AAPP version 8

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Outline

- AAPP current features
- AAPP v8
  - Generalisation of MAIA v4
  - Imager clusters in hyper-spectral FOVs
  - Support of ecCodes
- AAPP for DBNet
  - What for?
  - Performances benchmark
- Early information for IASI-NG level 1c processing
- Summary

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AAPP current features

- Version 7.15, February 2017
- Ingest and process from raw data up to level 1c/1d
  - HIRS, AVHRR, AMSU, MHS (NOAA polar)
  - HIRS, AVHRR, AMSU, MHS, IASI (METOP)
  - Specific processor for IASI (OPS-LRS)
- Process Sensor Data Record from
  - ATMS, CrIS, VIIRS from S-NPP
  - Sounders on board FY-3
- AVHRR and VIIRS cloud masks
- Mapping sounder on a common grid
- Principal components encoding/decoding for hyper-spectral instruments
- BUFR and HDF5

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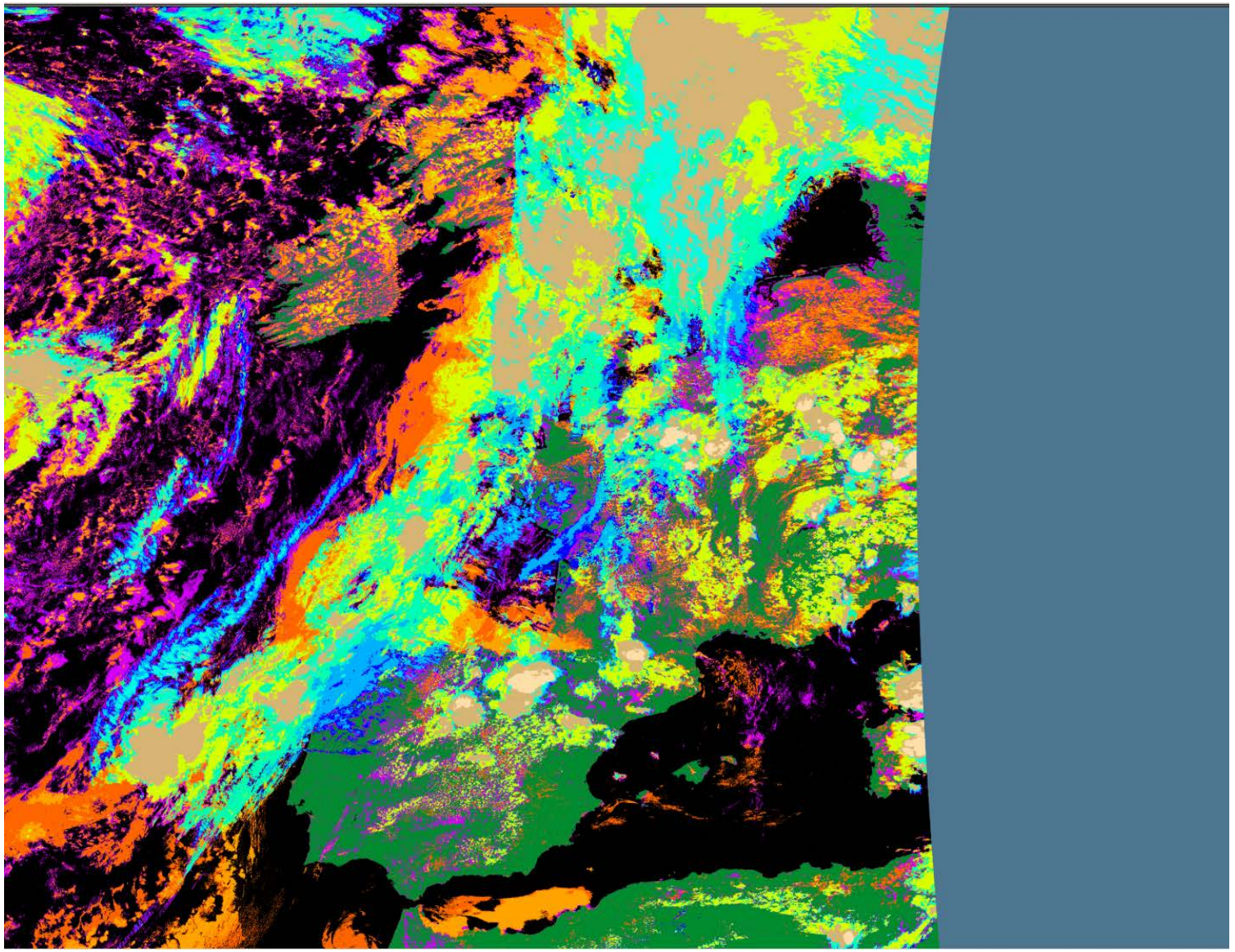
AAPP v8 MAIA v4



viiCloudTypeImg_npp_20170602_1335

- Unprocessed
- Cloudfree land
- Cloudfree sea
- Snow cover
- Sea ice
- Very low clouds
- Low clouds
- Medium level clouds
- High clouds
- Very high clouds
- Very thin cirrus
- Thin cirrus
- Thick cirrus
- Cirrus above low/medium
- Fractional clouds
- Unclassified

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AAPP v8 imager clusters

- ITSC XX recommendation DA/NWP-17

  "*Use the AVHRR cluster algorithm available in AAPP for all hyperspectral sounders*."

- The relevant code will be extracted from the OPS software to create an independent tool which will allow the cluster generation with the "nuées dynamiques" method, for both VIIRS/CRIS and AVHRR/IASI Sensors

- For IASI and IASI-NG the clusters are defined on the imager box covering the sounder FOR.

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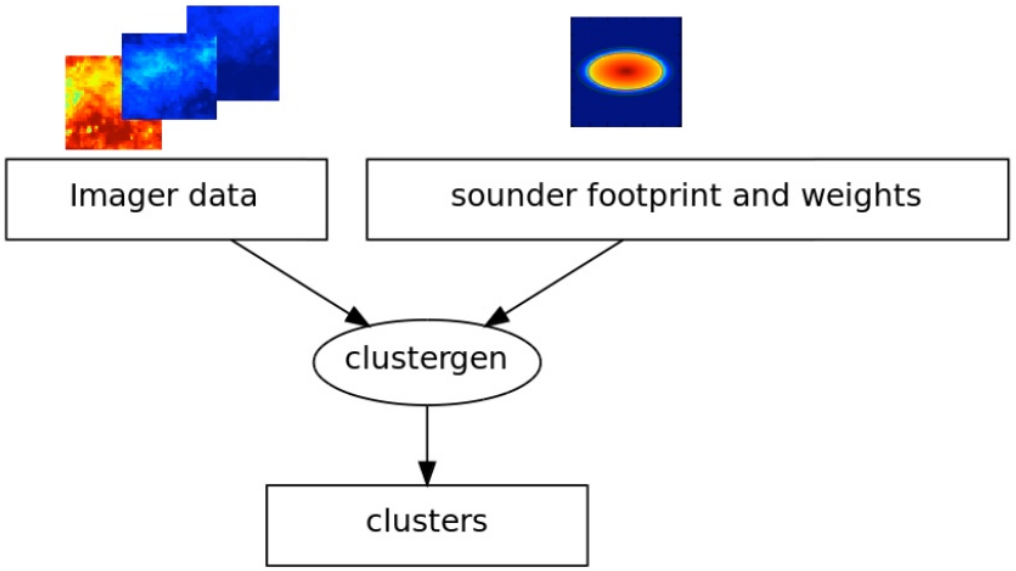
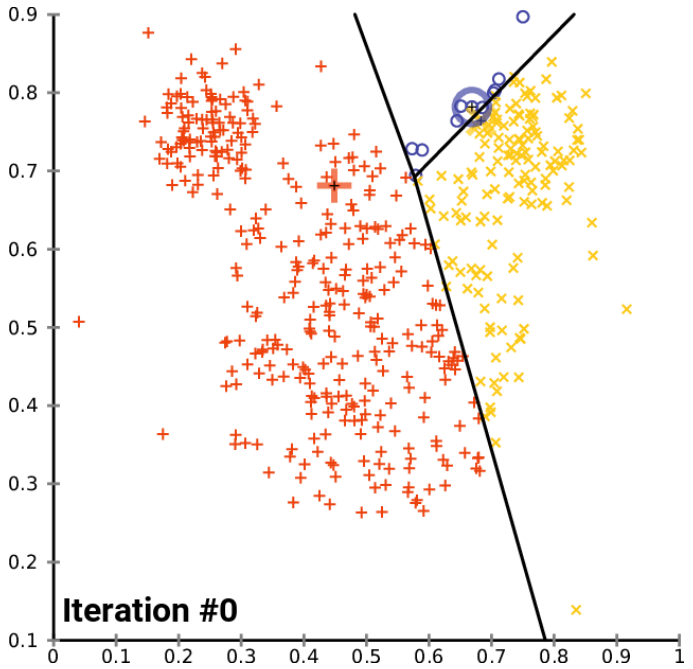
Clusters





- Input:
  - Radiances/reflectances/BTs arrays for every channels
  - Sounder field of view print / sounder weights
  - Configuration parameters
- Output
  - Number of clusters in FOV
  - Mean and standard deviation
  - Cluster mapping

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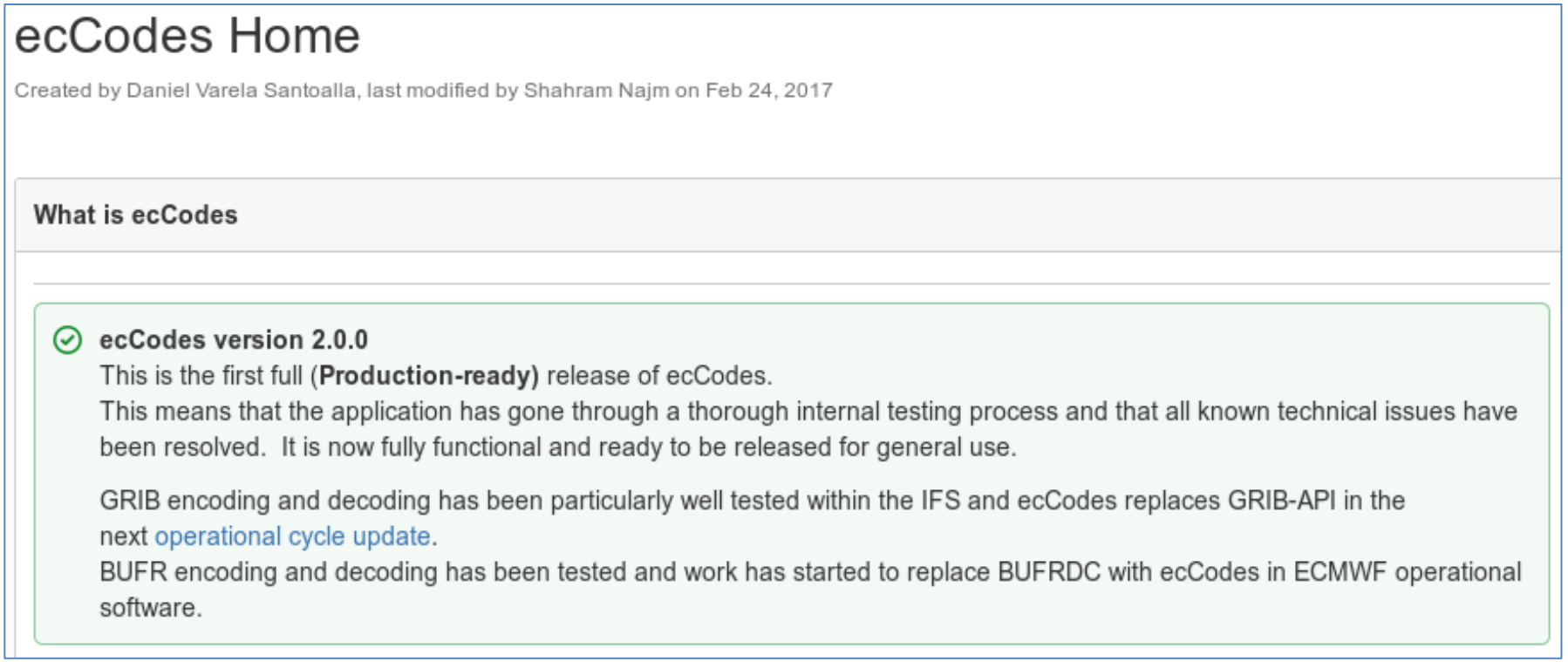
Support for ecCodes in AAPP

- ecCodes is the new BUFR/GRIB software being developed by ECMWF
- Designed to replace GRIB_API and BUFRDC
- See https://software.ecmwf.int/wiki/display/ECC



ecCodes Home

Created by Daniel Varela Santoalla, last modified by Shahram Najm on Feb 24, 2017

What is ecCodes

ecCodes version 2.0.0
This is the first full (**Production-ready**) release of ecCodes.
This means that the application has gone through a thorough internal testing process and that all known technical issues have been resolved. It is now fully functional and ready to be released for general use.

GRIB encoding and decoding has been particularly well tested within the IFS and ecCodes replaces GRIB-API in the next operational cycle update.
BUFR encoding and decoding has been tested and work has started to replace BUFRDC with ecCodes in ECMWF operational software.

- Latest version is 2.3.0 (May 2017)
- It has C, Python and Fortran90 interfaces, and also some command-line tools

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Plans for ecCodes in AAPP v8

- The MAIA cloud mask software reads GRIB forecast files
  - Currently uses GRIB_API
  - Migration to ecCodes should be straightforward as the interfaces are similar
  - This migration is planned for AAPP v8
- AAPP can read and write level 1c BUFR files (in some cases level 1d also)
  - For example, part of the DBNet production process
  - BUFR is a table-driven code format regulated by WMO, and designed for international data exchange
- ecCodes BUFR is less mature than GRIB, so for AAPP v8 we plan to retain the existing interfaces to BUFRDC, but also to create new readers/writers for ecCodes, so that users (and developers) can get used to it
- An issue:
  - Currently ecCodes is rather slow for datasets with large BUFR messages, for both encode and decode (we have found up to a factor 7 slower than BUFRDC, for IASI l1c)
  - This has been reported to ECMWF and they hope to make improvements soon (probably in v2.4.0)

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Some Some differences between ecCodes and BUFRDC

Characteristic	BUFRDC	ecCodes
Language	Mostly FORTRAN77. Some C for I/O	Mostly C
Build process	Shell scripts *build_library* and *install*	*cmake* → *make* → *make install* Separate build directory
BUFR tables	Approx 7000 BUFR table files all in one directory $BUFR_TABLES. The file name defines the table version, e.g. B00000000000254019001.TXT	Different versions are in different directories. Each directory contains 3 files: codetables, element.table, sequence.def
Descriptors	Referred to by number, e.g. 012163	Referred to by mnemonic, e.g. brightnessTemperature
Encoding strategy	Fill up a big array with all the data to encode (have to get the order correct), then make a call to BUFREN	Each descriptor is treated separately. Do not need to know the order, e.g. call codes_set(ibufr,'latitude',rvalues) Then at the end we create the message using: call codes_set(ibufr,'pack',1)

- As a consequence, all the AAPP encode/decode routines need to be re-written for ecCodes
- The old ones will be retained to allow continued use of BUFRDC, for as long as it is needed

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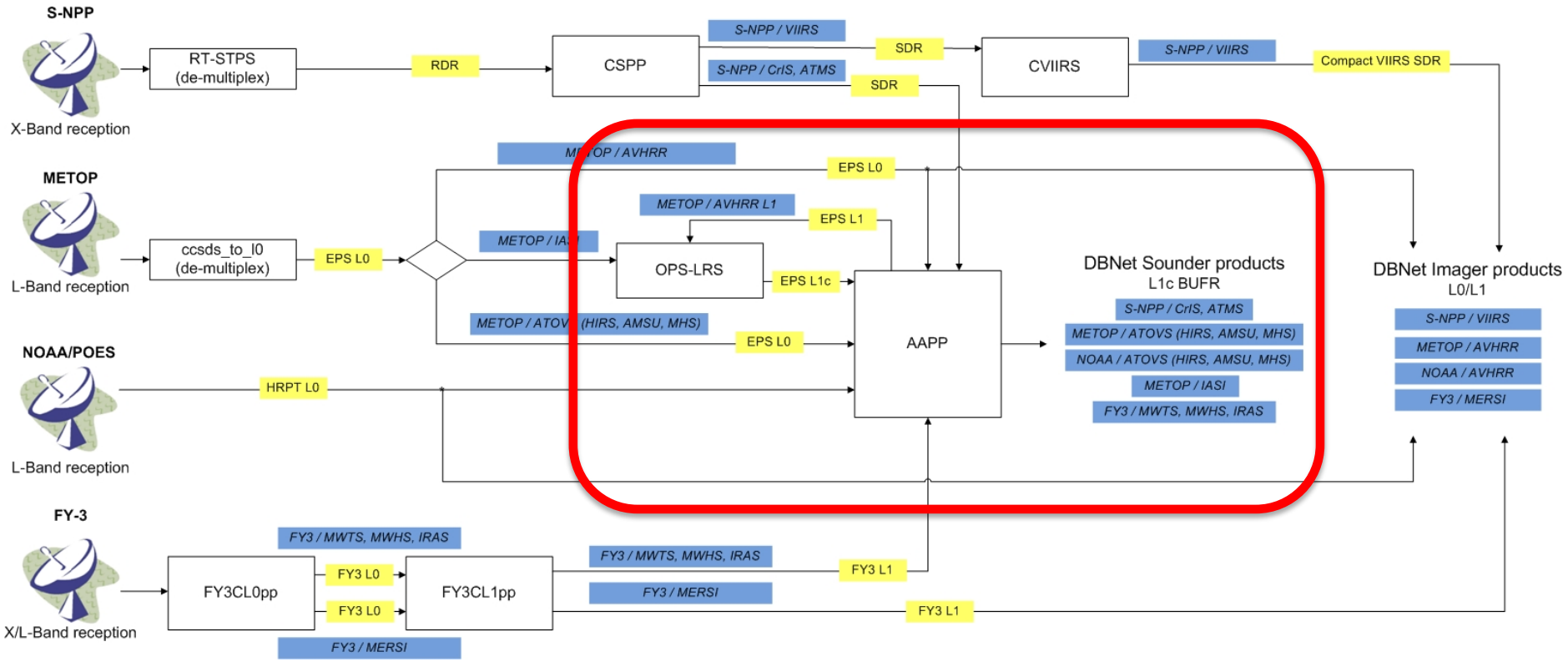
AAPP for DBNet

- Direct Broadcast Network for Near Real-Time Relay of Low Earth Orbit Satellite Data (DBNet)
  http://www.wmo.int/pages/prog/sat/documents/DBNet_Guide-to-DBNet.pdf



AAPP for DBNet

- Reference benchmark script is now available to users for performance testing (both AAPP and CSPP)

- MetOP test for 10mn acquisition:

Centre/machine	Met Office/radsat-dev	SSEC
Date of test	02/03/2016	02/02/2017
Architecture	x86_64	x86_64
CPUs	24 (2 physical x 6-core x 2 threads)	32 (2 physical x 8-core x 2 threads)
CPU MHz	3059	2600
Total memory	66 GB	129 GB
Available memory	23 GB	
OPS-LRS threads	4 (8)	4
Time to process ATOVS+AVHRR	3s	4s
Time to process IASI	2 min 46 s (2 min 16 s)	2 min 46 s

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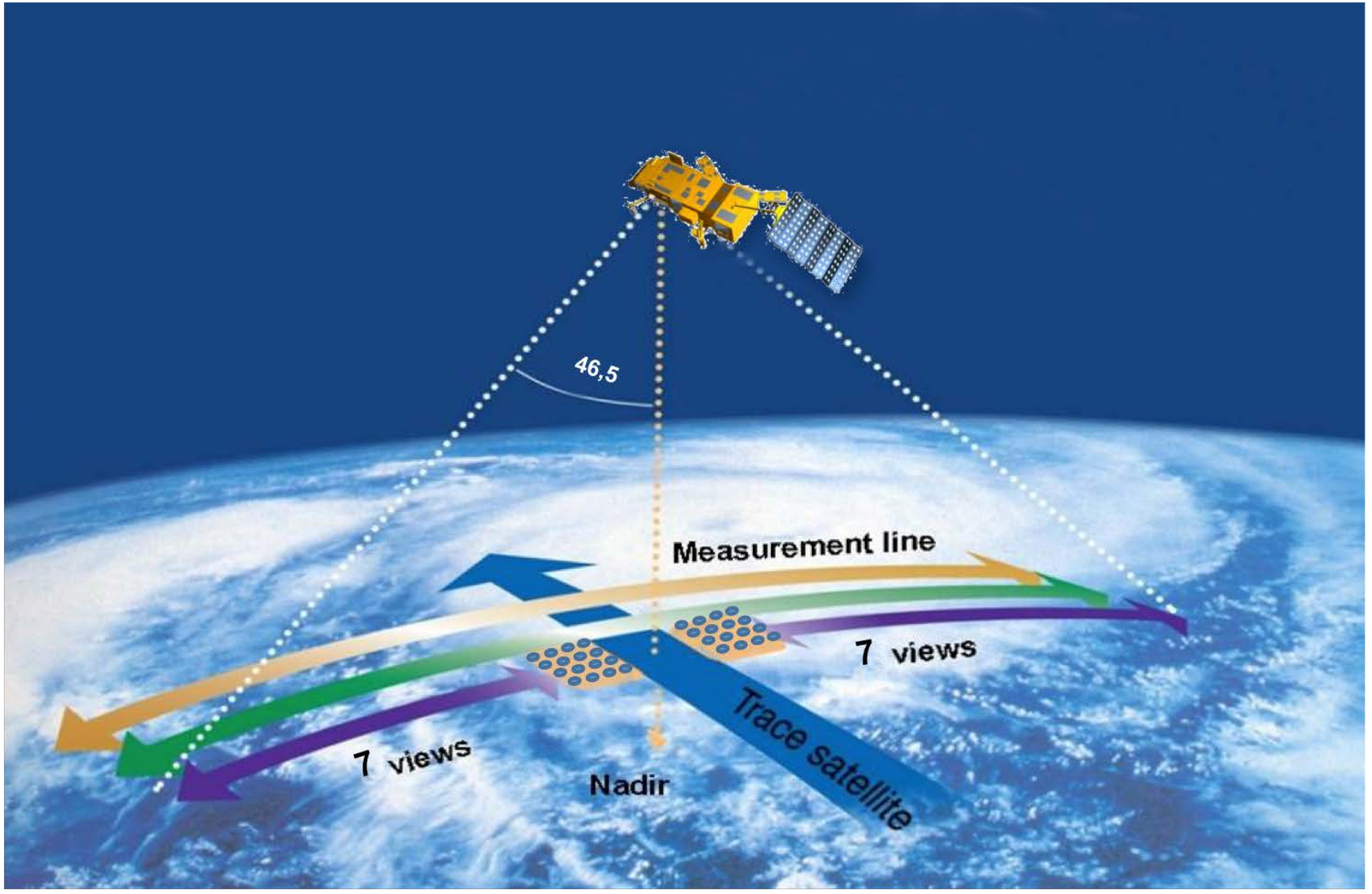
EPS-SG IASI-NG
Early information for level 1c processing



EPS-SG End User Requirements Document [EURD]

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- PRD-11050
  - a) Global (central) and local (usually direct readout) product processing shall be harmonised in that products derived from both agree within tolerances that are not greater than 10% of the respective performance requirements;
  - b) Global (central) and regional (central) product processing shall be harmonised in that products derived from both agree within tolerances that are not greater than 10% of the respective performance requirements;
  - c) Portable software including source code shall be made available for the product generation of the observation missions IAS, MWS, VII, SCA, MWI, ICI, UVNS, 3MI.

- Note: “Portable software” is computer software designed to run independently from an operational system. To achieve this, the software must adhere to programming language standards, avoid inclusion of software libraries that are dedicated to single operating systems, and be available as source code. It is further recommended to share as much as possible the software modules between the global and local processors.

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Payload Data Acquisition and Processing

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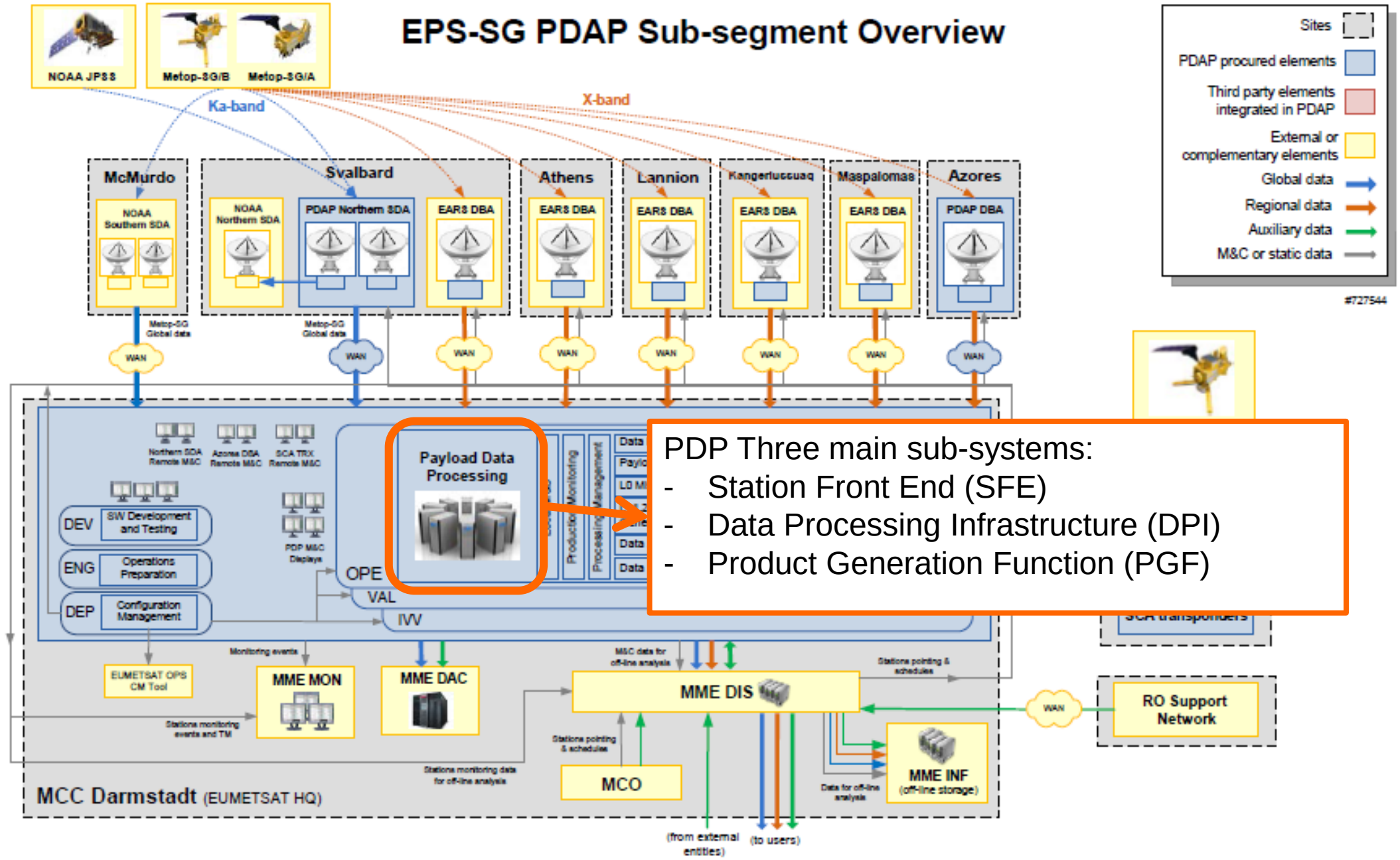
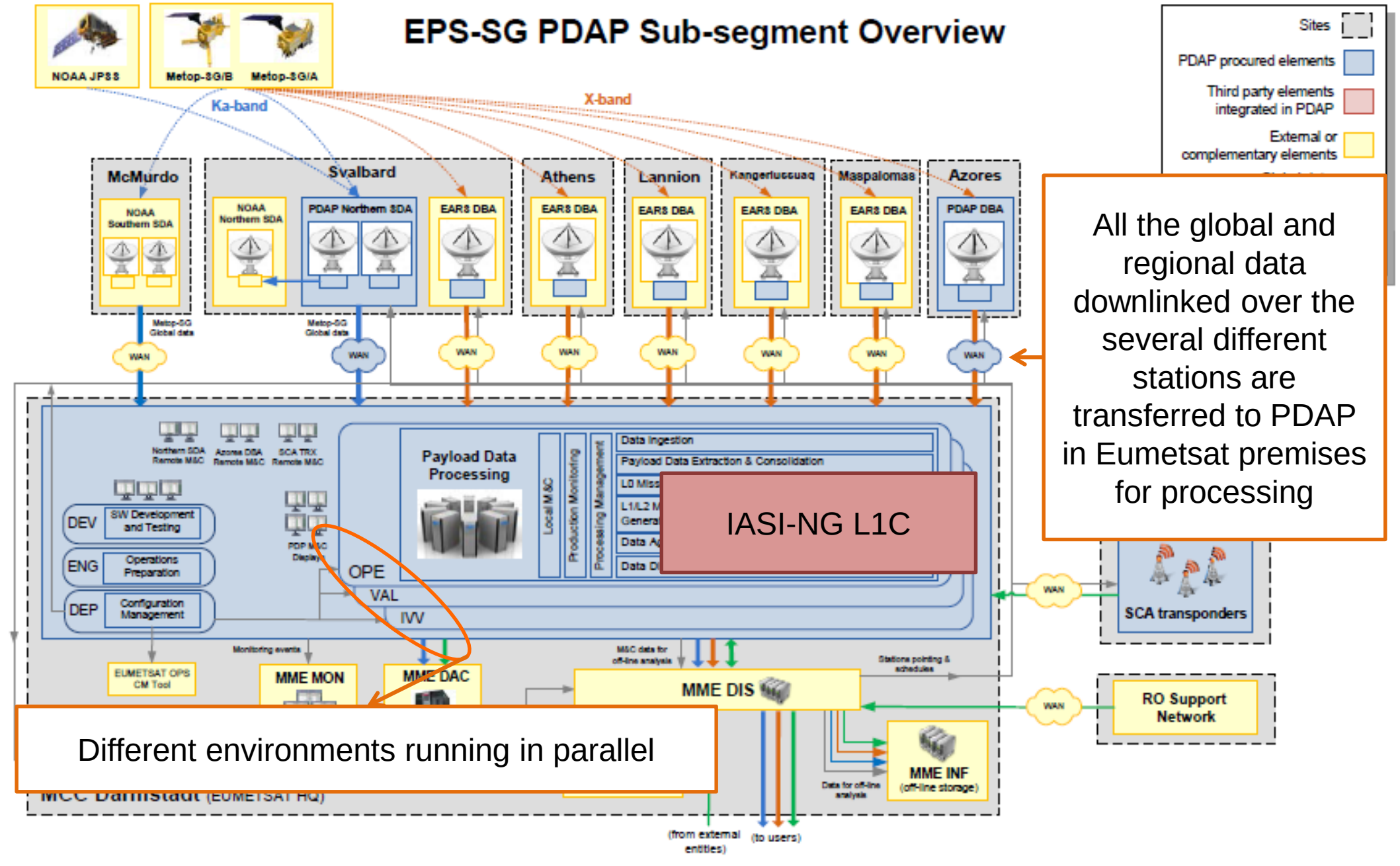


L1CPOP in EPS-SG OGS



L1CPOP Regional Mission

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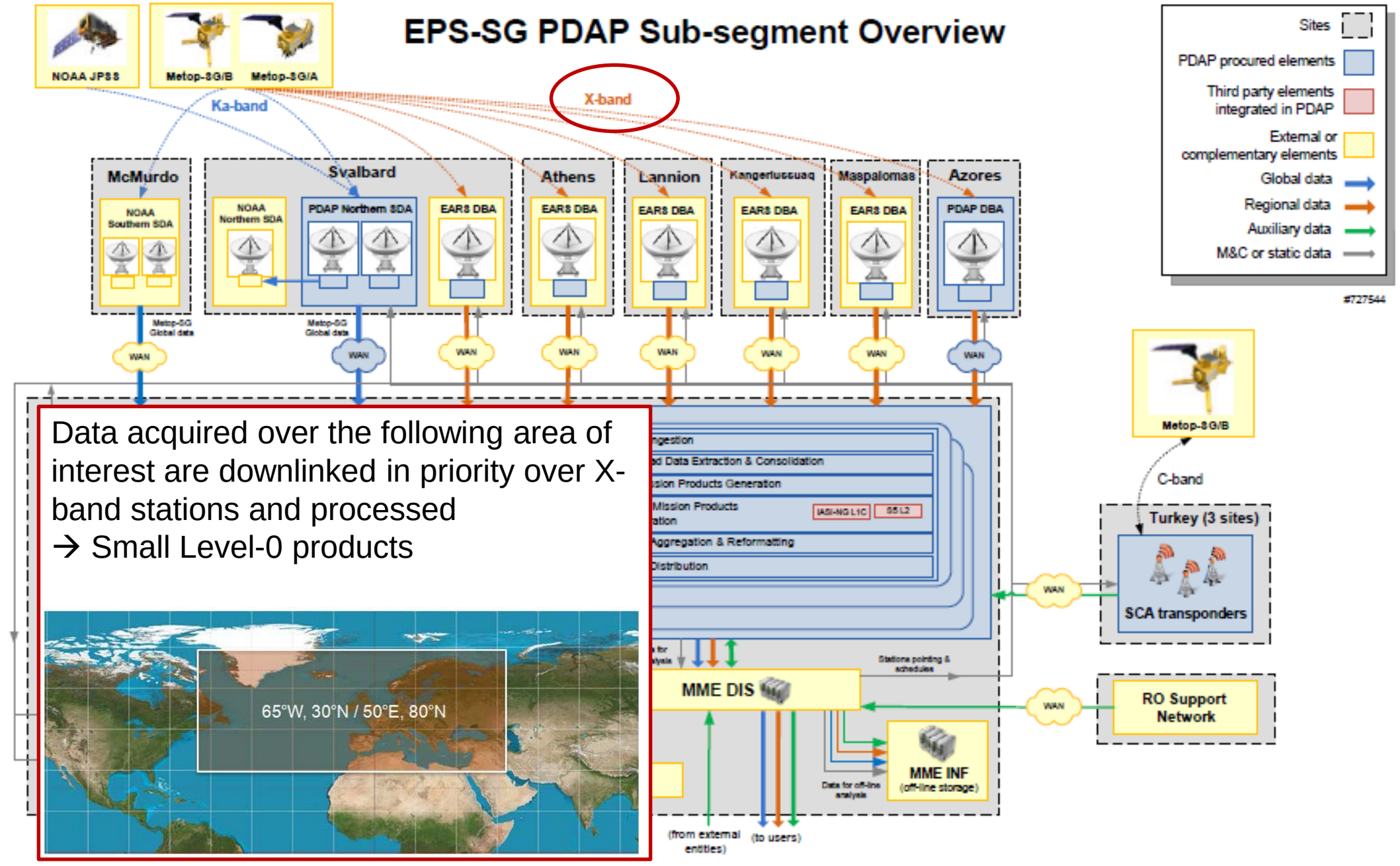


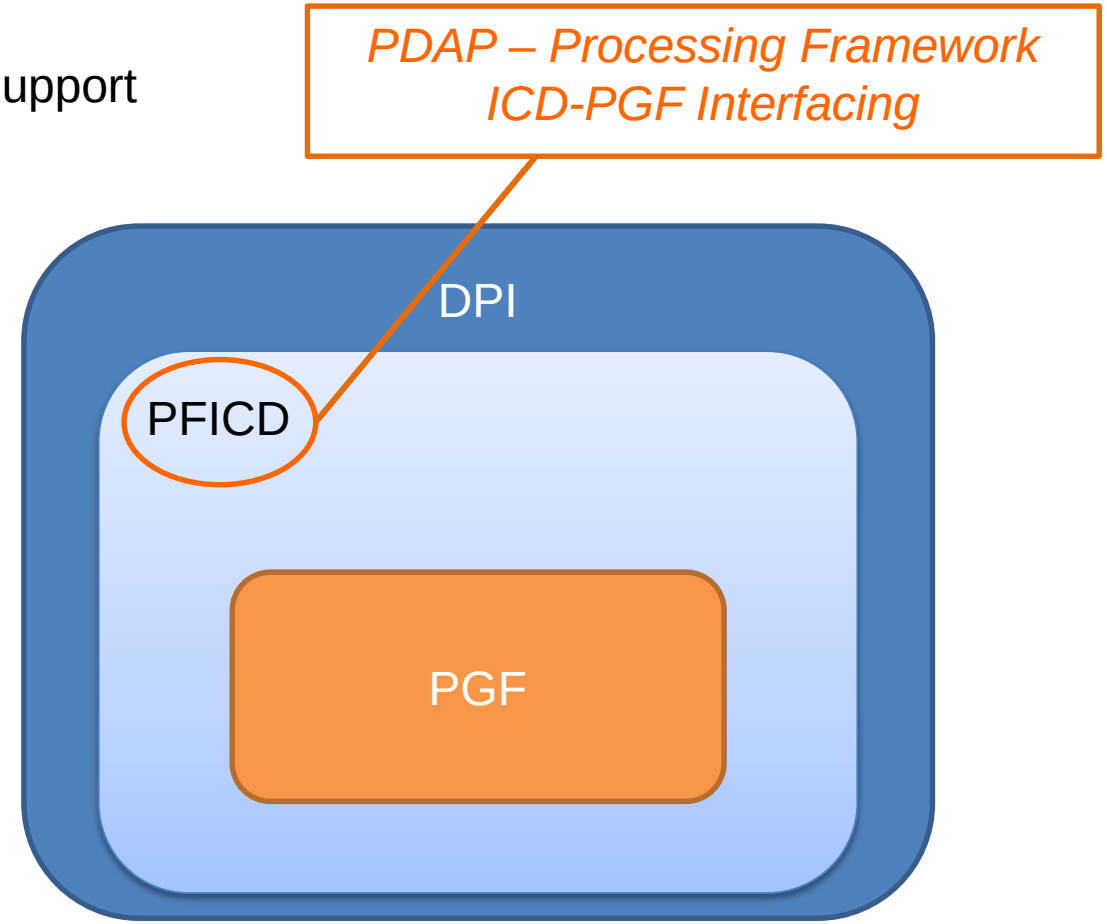
DPI and PGF

DPI provides both software and hardware infrastructure to host and execute PGF

- Interfaces with MMEs, SFE, Off-line Support
- PGFs Orchestration
- Common Libraries and services

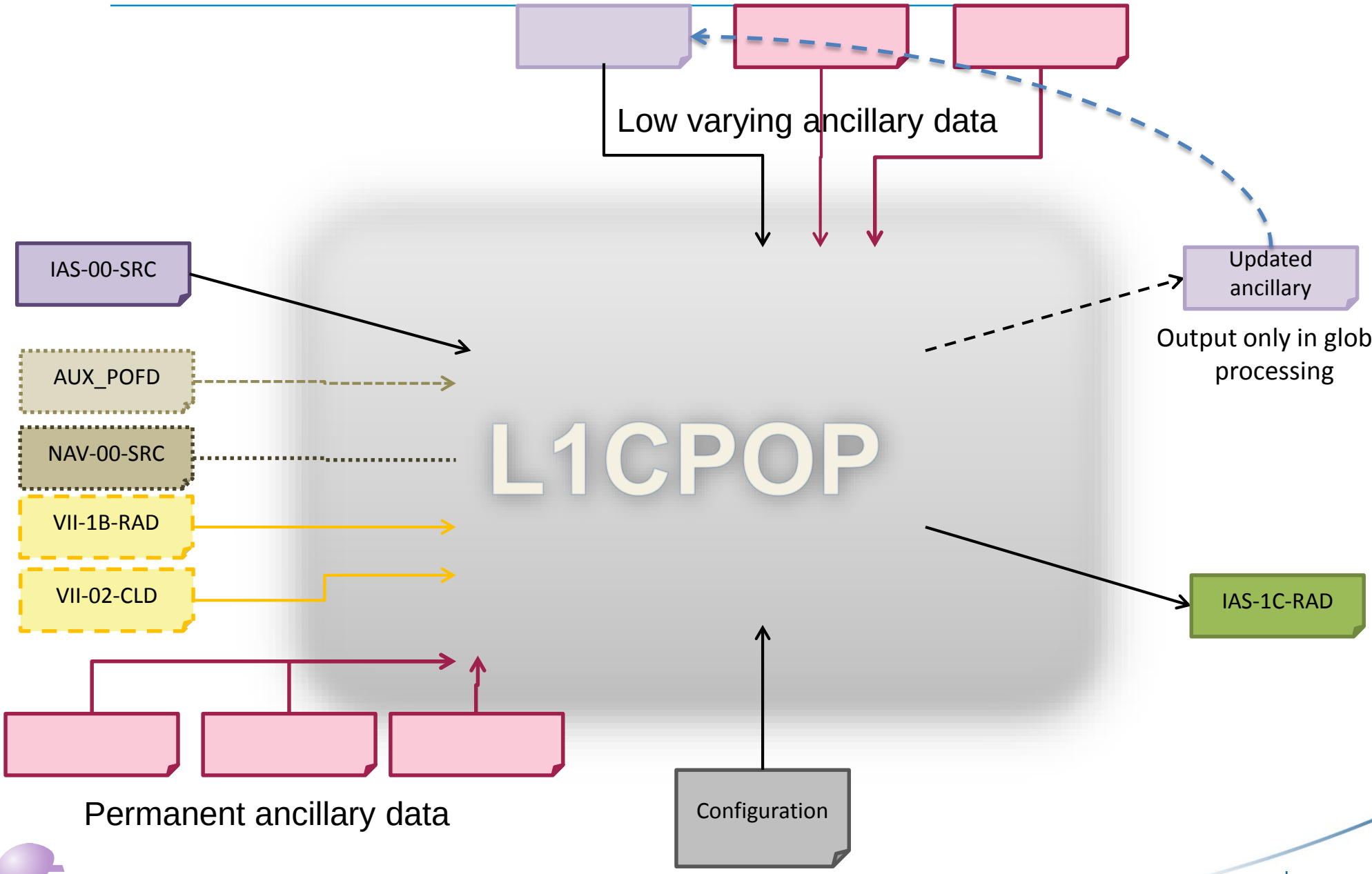
L1CPOP
=
IASI-NG
L1C PGF

GFs



PGF is the specific algorithmic implementation

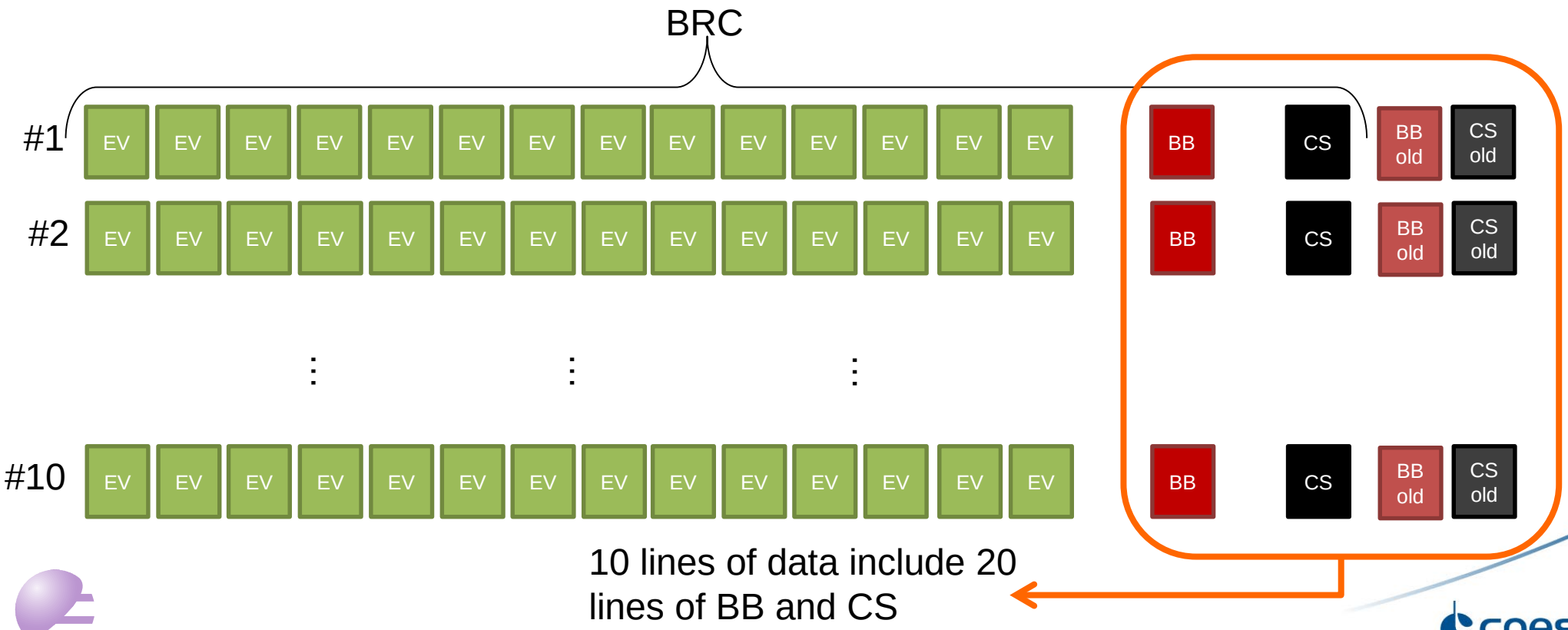
L1CPOP overview



Calibration data duplicated in TM

For the radiometric calibration in regional processing

- In regional processing IAS-00-SRC products are « shorter » (≥ 10 lines), nevertheless the same performances of global products shall be guaranteed.
- For radiometric calibration an average over several BB abd CS acquisition is performed.



Conclusion

- Generalisation of MAIA v4 in AAPP is done (see Pascale's presentation)
- Imager clusters in hyper-spectral FOVs, work in progress, will be part of an intermediate release.
- Support of ecCodes, done
- AAPP v8 is on track for release during summer
- EPS-SG program is taking into account local stations needs and requirements. Users are involved in the IASI-NG software review.

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Thanks for your attention
Centre de Météorologie Spatiale - Lannion
Direction des opérations pour la prévision