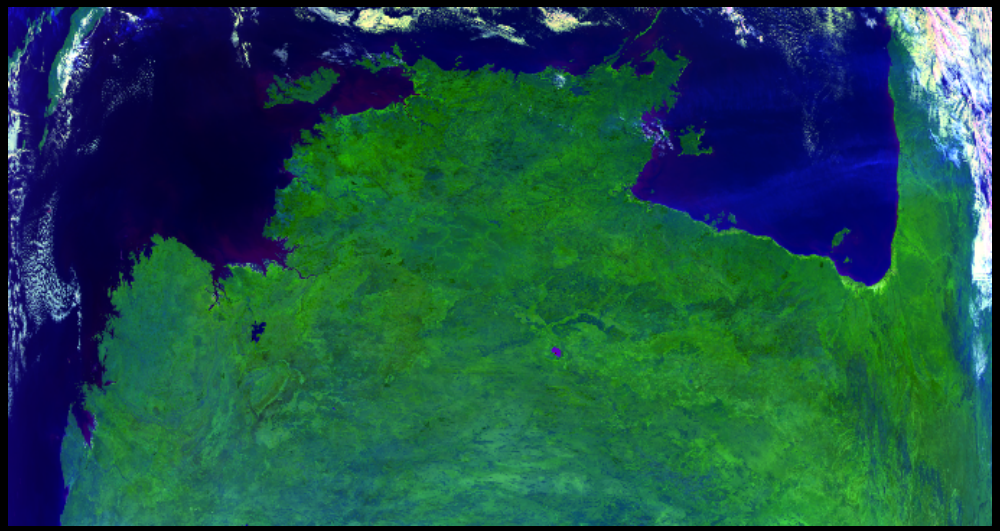


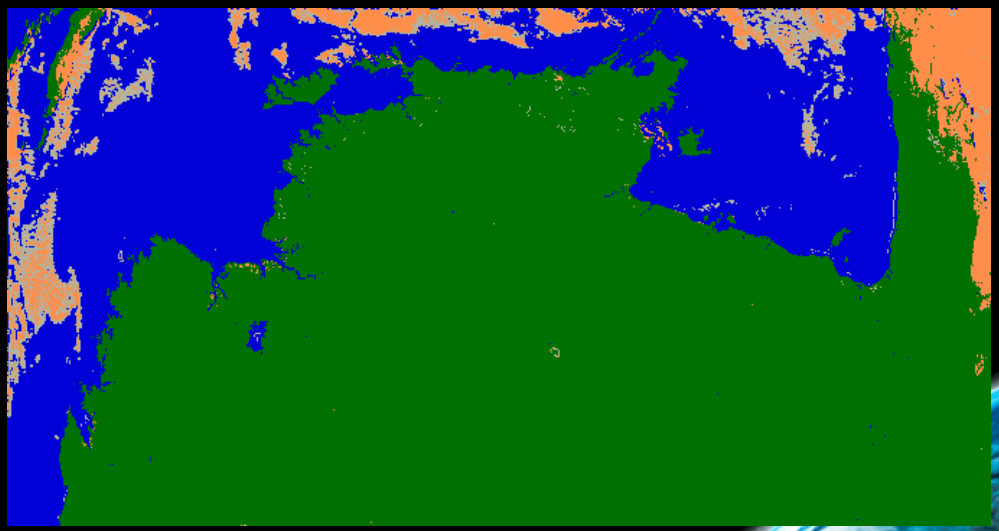
S-NPP VIIRS True Color

Example: Salt lake Urmia, Iran

New SST based test

- PPS v2012 missing thin cirrus clouds

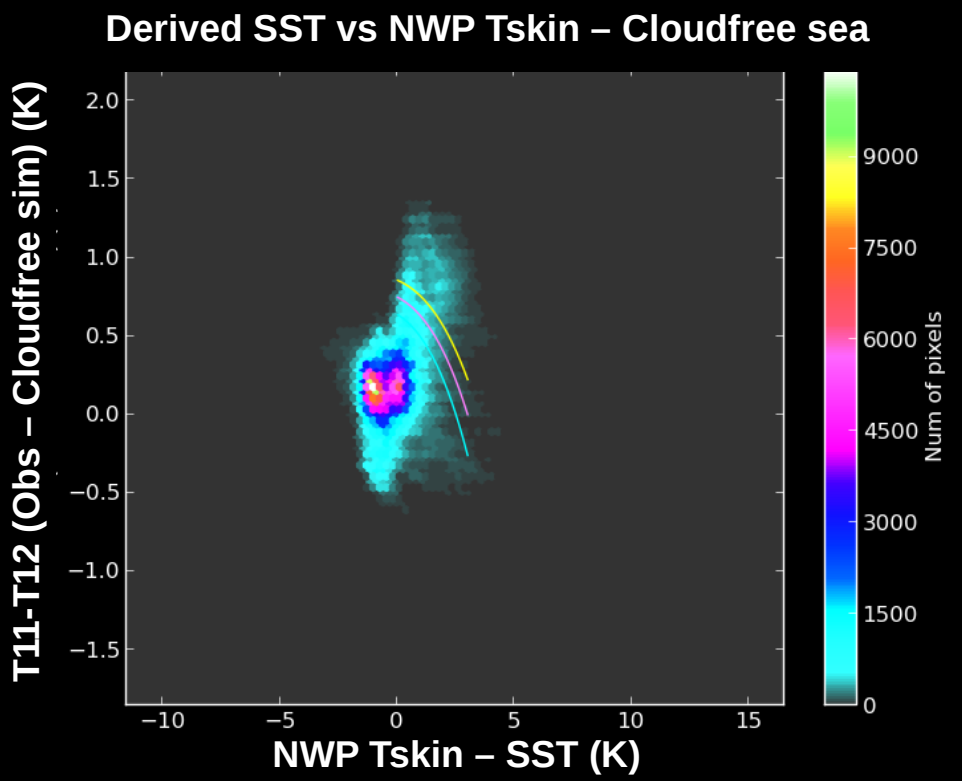




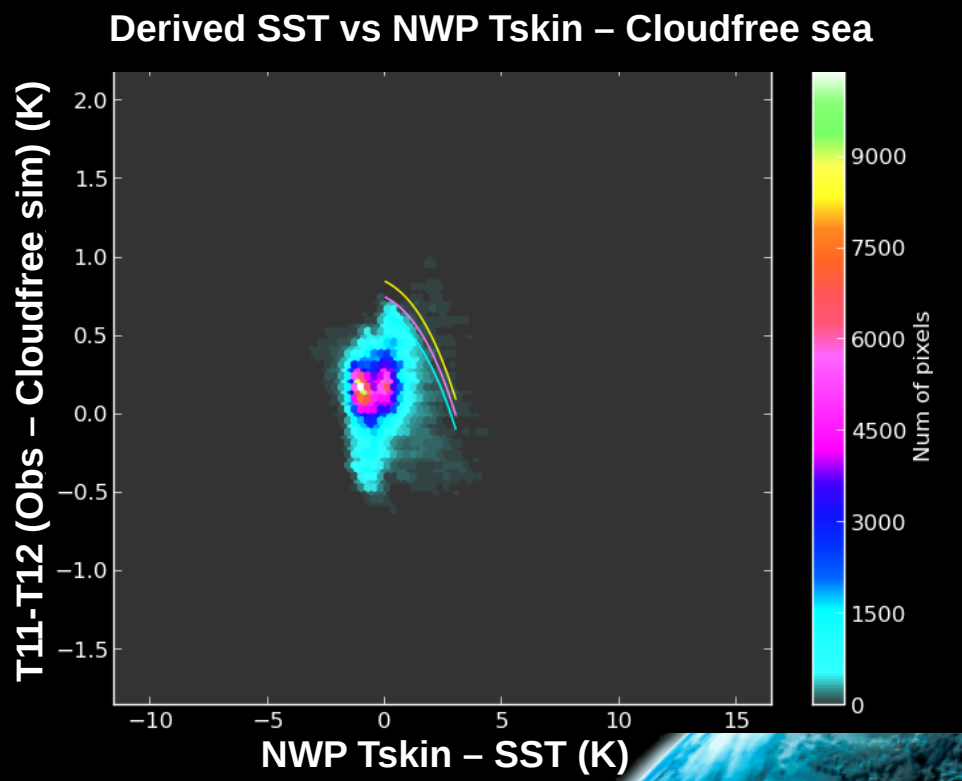
New SST based test

- Derive OSISAF SST and compare to NWP Tskin
- Combine test with T11-T12

All cloudfree according to PPSv2012



All cloudfree according to PPSv2014



New SST based test

PPS v2014:
(Purple = low quality)