



AAPP status report and review of developments for NOAA-N and METOP

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Acknowledgements: Steve English, Amy Doherty (Met Office)
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Status of AAPP version 4

Developments for AAPP version 5

Plans for METOP and AAPP version 6

Plans for NPP and NPOESS

AAPP – a reminder



- Pre-processing package for polar orbiter data
- Maintained by **EUMETSAT Satellite Applications Facility for Numerical Weather Prediction (NWP-SAF)**
- Lead institute - Met Office
- ~200 licensed users worldwide
- Runs on a range of Unix and Linux computer platforms



Updates to AAPP v4.0

■ Update 4.4, 31/8/04:

- 1) Linux compatibility (also Windows via MS Services For Unix)
- 2) Improved robustness in decommutation
- 3) Utility to compare output files from different platforms (*atovsCompare*)
- 4) Big/little-endian conversions
- 5) Processing of NOAA-17 to level 1d
- 6) 1d flag for fewer co-locations than expected in re-mapping AMSU-A to HIRS

■ Update 4.5, 03/02/05:

- Updated AMSU-B calibration parameters file (gross limits)
- See also list of bugs on web page
- New NESDIS 1b formats (from 28/4/05) are compatible with AAPP-4

- Now distributed by NWP-SAF (previously by EUMETSAT)
- Enquiries and licensing handled by NAP-SAF helpdesk
- AAPP web site is via
<http://www.metoffice.com/research/interproj/nwpsaf/>
- FTP server for update versions: thorn.metoffice.gov.uk
(command line ftp only)
- User email forum is still operated by EUMETSAT
 - L-aapp@listserv.eumetsat.int (note recent address change)
 - Subscribe via listserv@listserv.eumetsat.int
- Separate registered user email list held at Met Office

- Includes the following enhancements:
 - NOAA-N capability (including MHS)
 - New HIRS calibration method (based on NOAA v4)
 - Updated navigation – ability to use 2-line elements
 - Allow for moon contamination in AMSU-B and MHS
 - Added NWC-SAF scattering index (Bennartz) to AMSU-B level 1d
 - Use of instrument-specific scan characteristics, and removal of many hard-coded parameters

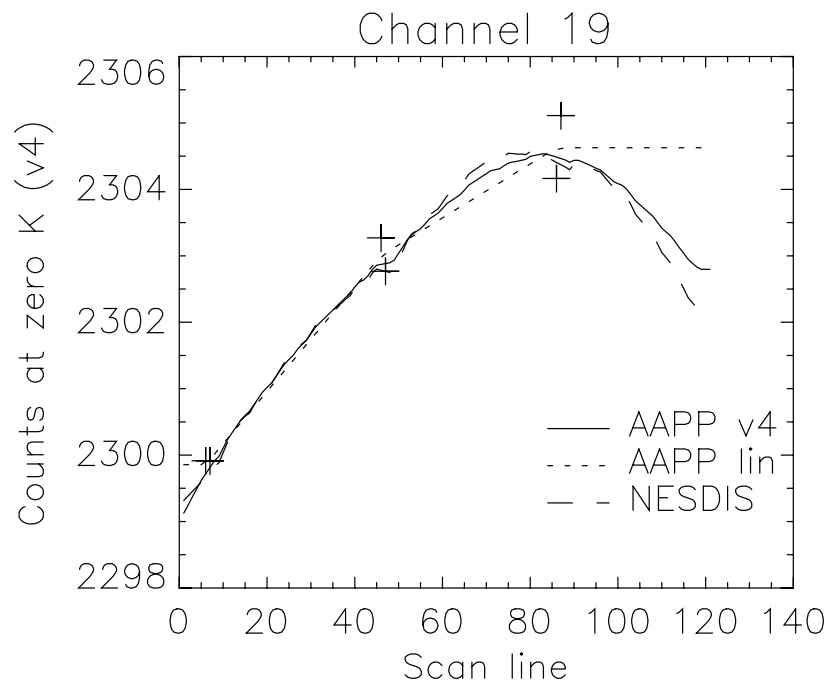
- V5.01 distributed to beta testers 28/4/05

- To be released as V5.1 following validation with NOAA-N data (approx 2 months after launch)

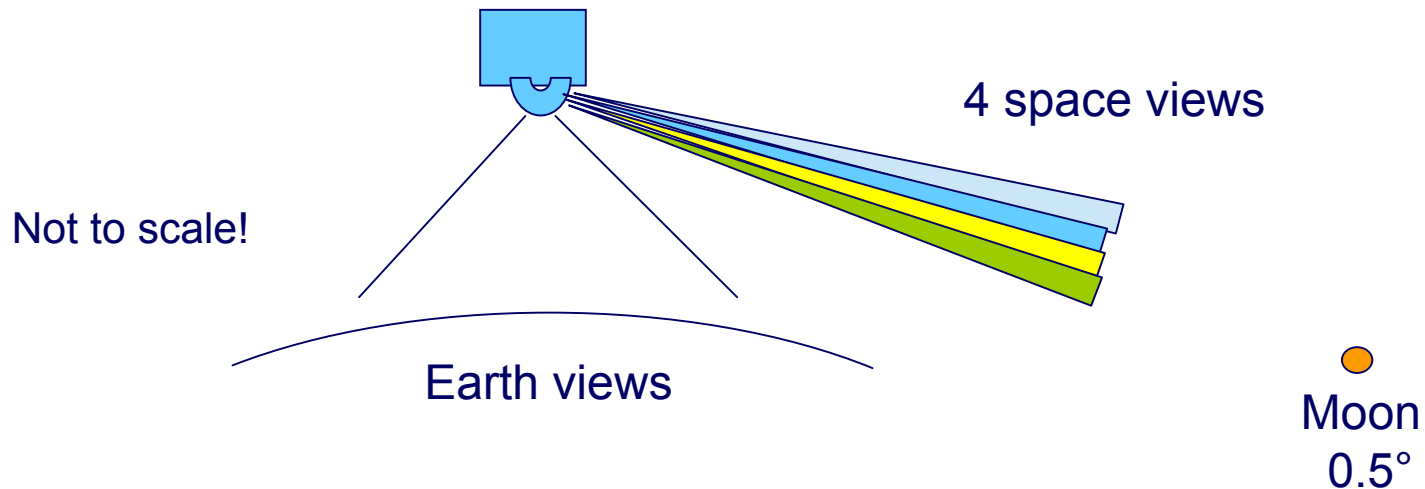
- New calibration module *mhscl*
- New MHS 1b format (same as NOAA format)
- 1c format same as AMSU-B – with different instrument identifier
- Allow for non-ideal antenna reflectivity (small scan dependence)
- No change at level 1d



- Based on NOAA 'version 4' algorithm
- Can be used with HIRS/3 and HIRS/4
- Accumulate statistics of slope/offset and telescope temperature from previous overpasses
- Should improve results in partial super-swaths



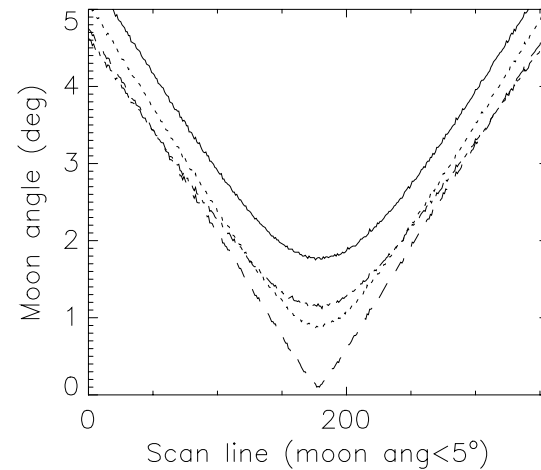
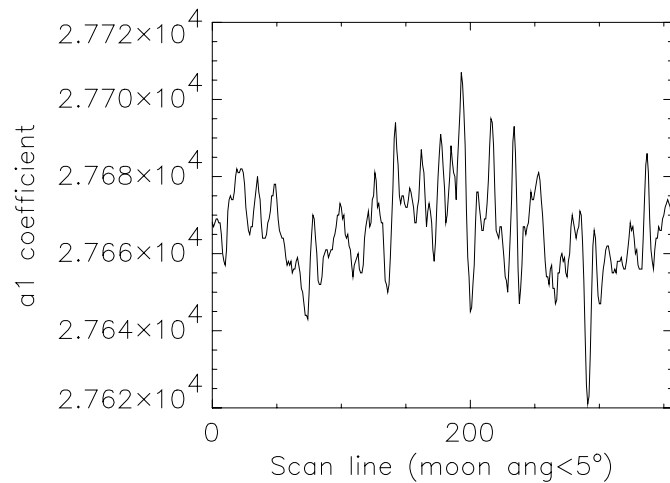
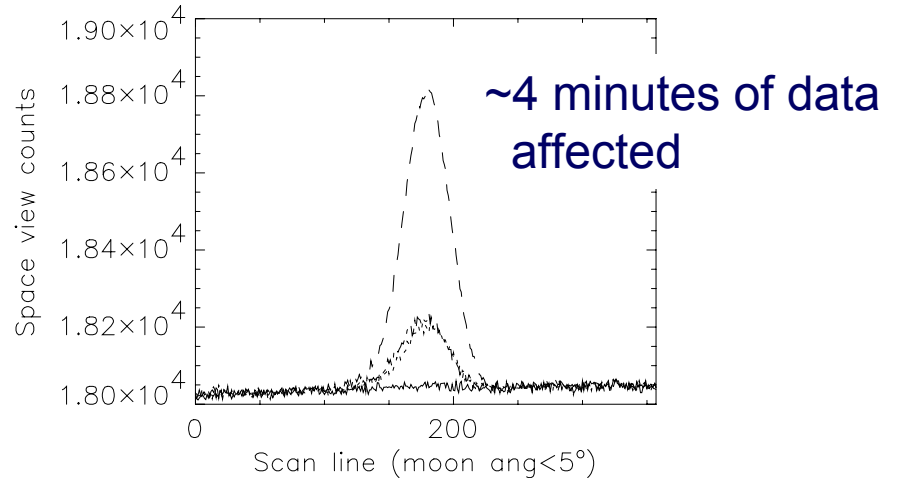
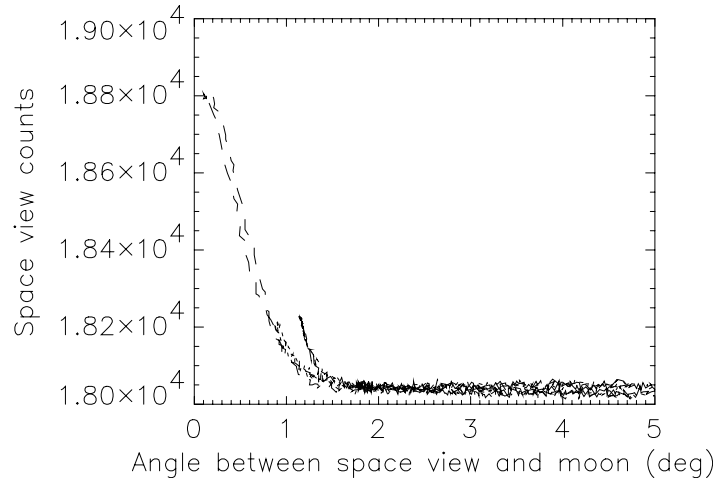
- In previous versions of AAPP, moon-contaminated AMSU-B scans were discarded by QC
- For V5, use astronomical formula to predict which (if any) of the 4 space view samples are contaminated
- Same method now used by NESDIS



Moon in AMSU-B



NSS.AMBX.NK.D03283.S1446.E1630.B2811213.GC



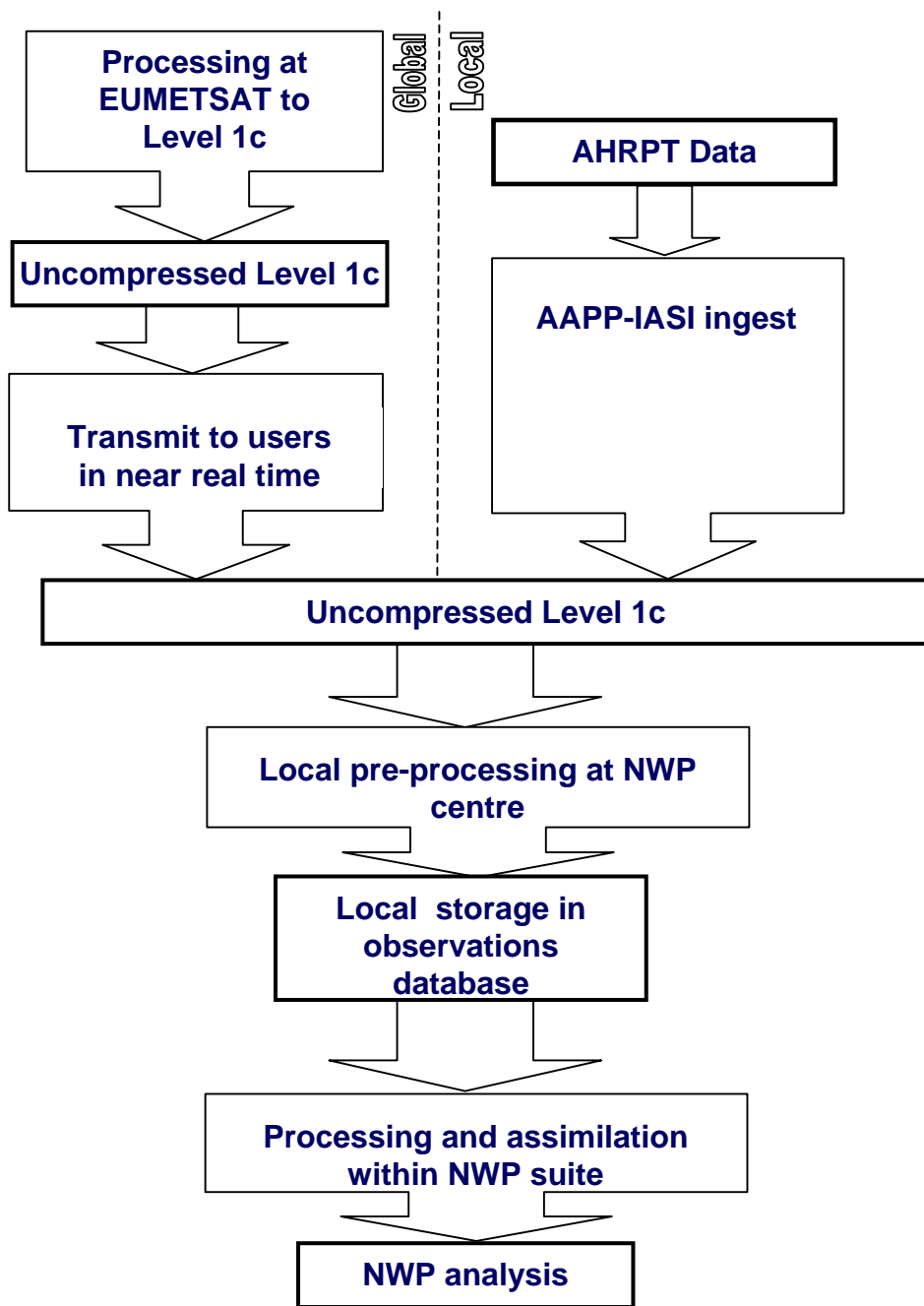
**Worst case: 3 samples out of 4 see moon,
But *a1* coefficient still computed OK.**

- Alternative to TBUS
- Improved navigation accuracy for AVHRR
- Data available from <http://www.space-track.org> (need to register)
- AAPP-5 contains script for automatic download (using *wget*)

Satellite	Method	bias	sigma	r.m.s
noaa16	tbus	-2.92	1.25	3.17
	2line	-0.05	0.76	0.77
	argos	0.61	0.80	1.01
noaa17	tbus	4.70	1.95	5.09
	2line	-0.06	0.66	0.67
	argos	0.78	1.00	1.27

Extrapolation error in km per day, from 2003/09/22 to 2004/03/15

- Availability will be announced via
l-aapp@listserv.eumetsat.int
and **<http://www.metoffice.com/research/interproj/nwpsaf/>**
- Users will need to register via NWP-SAF web page
- Distribution will be on CD-ROM, as for previous releases



Requirements for METOP: IASI data processing overview

As presented to EUMETSAT
Science Working Group

Uncompressed Level 1c

Optional AMSU-A, MHS

Pre-processing at the NWP centre:

Optional steps:

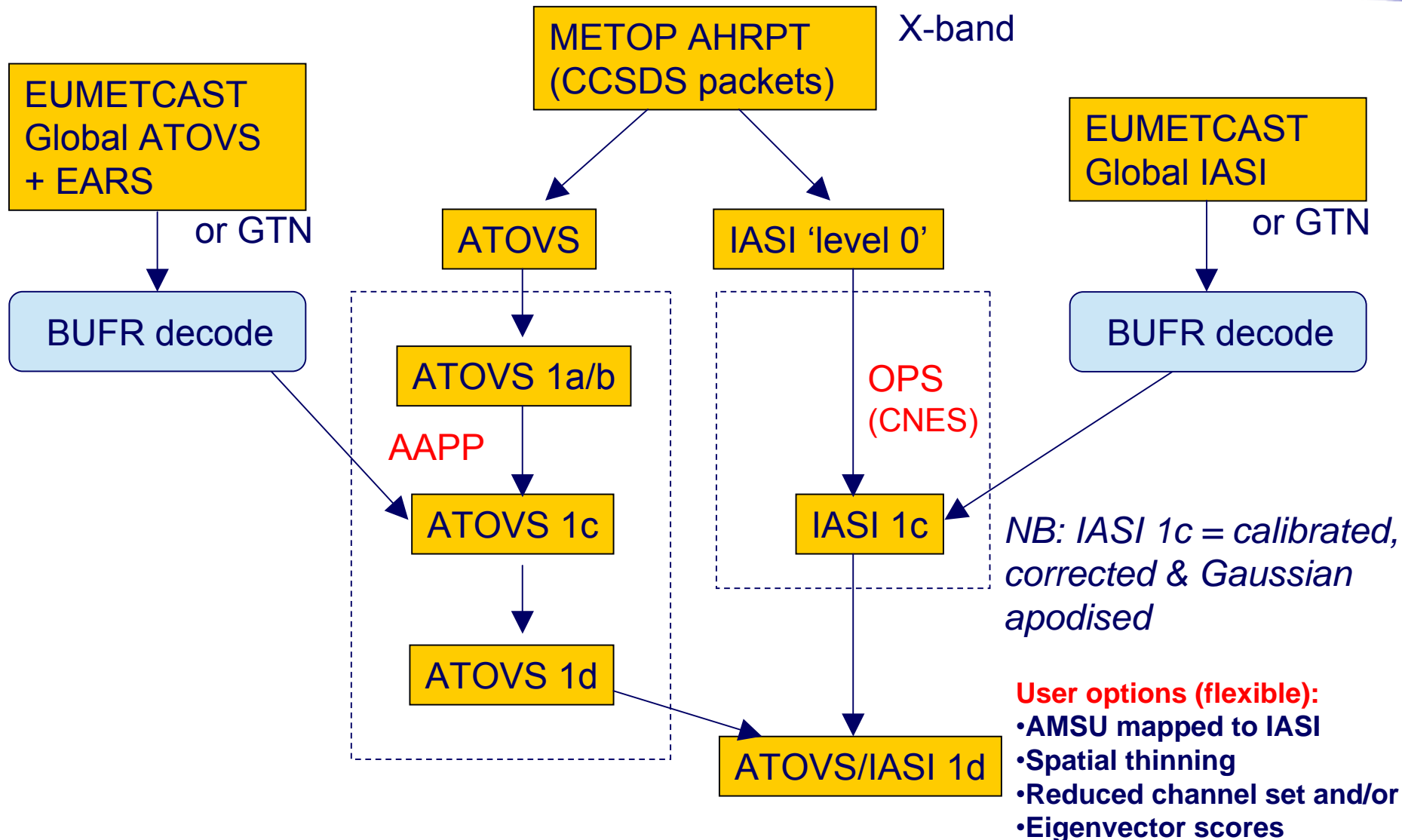
- Gross quality control
- Identify surface type and altitude
- IASI (+AVHRR) cloud tests
- Map AMSU-A and MHS to IASI
- Eigenvector compression
- Truncated eigenvector decompression (“reconstructed radiances”)
- **Data subset selections:**
 - Selected fields of view
 - Fixed grid
 - Warmest fov
 - Cloud free fovs
 - Channel or eigenvector coefficient selection
- Data formatting (e.g. BUFR)

**“Level 1d” stored in
observations database**

*Alternate data
sets
e.g. for climate*

Local pre-processing
At NWP centres

AAPP Version 6 - METOP



- Cannot store all IASI channels (or process in NWP)
- Plan to store ~300 channels initially
 - Channel selection work in progress
- Also ~300 Eigenvector scores (sig/noise) $\mathbf{c} = \mathbf{U}^T \mathbf{N} \mathbf{y}$
 - 8641 point radiance spectrum \mathbf{y}
 - Eigenvectors \mathbf{U} to be computed off-line from training dataset (self apodised, noise normalised)
 - \mathbf{N} does the noise normalisation for \mathbf{y} (NE Δ R + de-apodisation)
- Initially spatially thinned to 1 spot in 4 (1 detector per scan pos)
- Data rate factor 30 less than raw IASI, but still ~10 times that of ATOVS 1d!
- An internal BUFR format has been devised for IASI (+ AMSU) level 1d

X-band reception
System at Exeter





■ NPP and NPOESS

- AAPP development effort will concentrate on METOP, but would like to process NPP
- New instruments – CrIS, ATMS, VIIRS
- X-band direct broadcast – interface AAPP with output from NASA's direct broadcast software?
- Global data distribution via NOAA? Details not yet clear
- Need information on formats ASAP

- AAPP is used worldwide to pre-process direct-readout and global polar orbiter data
- Available via NWP-SAF web site
- Version 5 is being beta-tested and will be released ~2 months after launch of NOAA-N
- Preparations well underway for METOP-compatible version, including IASI
- Plan to extend for NPP and NPOESS – but need detailed information on instruments and formats as soon as possible

Thanks to CMS (Météo-France) for their contributions to AAPP development

