NWC SAF ENTERING A NEW PHASE

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Abstract

The Satellite Application Facility on support to Nowcasting and Very Short-Range Forecasting (NWC SAF) entered the Second Continuous Development and Operations Phase (CDOP-2) in March 2012.

The objectives are to continue providing to National Meteorological Services, Scientific Institutions and, in general, meteorological users from EUMETSAT member states and worldwide with an advanced, robust and reliable system to support both operational and research activities in Nowcasting and very short range forecasting activities, by means of:

- The production and provision of a software application for the near real time generation of a set of meteorological products to support Nowcasting activities, and
- The provision of support services to final users to allow the maximum exploitation and benefit of the software application and the transfer of knowledge from the NWC SAF consortium to its users.

In order to achieve these objectives, NWC SAF currently relies on user-friendly, flexible, stable and well validated software packages with a variety of operational products, also well validated, known to be a unique source of products. NWC SAF also provides a very good user service via helpdesk.

Taking into account the accumulated experience and lessons learnt from past phases, the main changes for CDOP-2 are as follows:

- To extend the operability of its packages to other satellites and to get prepared for MTG and EPS-SG.
- To develop new products and improve the current ones according to Nowcasting state of the art and user requirements.
- To strengthen coordination with Central Applications Facility (CAF) and the other Satellite Application Facilities (SAF) through dedicated cooperation and federated activities.

This presentation attempts to describe the goals attained at the end of the CDOP phase as well as to present the preliminary CDOP-2 activities and prospects.

INTRODUCTION

The NWC SAF belongs to the EUMETSAT “Satellite Application Facilities”, dedicated centres for satellite data processing as part of the distributed EUMETSAT Ground Segment. The Nowcasting Team is led by AEMET with participation of the meteorological services of France, Sweden and Austria.

OBJECTIVES AND PHASES

The general objectives of NWC SAF are the development of Nowcasting products derived from both geostationary (GEO) and polar platform systems (PPS) data, distributed to the users as software
packages. The Team is then responsible for the development and maintenance of both products and software and also for the user support.

Concerning the phases, after a development phase between 1997 and 2002, 48 users were licensed at the end of the Initial Operations Phase (2002-2007), when the distributions started. Between March 2007 and February 2012, the Continuous Development and Operations Phase ended with the NWC products in a very good shape and 96 users licensed. The CDOP-2 started in March 2012 and since then 77 users have already updated the license.

CDOP-2 OVERVIEW

According to Figure 1, the CDOP-2 will have five important landmarks coincident with the SW distributions. Two Polar Platform Systems versions will be released on 2014 and 2016 and three geostationary versions in the odd years (2013, 2015 and 2017). From v2015 the GEO application will be able to operate other geostationary satellites, new products will be available and we will start preparations for the future European satellites. Three users’ workshops will be held, two of them devoted to engineering issues and one for assessing the products applicability and for collecting user requirements for the next phase.

![Figure 1: NWC SAF CDOP-2 planning](image)

PRODUCTS

The NWC products at the end of the CDOP can be compiled in groups of Clouds, Precipitation, Convection, Clear Air Instability, Wind and Meteorological Systems. The following paragraphs refer to the current status of these products as well as the improvements to be implemented in the new phase and an overview of the new proposed products.

The cloud products for the GEO package, Cloud Mask (CMA), Cloud Type (CT) and Cloud Top Temperature and Height (CTTH) have been well consolidated with relevant improvements along the CDOP, of which an example is displayed in Figure 2.

![Figure 2: NWC/GEO Cloud example](image)
For the current phase, better detected and classified cirrus, cumulus and stratus separation, multilevel clouds, and CTTH performance near tropopause will be some of the improvements.

A new product based on cloud top microphysics properties is also being developed of which an early prototype is displayed in Figure 3 applied to precipitation.

The precipitation products, Precipitating Clouds (PC) and Convection Rainfall Rate (CRR), are being improved by using the mentioned cloud microphysical properties. The Figure 3 shows in the left hand side the radar image and the current performance for the Convection Rainfall Rate. On the right hand side, the new CRR image using the physical properties shows a more realistic performance compared to the radar one which is our ground truth.

![Figure 3: New microphysics algorithm applied to precipitation](image)

The improvements for the Clear Air products (SPhR), Precipitable Water and Instability Indices, will be based among other, on the Numerical Weather Prediction hybrid levels management of which, some preliminary tests are displayed in Figure 4 (Martinez M.A., 2010).

![Figure 4: Spatial distribution of the TPW RMSE. January-December 2009](image)

The High Resolution Winds (HRW) is a well consolidated product that in the current version can use up to 7 SEVIRI channels and the height assignment has been improved through the CCC method in cooperation with EUMETSAT (Figure 5). This product can easily be run and has great advantages as standalone software for Automatic Motion Vector calculation.
The new product in the wind group, the Extrapolated Imagery, is a kinematic tool allowing the extrapolation of products and other images up to 1 hour.

For the Meteorological Systems, the Automatic Satellite Image Interpretation (ASII) will evolve to a New Generation product providing Probability Fields and Clear Air Turbulence Prediction.

For Convection, the Rapid Development Thunderstorm (RDT) product will generate two new outputs, a Convection Warning and a Convection Trajectory, taking advantage of other NWC SAF products.

A new product strongly requested by the users is the Convection Initiation. This product calculates a convection probability based among other parameters on the instability indices, cloud information and wind from the NWC SAF package (Figure 6).

The PPS Cloud products, Cloud Mask (CMA), Cloud Type (CT) and Cloud Top Temperature and Height (CTTH), include in the current version the recently operational Cloud Physical Properties (CPP). Fractional water clouds detection, multilevel clouds and cloud height estimates will be some of the improvements.

The PPS precipitation product (PC) will also be improved taking advantage of the cloud physical properties as well as using a retrieval algorithm based on Microwave data. A new rainfall rate output is also expected. These products apply to NOAA, Metop and NPP systems.

**GEO EXTENSION**

Following a strong request by a number of NWC SAF users, we intend to extend the current MSG package to process data from other geostationary satellites. This GEO application, able to process the
observations from a generic geostationary satellite, is expected to be available in version 2015. The NWC SAF products are also intended to be scientifically tuned afterwards taking the maximum benefits of the spectral and spatial resolution of the selected platform. The possible candidates for the scientific adaptation are GOES-R and Himawari-8, depending on the launch schedule and instrument characteristics (see Figure 7).

Some adaptations have already been made by users in countries outside of the MSG coverage, as the Automatic Satellite Image Interpretation adapted to the Korean satellite COMS by the Korean Meteorological Agency.

**MTG & EPS-SG PREPARATIONS**

The geostationary application will be prepared for MTG Flexible Combined Imager data through simulations and similar satellite channels (MODIS) and assessment activities for the MTG cloud processing in the EUMETSAT central facilities will also be performed.

An active participation in the MTG Infrared Sounder Science Team (MIST) as well as early studies for the Infrared Sounder data contributes to MTG-IRS preparations.

There will also be some studies of precipitation sensors for EPS-SG.

**CONCLUSIONS**

The NWC SAF software packages and the operational products have entered this new phase in a very good shape.

An important upgrade will take place with the 2015 version which will extend the MSG application to other geostationary satellites. V2015 will also include new developments such as Convection Initiation, Extrapolated Imagery, Cloud Microphysical Properties and a New Generation of the Automatic Interpretation product.

Going onwards into the future, we intend to adapt the software and the products for the forthcoming European satellites in close cooperation with the EUMETSAT Secretariat.

**REFERENCES**