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REPORT ON PRE-PROCESSING CODES FOR FUTURE ADVANCED INSTRUMENTS AND ACTIVITIES FOR INTEGRATING THE CODE IN PROCESSING PACKAGES

This paper summarises EUMETSAT plans and activities to provide pre-processing code for future advanced instruments, in particular IASI and ATOVS on Metop within the EUMETSAT Polar System.

The paper has been written in response to CGMS action 30.23.

REPORT ON PRE-PROCESSING CODES FOR FUTURE ADVANCED INSTRUMENTS AND ACTIVITIES FOR INTEGRATING THE CODE IN PROCESSING PACKAGES

1 INTRODUCTION

The meteorological operational polar orbiting satellites have provided, through the High Resolution Picture Transmission (HRPT) service, sounding and imaging data in real time for local users. This will be continued by the A(dvanced)HRPT on Metop, which will contain all instrument data, i.e. in particular the new infrared high spectral resolution sounder IASI (Infrared Atmospheric Sounding Interferometer) and the Advanced Scatterometer (ASCAT). There has always been a need for software to process locally received sounder and imager data. This has been addressed through the development of the AAPP (ATOVS and AVHRR Processing Package), that was originally developed by EUMETSAT in co-ordination with scientists from several Member States and ECMWF (i.e. the AAPP software was written by scientists for scientists.). AAPP is maintained and further developed by the NWP SAF and has been distributed today world-wide to over 250 Users. This service addresses operational needs (AAPP is run operationally at National Meteorological Services, including non-member states of EUMETSAT) as well as research needs.

Furthermore AAPP is the basis software for the EUMETSAT Retransmission Service (EARS), where HRPT data received at stations distributed in the Northern Hemisphere are locally processed with AAPP and the resulting files are collected and retransmitted to the user community by EUMETSAT. This service addresses operational needs and the increased timeliness requirement of 30 minutes for local models, in particular HIRLAM. The status of EARS is described in EUM-WP-26.

With regard to EPS it is noted that requirements were already identified to provide local processed data from ASCAT to local users with similar timeliness requirements as for the EARS service (i.e. for use in regional models).

2 LOCAL PROCESSOR DEVELOPMENT

2.1 AAPP upgrade

Activities are planned to upgrade the AAPP for the EPS/Metop/NOAA-N, N' era. Those are foreseen for the Initial Operations Phase (IOP) of the NWP SAF. Close co-operation will be undertaken between the EUMETSAT EPS team and the NWP SAF. A joint work plan is being drafted and three development steps have been identified.

2.1.1 Step-1: Inclusion of MHS for NOAA-N, N'

As a first step the current AAPP must be made capable to support the MHS instrument for which NOAA-N will provide the first real data in summer 2004. New code needs to be developed since some steps in the calibration are different to AMSU-B. Test data and instrument characteristics for MHS will be made available. Prototype code is being developed for this purpose.

2.1.2 Step-2: Update of AAPP for use with Metop

The second step is the upgrade of AAPP for the use with Metop data in summer 2005. In principle, the modules for the calibration and Earth location should be the ones already included, since the ATOVS and AVHRR instruments on Metop will be the same as on NOAA-N. However AHRPT will provide CCSDS (Consultative Committee for Space Data Systems) source packets.

Hence one item required is to adapt the decommutation step to assure the data provision. Within the development of the EPS AHRPT reference user station, software will be developed to provide level 0 products for each instrument (TBC). This software could be used as basis of the AAPP further development. An adaptation to local user needs should be left to the local user according to the individual installation and requirements.

The second item is the enhancement/upgrade of the navigation software and in particular the orbit propagator. Metop will fly routinely in yaw-steering mode. AHRPT will provide orbital parameters both in TBUS-format and as SPOT-5 parameters in the ADMIN message, updated every 12h. The orbital model, which is used to generate the orbital elements, must be used within the navigation software. Hence new orbit propagation software needs to be generated, based on the algorithms used in the EPS Flight Dynamics facility. EUMETSAT will make the documentation available as soon as it will be received from the contractor. The development work could be started as soon as this documentation is available and stable. The resulting navigation software should allow to process Metop- and NOAA-based data. The development has not yet started.

It should be noted that the possibility of local processing of GRAS has not yet been demonstrated. The essential point is availability of ancillary data.

2.1.3 Step-3: Inclusion of IASI Level 1c processor into AAPP

IASI is a new instrument, in addition to ATOVS and AVHRR, and will require the development of completely new software. It is envisaged to make use of the CNES OPS operational level 1 processor, which is currently being developed. It has already been agreed that the software can be made available for the development. Version 2 of the software will be the first delivery. The currently planned delivery date is November 2003. It is planned to take the software as is, and to mainly adapt the interfaces. The development of the IASI level 1 c part needs to be started as soon as the CNES software is available.

2.2 Local ASCAT Processor

The need had been expressed to have a local processing system for the processing of Advanced Scatterometer (ASCAT) data available in order to reduce the delay (2h15 min for global level 1b products) for NWP. An EARS like service may be envisaged.
EUMETSAT has explored technical aspects already and summarised them in a technical document. It is planned to develop software and the way forward is being explored.

3 CONSISTENCY WITH GLOBAL PROCESSORS

One important aspect of local processing is that the output is kept consistent with global processing. The possible areas of consistency between global and local processing are navigation (positioning of the instrument pixels) and calibration.

Consistency needs to be ensured at all stages of the development and operations:
- Development of the software
- Maintenance phase
- Upgrades

The consistency in the development stage can be assured by close co-operation of the teams involved. In the development phase the consistency will be checked against the EPS prototype results using defined configurations. EPS prototype processors have been used to derive the specifications for the operational global processors and have also been used to provide the test data for the acceptance testing.

In the maintenance phase several situations may occur. The operational processors will be validated and will be the reference for consistency. Changes/upgrades of processors may be caused by bug-fixes, science updates and corrections due to anomalies. Before being implemented, changes should be discussed involving the relevant experts.

In this context it may well be, that in a first phase, when the operational software is under industrial warranty, the upgrades will involve contractors and may be delayed with regard to the update of the local processor. In a sense that could be turned into an advantage, as the local software could be tested by agreed beta-testers and prove a change before being implemented into the global chain. Consistency will be tested against the results of the operational software.

Upgrades also occur when new instruments are to be included, typically after launch of a new spacecraft, or when new science has to be incorporated.

4 CONCLUSION

EUMETSAT is taking steps to provide ingest and pre-processing code for future advanced instruments, and integrate this code into (existing) processing packages for international distribution in a timely manner, such that those packages are available prior to the launch of the new sensors. Sensor information, navigation and calibration information will be made available.