



# **AAPP status report and initial experiences with processing NPP data**

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# Alternative title:

## *A European perspective on NPP commissioning activities*

### Acknowledgements:

**Météo-France:** Pascal Brunel, Tiphaine Labrot, Pascale Roquet, Lydie Lavanant

**EUMETSAT:** Christelle Ponsard, Anders Soerensen, Simon Elliott, Thomas Heinemann

**NOAA:** Chris Barnet, Andrew Collard, Yi Song      **CIMSS:** Liam Gumley, Kathy Strabala

**NRL:** Steve Swadley, Steve Doherty, John Eyre      **Met Office:** Bryan Conway, Simon Keogh, Anna Booton, Amy

**ECMWF:** Niels Bormann, Bill Bell

- *and many others!*



# Current status of the SDR data

- **Global data**

- ATMS

- publicly available on NOAA/CLASS
- EUMETCast trials underway

- CrIS

- the NOAA NDE/CLASS product is not yet ready (awaiting software updates), but have received some good data off-line ("focus day" 25-26 Feb 2012)
- EUMETCast trials underway

- VIIRS

- Available on CLASS by request (not yet public)
- or <http://oceandata.sci.gsfc.nasa.gov/VIIRS/>

- **Direct readout**

- DB stream turned on 26<sup>th</sup> Feb 2012
- Being received at several stations
- Software available to generate SDRs (more detail later)
- Preparations underway for regional re-broadcasting:
  - EARS – ATMS, CrIS and VIIRS
  - RARS – Implementation Group meeting this week!



# NRT data distribution for ATMS and CrIS (Europe)

**NPP**



Dump



Svalbard

HRD direct broadcast



X-band user

**NOAA**

**IDPS**

**NDE**

*convert to BUFR*

IDPS=Interface Data Processing Segment  
NDE=NPOESS Data Exploitation

ATMS/CrIS  
BUFR data

**EUMETSAT**

other users

**Eurobird-9**



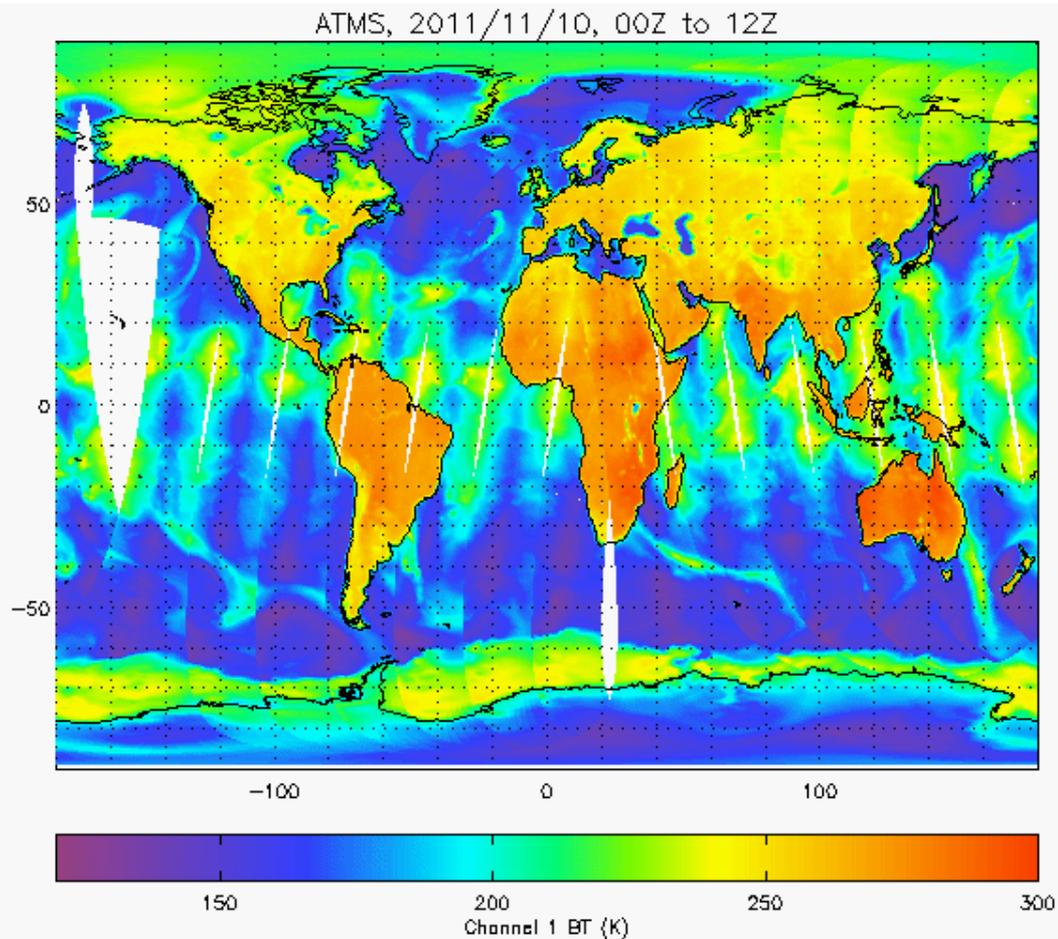
*EUMETCast*



EUMETCast  
user

# ATMS

- Instrument turned on 8<sup>th</sup> November 2011
- Early data made available to cal/val team: looked good
- Focus on antenna temps (since the initial antenna corrections were bad)



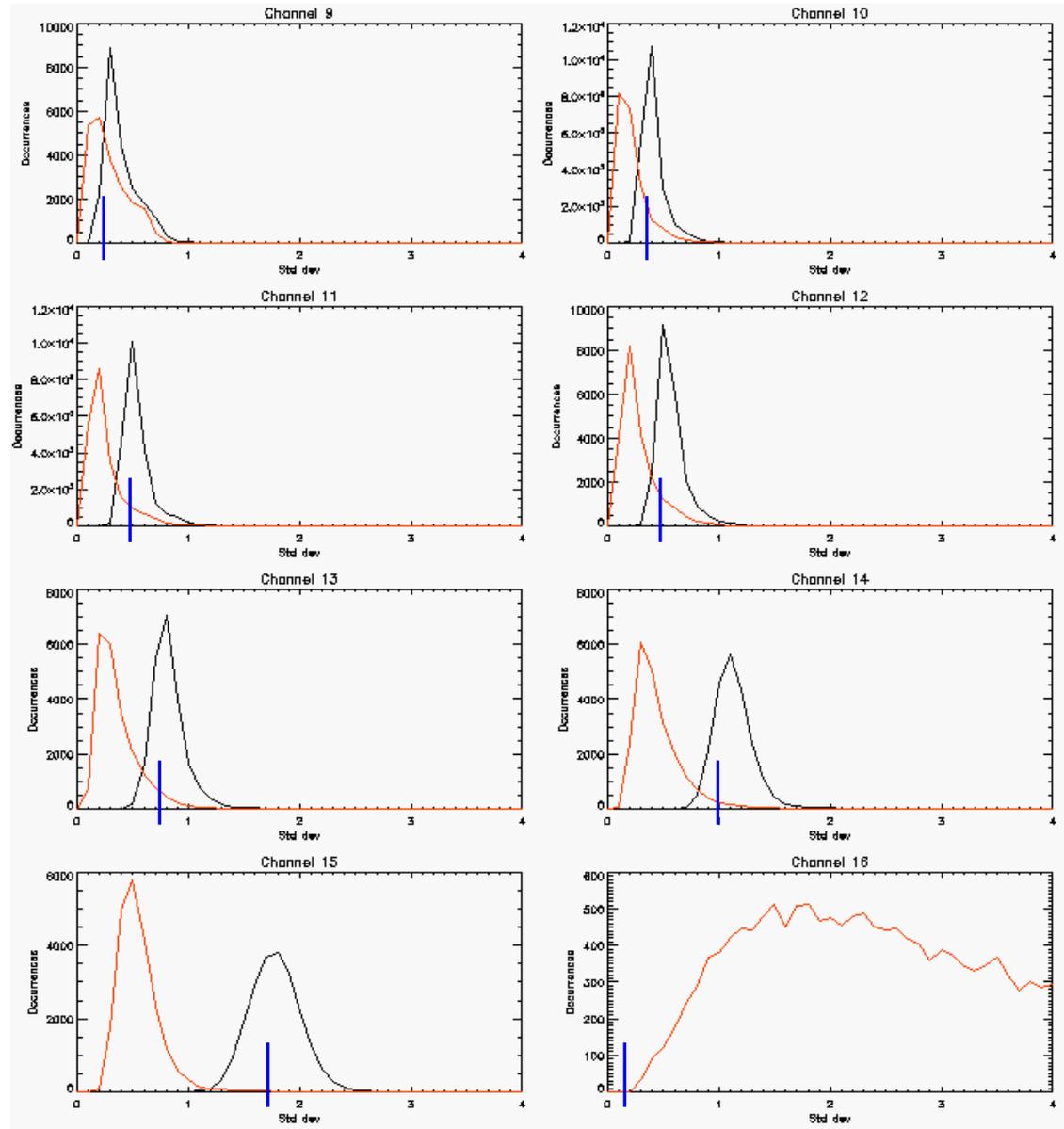


# NEΔT check

6x6 pixel BT std dev

SDR values:

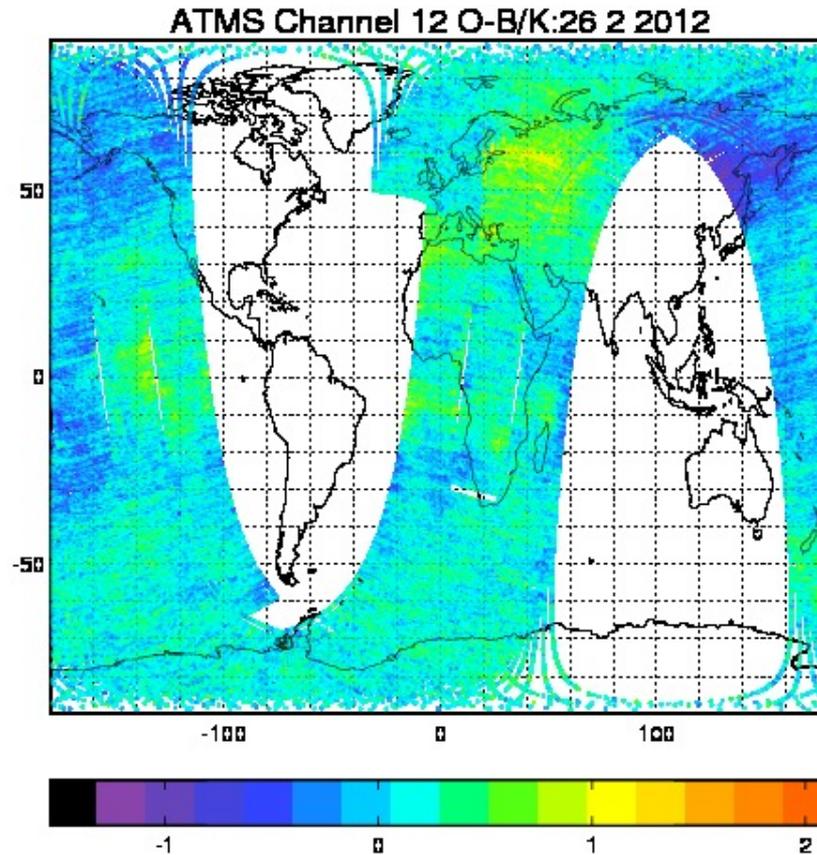
| Chan | Warm  | Cold  |
|------|-------|-------|
| 9    | 0.241 | 0.132 |
| 10   | 0.346 | 0.182 |
| 11   | 0.476 | 0.253 |
| 12   | 0.496 | 0.265 |
| 13   | 0.741 | 0.396 |
| 14   | 1.047 | 0.557 |
| 15   | 1.705 | 0.906 |
| 16   | 0.191 | 0.132 |
| 17   | 0.306 | 0.248 |
| 18   | 0.278 | 0.232 |
| 19   | 0.301 | 0.252 |
| 20   | 0.388 | 0.323 |
| 21   | 0.396 | 0.331 |
| 22   | 0.535 | 0.446 |



**Red curves are after spatial filtering – see later**

**Good agreement for sounding channels**

# ATMS O-B plot

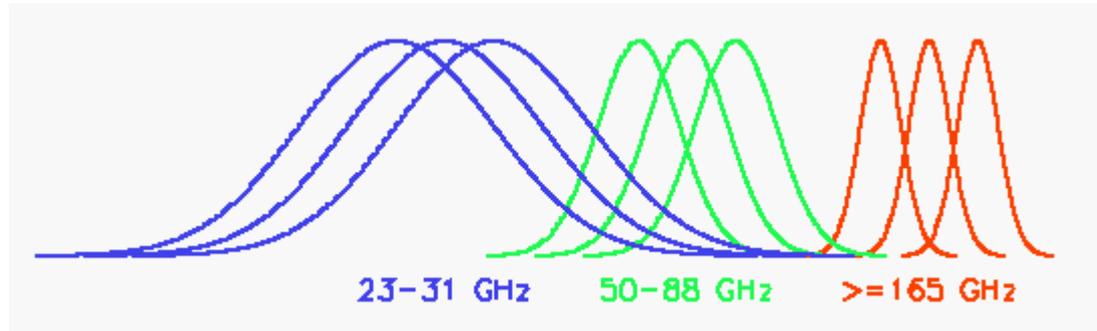


- Channel O-B plot generated at Met Office, 26 Feb 2012, bias corrected
- Hint of calibration noise (also noted by Andrew Collard, NOAA)
- Possibility of further optimisation

# Spatial filtering

Two issues for NWP:

1. For many channels, raw  $NE\Delta T$  is larger than model background error (and larger than AMSU  $NE\Delta T$ )
2. Difficult to use channels 1&2 due to beamwidth mismatch with channels 3-15 ( $5.2^\circ$  vs  $2.2^\circ$ )



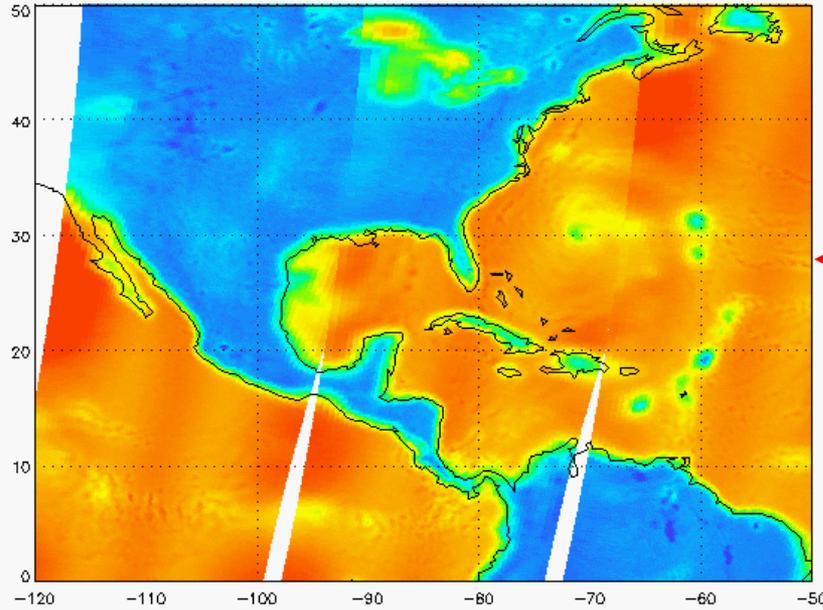
These issues are handled by **AAPP**:

- Broaden ch 3-15 beam width to that of AMSU-A
- Narrow ch 1-2 (as far as possible without increasing noise)

see AAPP document on ATMS processing at <http://www.nwpsaf.org>

# Channel 3-2 difference images

Channel 3c minus 2c

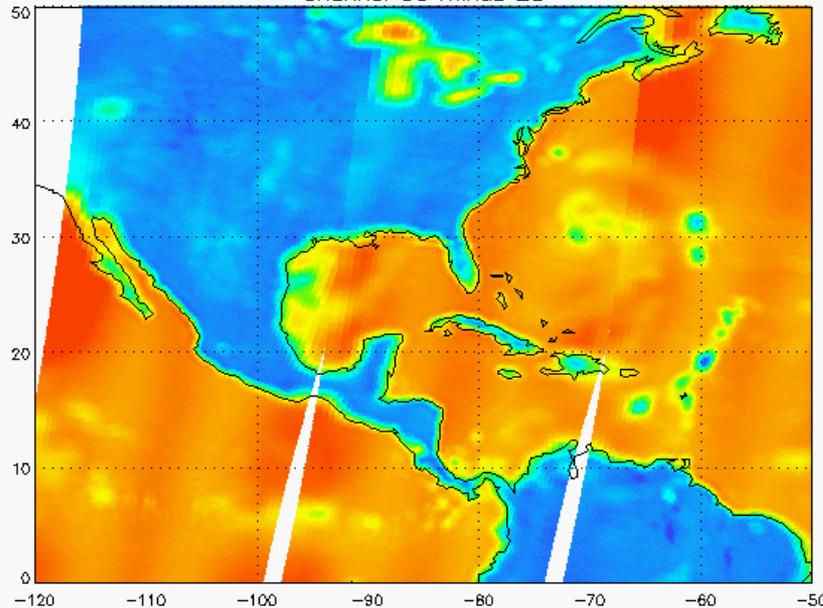


← **Raw SDR**

Evidence of improved contrast and reduced artefacts

NWP will be a more stringent test

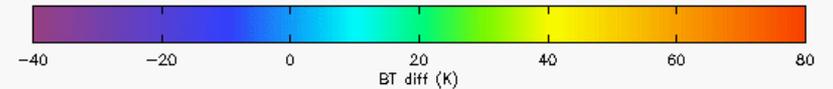
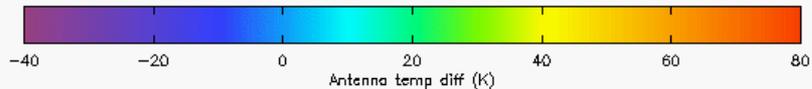
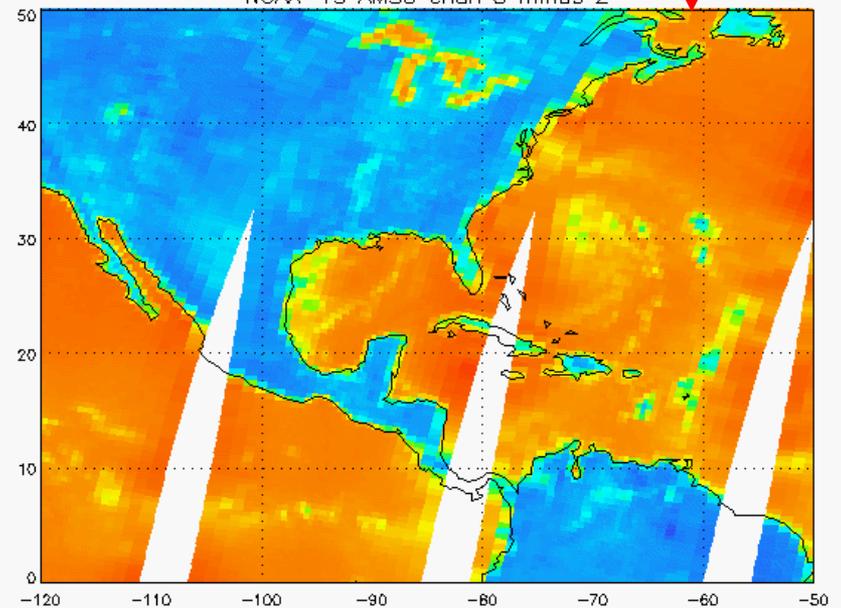
Channel 3d minus 2d



**Modified**

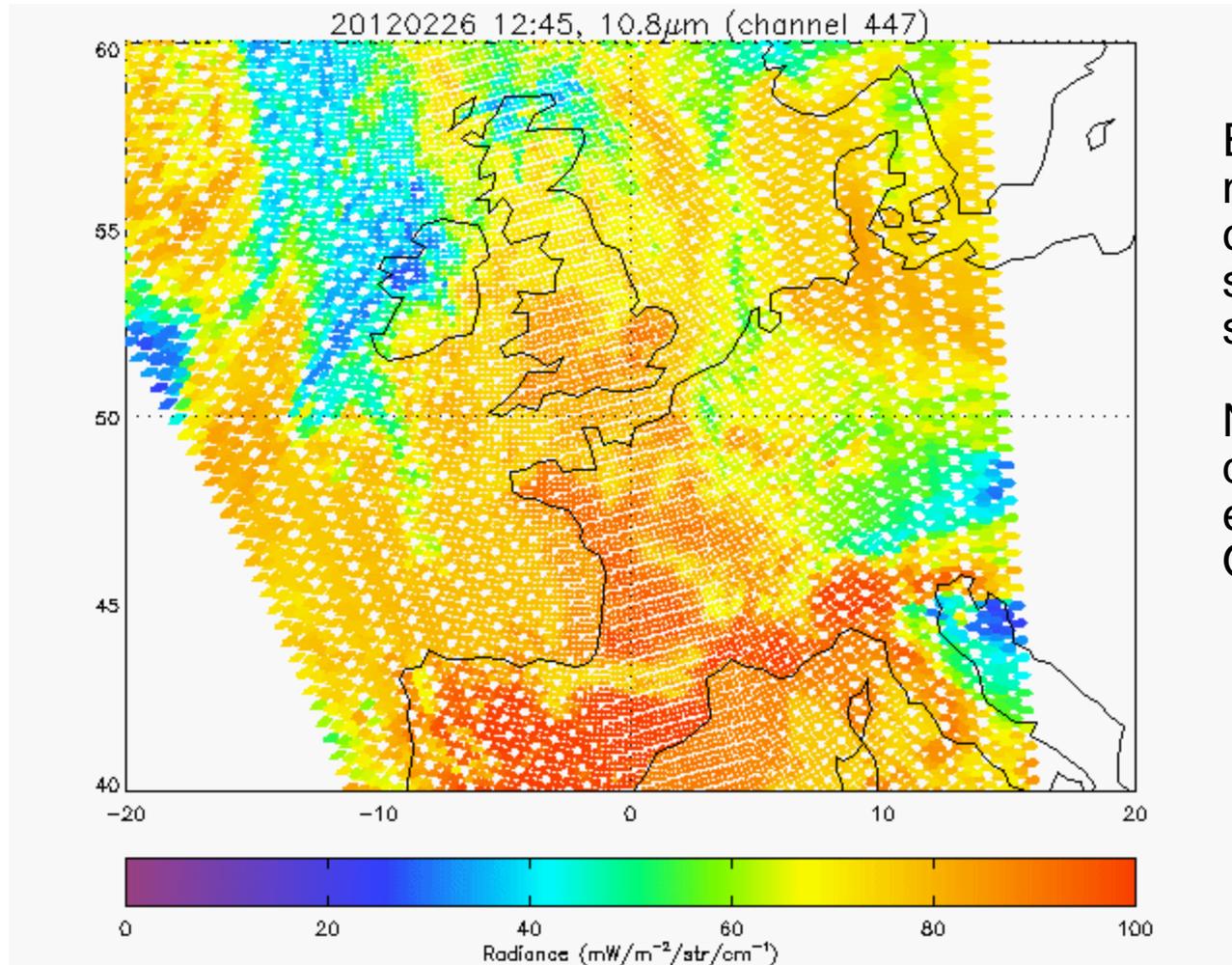
**AMSU**

NOAA-19 AMSU chan 3 minus 2



# CrIS

- Instrument turned on 20<sup>th</sup> January 2012
- First data that we've seen are for "focus day" on 25-26 Feb.



Early problems with navigation and calibration appear solved by NOAA science team.

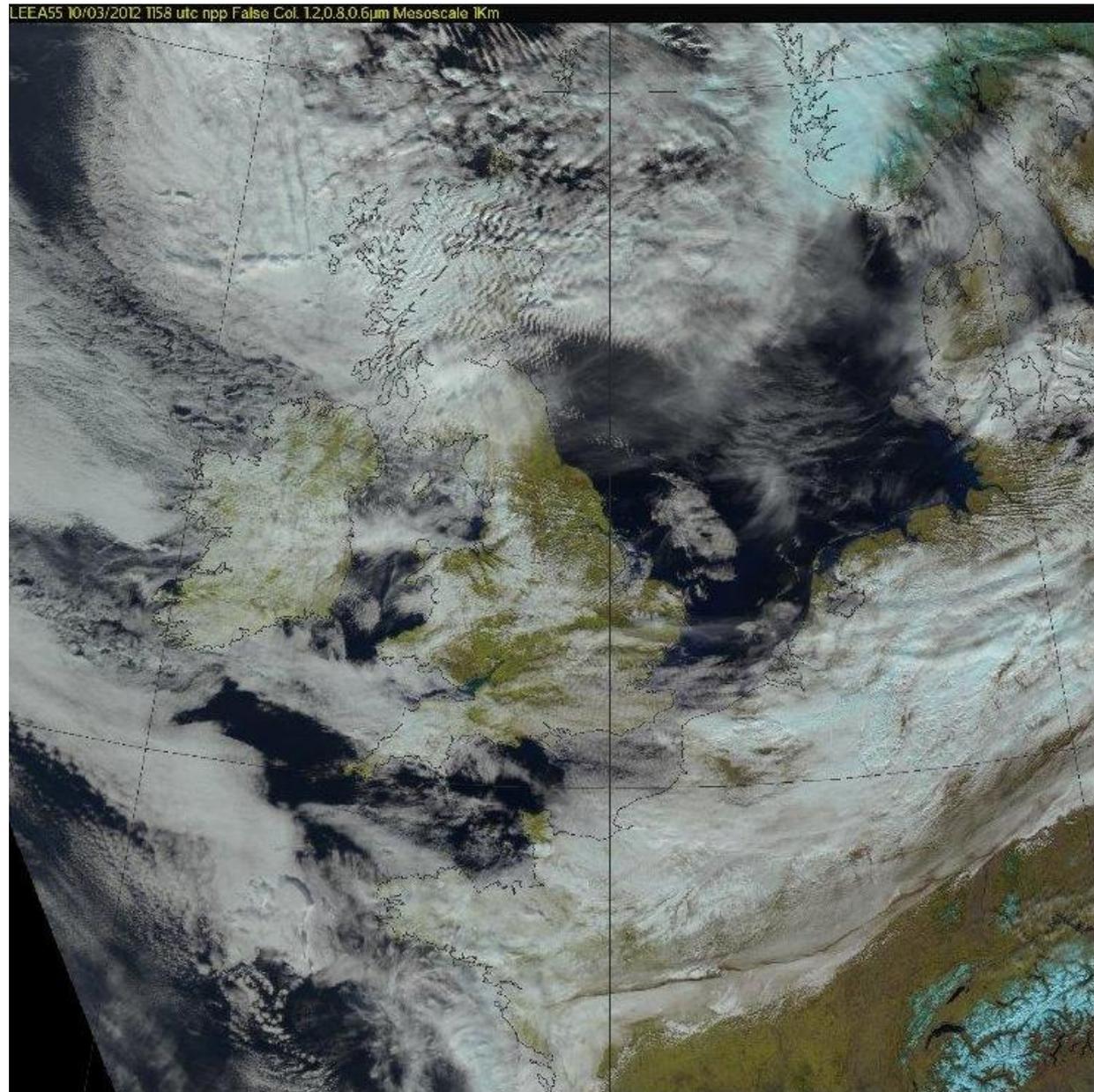
Not yet done any quantitative experiments at Met Office

10<sup>th</sup> March 2012, 1.2, 0.8, 0.6 $\mu$ m



# VIIRS

- Imagery from direct reception at Exeter
- Using RT-STPS and CSPP to generate SDRs (more info later)



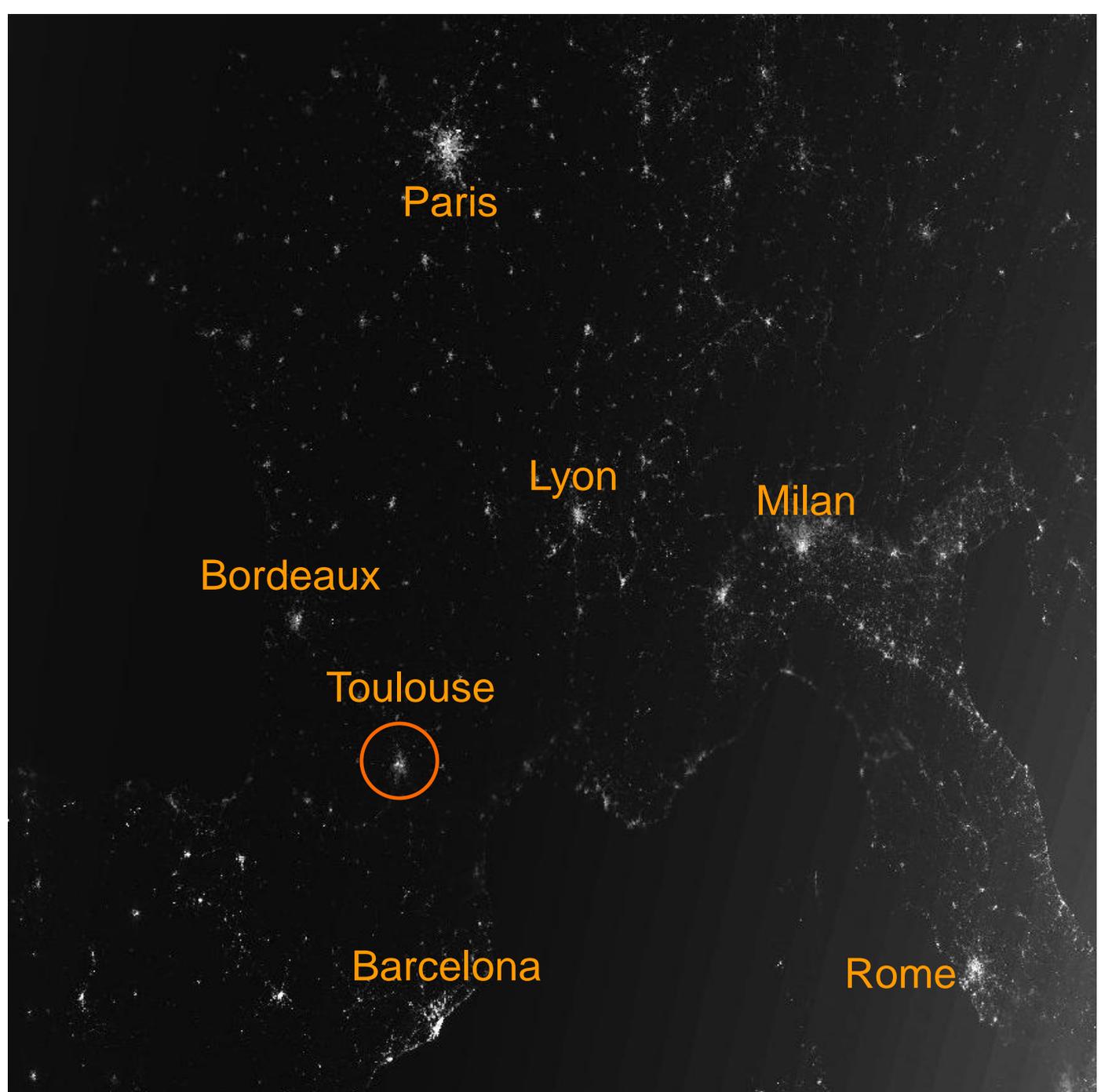


## VIIRS day-night band

16 March 2012  
02:00

Data from CLASS

What scientific  
uses can we see  
for this data?





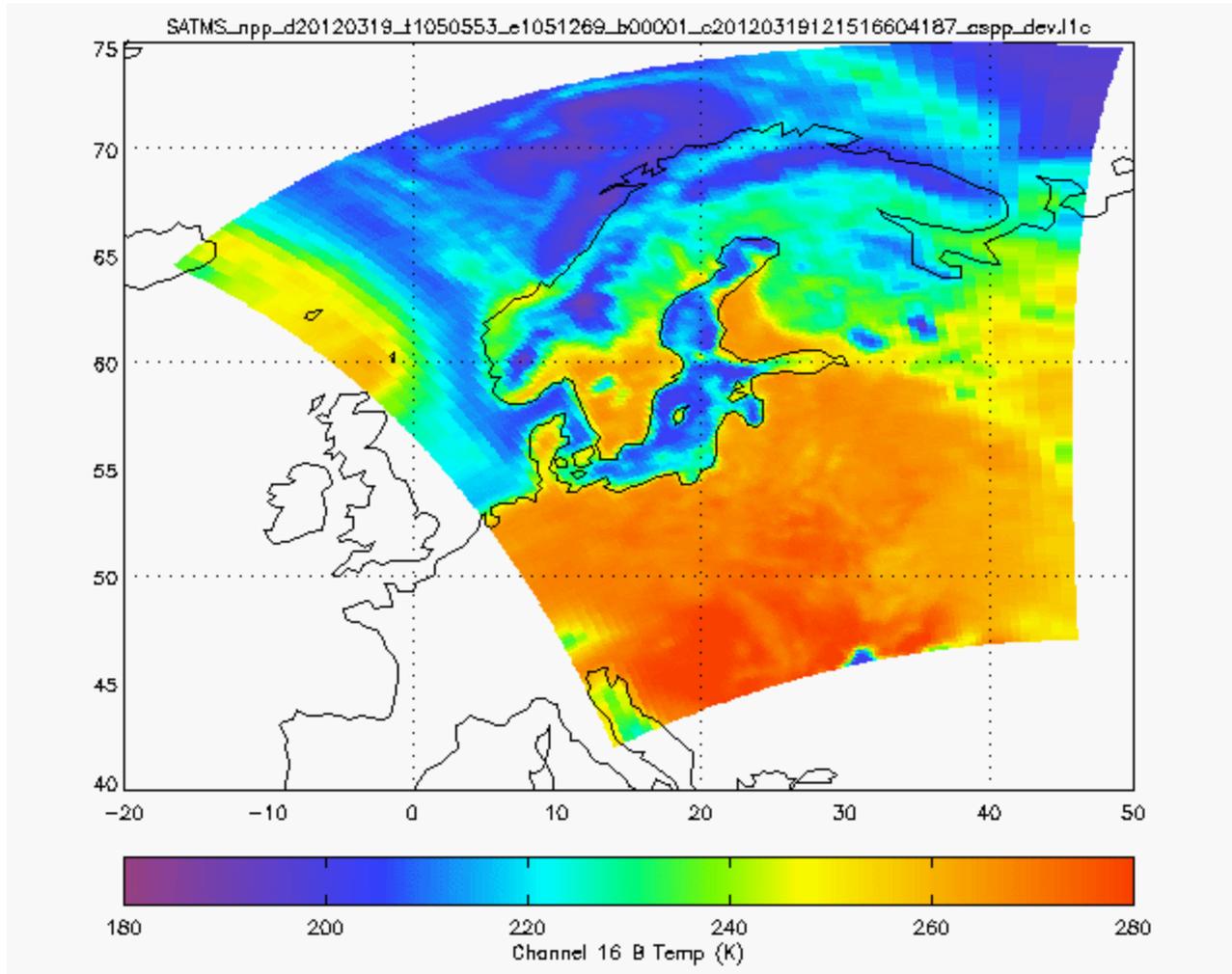
# NPP processing packages

status as of 19 March 2012

| Package  | Use   | Where to get it   |
|--|---|---|
| <b>RT-STPS v5.1a</b><br>with UW "DB1" patch<br><i>09/03/2012</i> | Create RDR from raw telemetry   | UW<br>(see CSPP Installation Guide)   |
| <b>Simulcast v5.0</b><br><i>17/02/2012</i>                       | Quick-look viewer   | NASA DRL<br><a href="http://directreadout.sci.gsfc.nasa.gov/">http://directreadout.sci.gsfc.nasa.gov/</a>                       |
| <b>CSPP v1.0</b><br><b>** 16/03/2012 **</b>                      | RDR to SDR<br>(currently VIIRS & ATMS)  | UW<br><a href="http://cimss.ssec.wisc.edu/cspp/">http://cimss.ssec.wisc.edu/cspp/</a>   |
| <b>AAPP v7.1</b><br><i>02/02/2012</i>                            | ATMS and CrIS pre-processing: <ul style="list-style-type: none"><li>• HDF5 ingest</li><li>• BUFR ingest / encoding</li><li>• ATMS spatial filtering</li><li>• CrIS spectral and spatial thinning</li><li>• Map ATMS to CrIS</li></ul> | NWP SAF<br><a href="http://www.nwpsaf.org">http://www.nwpsaf.org</a><br><i>Users of AAPP v6 need to re-register for AAPP v7</i> |

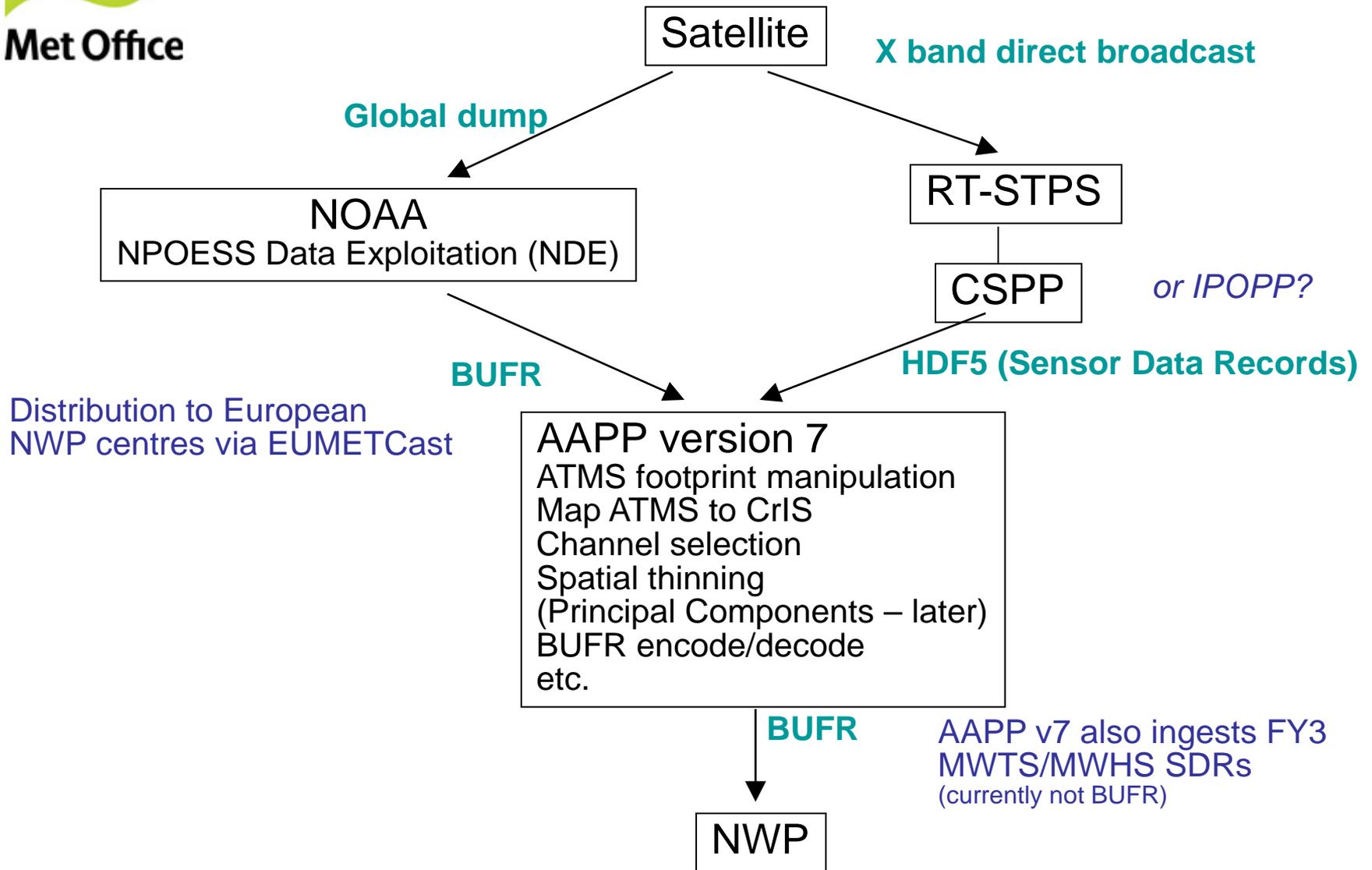
# ATMS direct readout

## 19 March



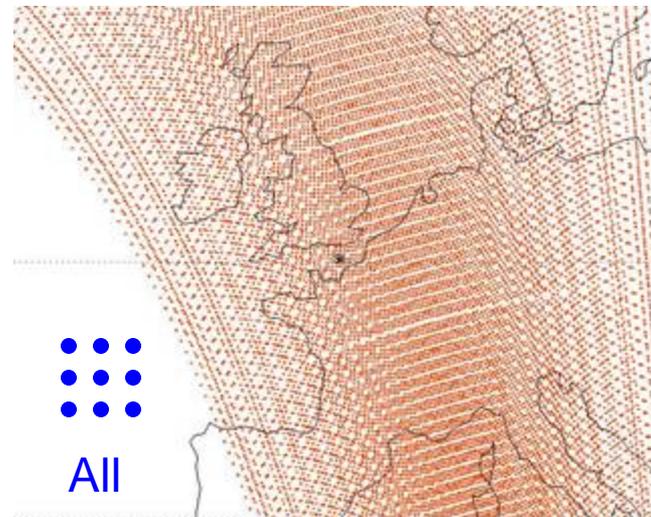
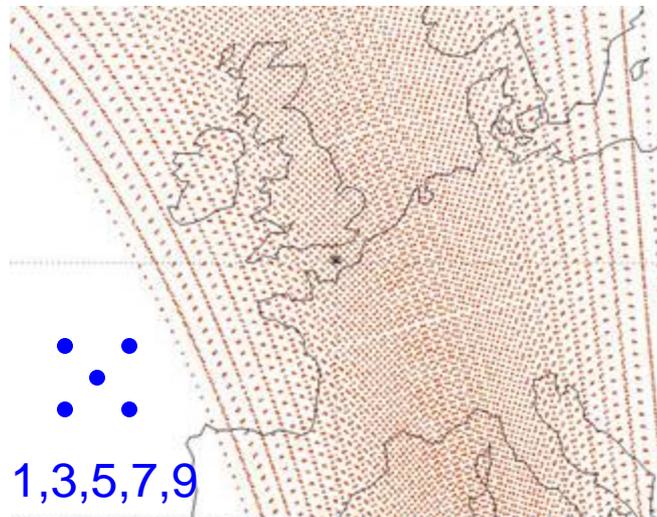
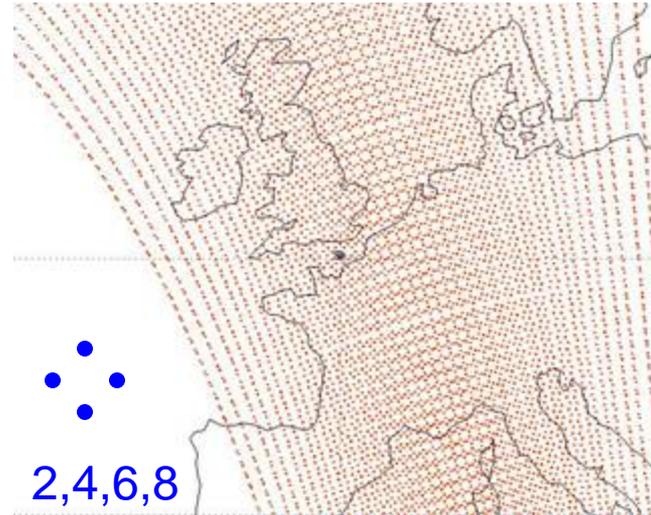
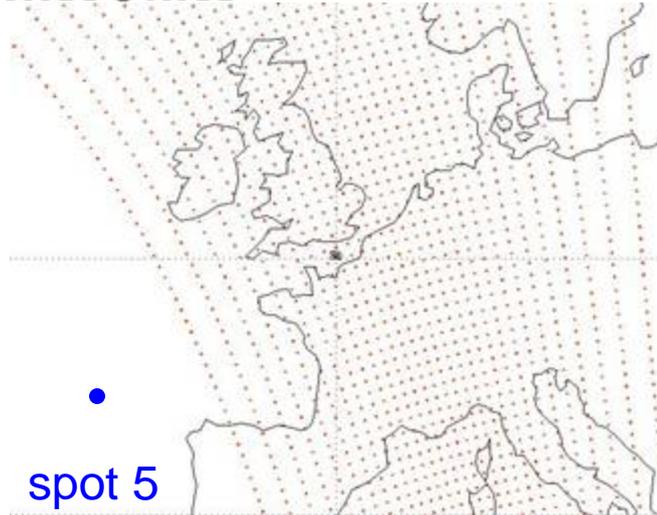


# NPP – ATMS and CrIS radiances





# CrIS thinning options



# Awkward issues for users

- Granularity
  - ATMS and CrIS granules are only 32 seconds long
  - This is too short for effective AAPP processing
  - Fortunately it's easy to concatenate BUFR files – just use the Unix `cat` command
- Granules from NOAA arrive in unpredictable time order
  - Need to wait for contiguous granules
  - We do this by creating a nominal granule number from the time stamp in the file name, and aggregating 10 successive granules
- CSPP generates 1 file per VIIRS channel per granule (many files)
  - Channels easily combined using `h5copy`
  - Tool to concatenate granules?



# An issue for VIIRS data handling

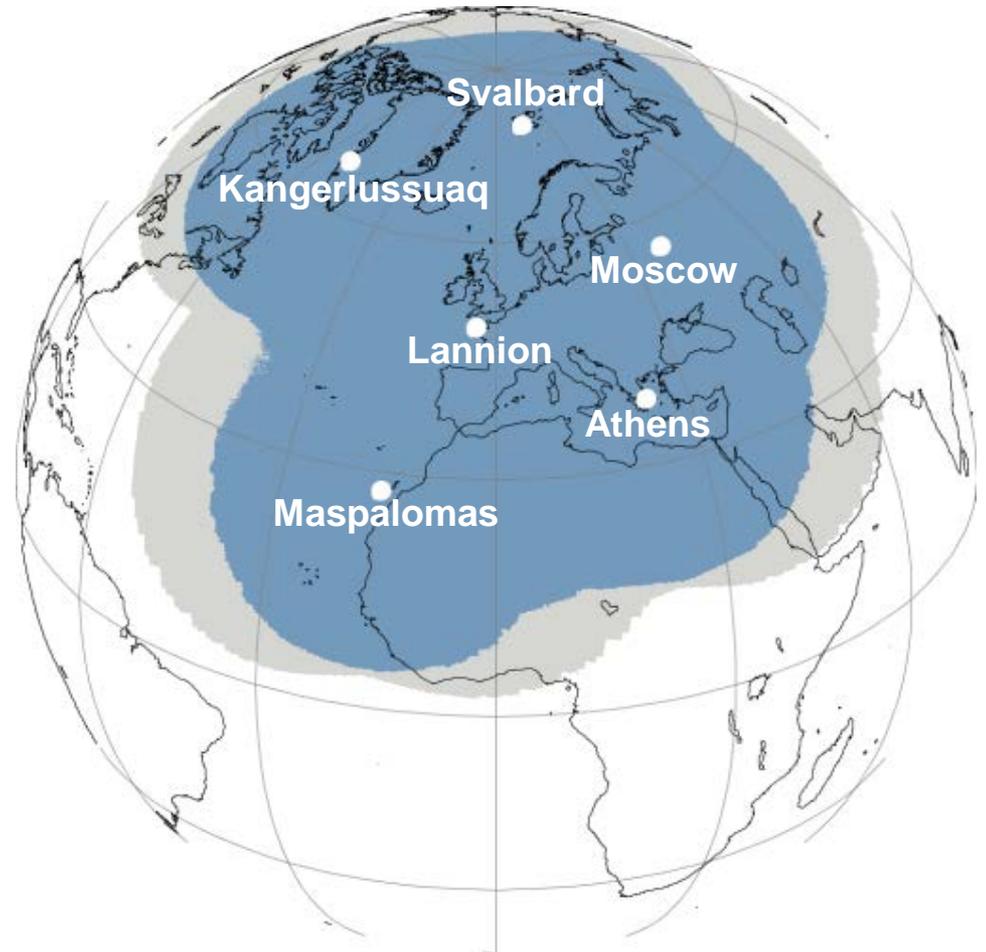
- SDR files are large and not packaged efficiently
- Especially the geolocation files
  - 80 / 320 / 130 Mb per 85 sec granule for M-band, I-band and DNB respectively
- EUMETSAT working on an alternative VIIRS SDR format for use with EARS-VIIRS
  - Tie points
  - Efficient integer representation of radiances
  - Software tool to convert to/from the NOAA format



# Initial EARS-NPP network

**ATMS** – all channels & spots, BUFR  
**CrIS** – 399 channels, BUFR  
**VIIRS** – M-band, HDF5

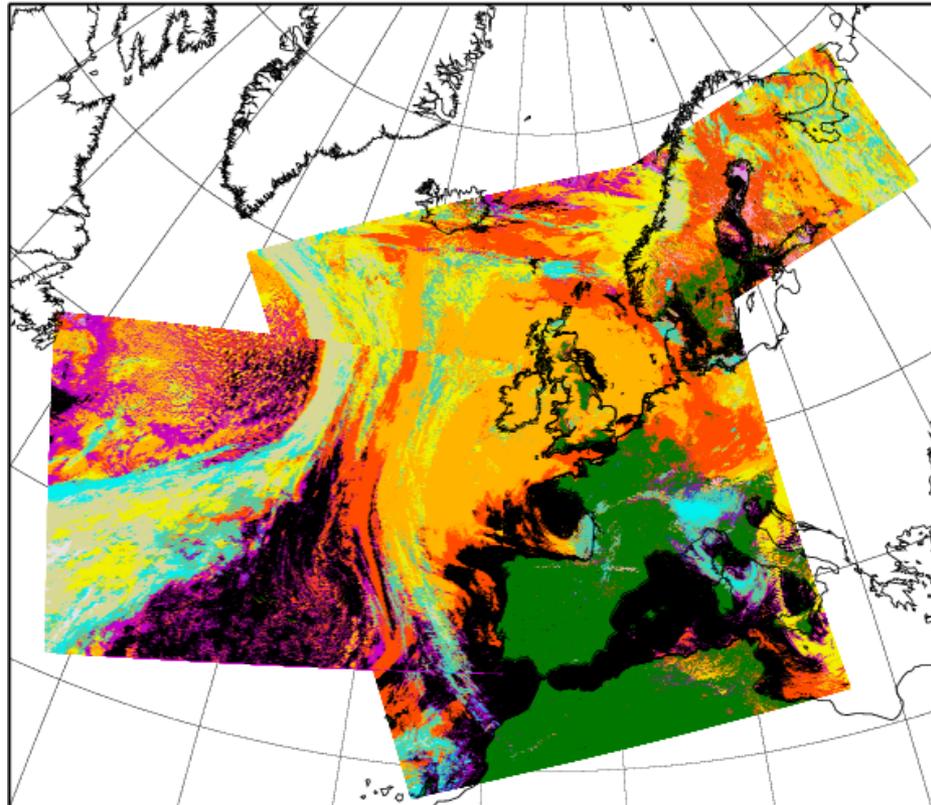
Will use Antonia Gambacorta's CrIS channel selection



# Next steps for processing packages

- Direct broadcast processing for CrIS (CSPP)
- VIIRS cloud classification (MAIA4) to be added to AAPP

*From Lydie Lavanant*





# Next steps for global data

- NOAA to update operational CrIS processing software
- NOAA to enable NRT feed to EUMETSAT (requires ground segment upgrade)
- NRT pre-operational data to cal/val partners (MetOffice + ECMWF)
- Enable data feeds to other users



# Met Office plans for ATMS/CrIS

- Store 4 data types:
  - ATMS ATMS only, 50km at nadir
  - ATMSHR ATMS only, full res, *regional*
  - CRIMSS ATMS+CrIS, ~50km at nadir
  - CRIMSS ATMS+CrIS, full CrIS res, *regional*
- From global feed, local reception and EARS/RARS
- Pre-processed using AAPP v7.1
- 399 CrIS channels
- ATMS spatially filtered to AMSU-A-like resolution for thinned datasets
- Radiance assimilation, as for AMSU, IASI, AIRS, etc.



# Conclusions

- NPP cal/val is still underway; lots of developments in the last few weeks
- Software packages are available
- Preparing for NRT distribution of regional and global NPP data to users
- Look forward to seeing results of assimilation trials



# Questions and answers