

# FIRST RESULTS FROM NOAA-18 WITH THE ATOVS AND AVHRR PRODUCT PROCESSING FACILITY FOR EPS

*Dieter Klaes, Jörg Ackermann, Rainer Schraidt, Peter Schlüssel*

*EUMETSAT*

*Am Kavalleriesand 31*

*D-64295 Darmstadt*

*Germany*

## **Abstract**

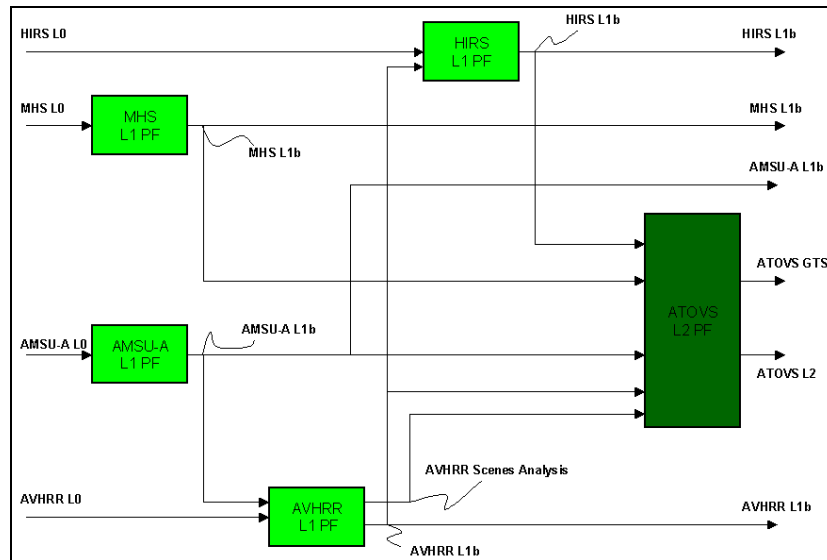
The ATOVS/AVHRR Product Processing Facility (PPF) of the EPS (EUMETSAT Polar System) Core Ground Segment (CGS) comprises the Level 1 processing of the data from the ATOVS sounding instruments AMSU-A, MHS and HIRS/4, and the imager AVHRR/3 into calibrated and navigated radiances. A second component includes the level 2 processing, which uses as input the level 1 products of the aforementioned instruments. This paper shows first results from the processing of data from the NOAA-N spacecraft, which is the first operational satellite of the Initial Joint Polar System (IJPS). The latter includes the EPS/Metop System for the morning (AM) orbit and the NOAA/POESS system for the afternoon (PM) orbit. NOAA-N is the first satellite that carries the Microwave Humidity Sounder (MHS), which replaces the AMSU-B instrument.

## **INTRODUCTION**

The ATOVS (Advanced TIROS (Television and Infrared Operational Satellite) Operational Vertical Sounder) instrument package was first flown on the NOAA-KLM Satellite series operated by NOAA, since 1998 in orbit as NOAA-15 (1998), NOAA-16 (2000) and NOAA-17 (2002). It is composed of the Advanced Microwave Sounding Units A and B (AMSU-A, AMSU-B) and is complemented by the High resolution Infrared Radiation Sounder (HIRS/3). To provide continuity the ATOVS and AVHRR instruments will be exploited by the EUMETSAT Polar System (EPS) (Klaes, 2001) in the frame of the Initial Joint Polar System (IJPS). The current AMSU-B sounder has been replaced by the Microwave Humidity Sounder (MHS). An upgraded version HIRS/4 of the Infrared Sounder is embarked on the Metop-A and Metop-B Satellites and also the NOAA-18 and N' satellites (NOAA-N being called NOAA-18 since in orbit). The Advanced Very High Resolution Radiometer (AVHRR/3) will support the ATOVS Product Generation. The global processing of the ATOVS and AVHRR data will be carried out in the EPS Core Ground Segment in the ATOVS and AVHRR Product Processing Facilities (PPF). This paper gives an impression of the level 1 product-generation at the example of results obtained from NOAA-18 data.

## THE ATOVS AND AVHRR PRODUCT PROCESSING FACILITY

The ATOVS and AVHRR PPF for the EPS CGS is being developed by an industrial contractor in the frame of the development of the CGS. (Klaes et al., 2004). The development is based on Product Generation Specifications (PGS), Product Format Specifications (PFS) and test data sets, provided through Prototype Processors.



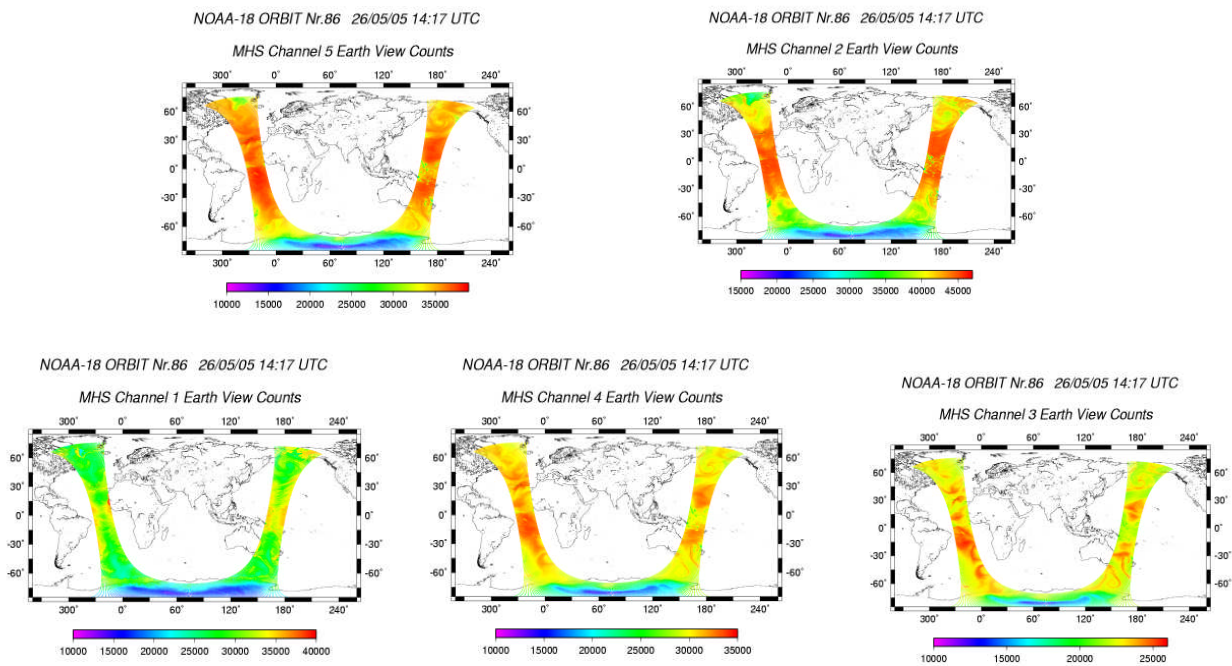
**Figure 1 ATOVS and AVHRR PPF.**

The ATOVS/AVHRR Processing for the EPS Ground Segment comprises as a first step the Level 1 processing of the ATOVS sounding instruments AMSU-A, MHS and HIRS/4, and also the AVHRR/3 instrument. The second step is the processing to level 2, which uses as input the level 1 product and a cloud mask from scenes analysis to provide temperature and humidity profiles. (Figure 1). Prototype processors have been established to verify the specifications and also to generate the required test data.

## NOAA-18 PROCESSING

The National Oceanic and Atmospheric Administration (NOAA) of the United States launched NOAA-N on 20<sup>th</sup> May 2005 on-board a Delta-II rocket from Vandenberg Air Force Base, California. Once successfully in-orbit, the satellite was re-named NOAA-18.

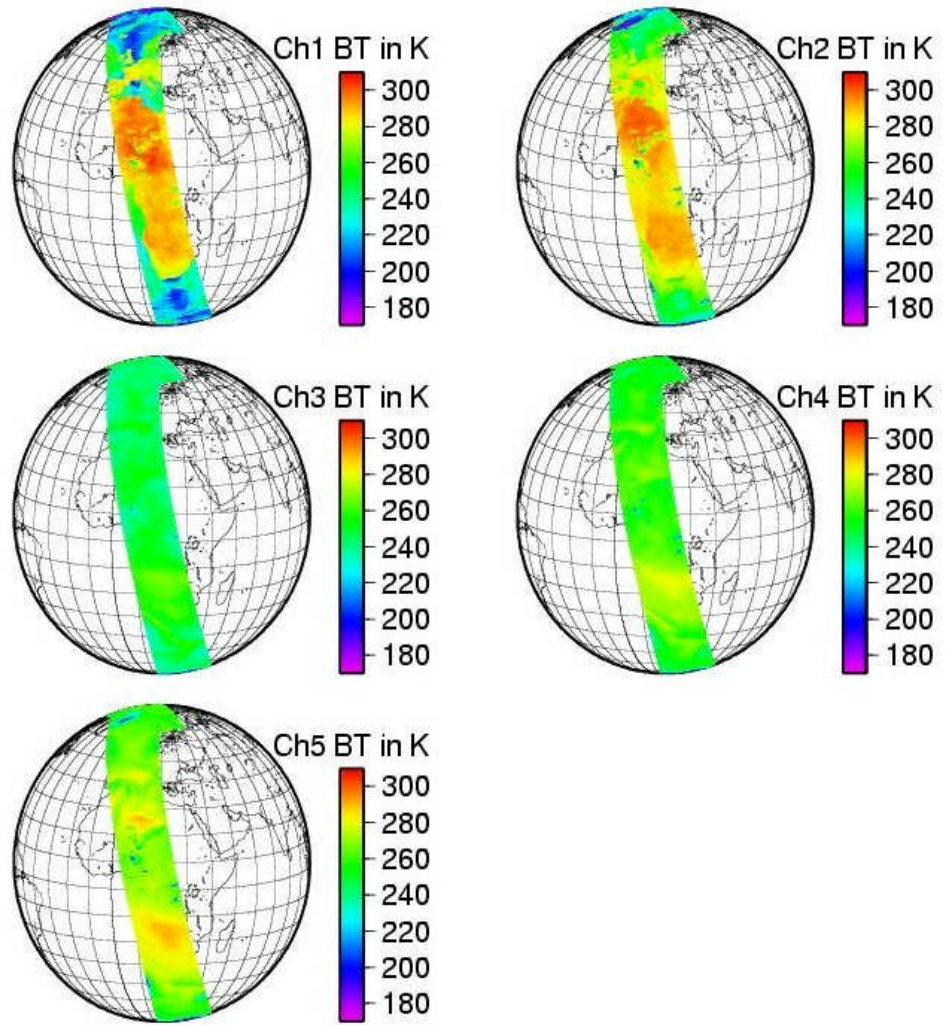
The instruments were subsequently switched on and first orbital data were made available to EUMETSAT. The first MHS data with the instrument in scan mode is shown in Fig.2 They were recorded from orbit 86 on the 26 May 2005. There were no calibration data available, so the first orbit displays Earth located counts.



**Figure 2 First MHS orbit (86), Channel 1-5 counts.**

Once the calibration parameters were available and adjusted we could calibrate and Earth locate MHS data. The results are displayed in Fig. 3 as brightness temperatures. The successful processing confirmed the correctness of the EPS-MHS processor specification.

Finally, in week 23 all instruments were switched on and all instrument data could be processed (calibrated and Earth located) with EUMETSAT's prototype processor. Figures 4 and 5 show the results for the AMSU-A data of orbit 155, HIRS/4 data and the AVHRR IR data for orbit 294.



**Figure 3 MHS Brightness Temperatures for 31 June 2005, Orbit 155.**



AMSU-A Channels 1 to 10 (all scales in K)

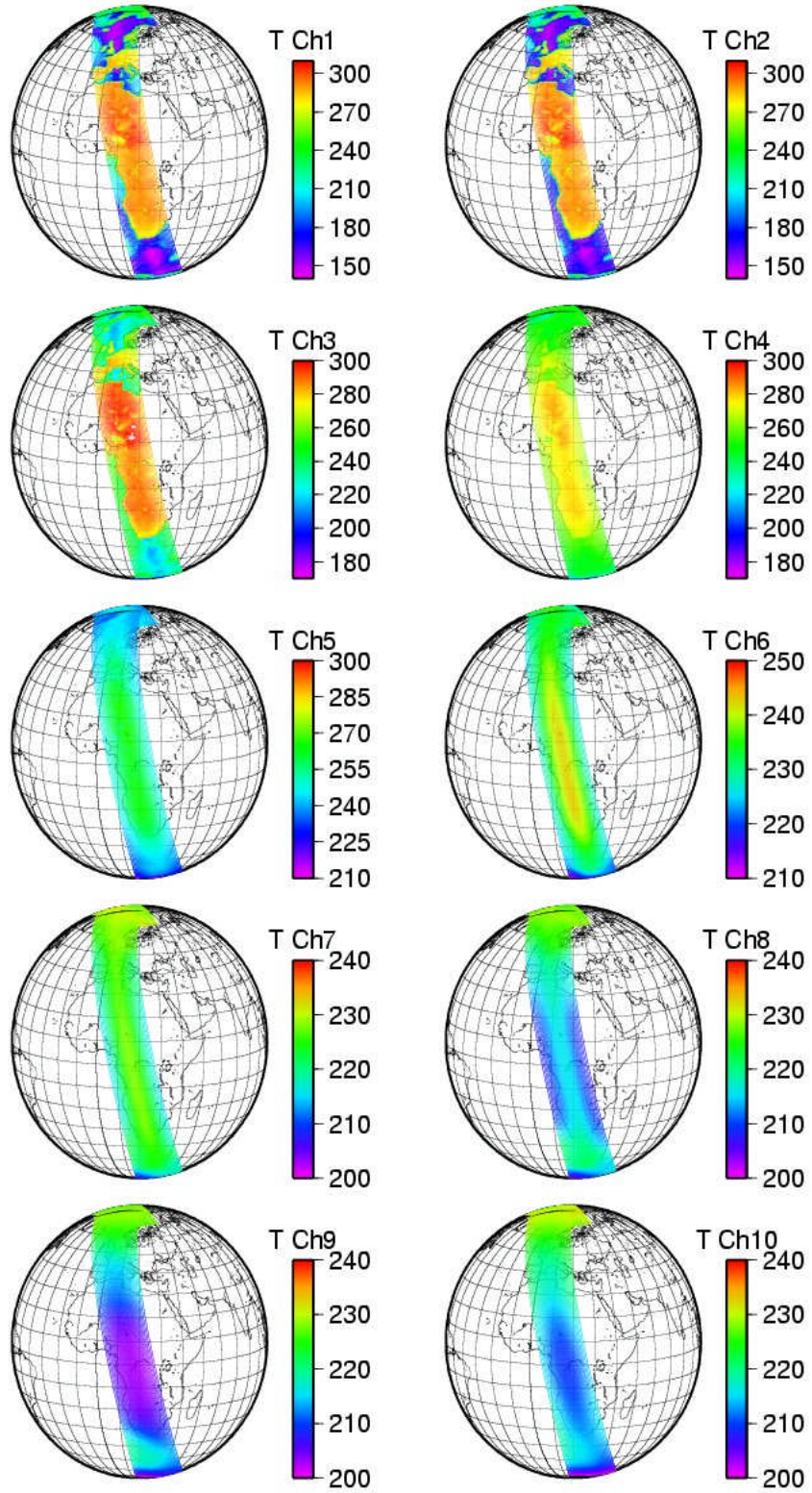
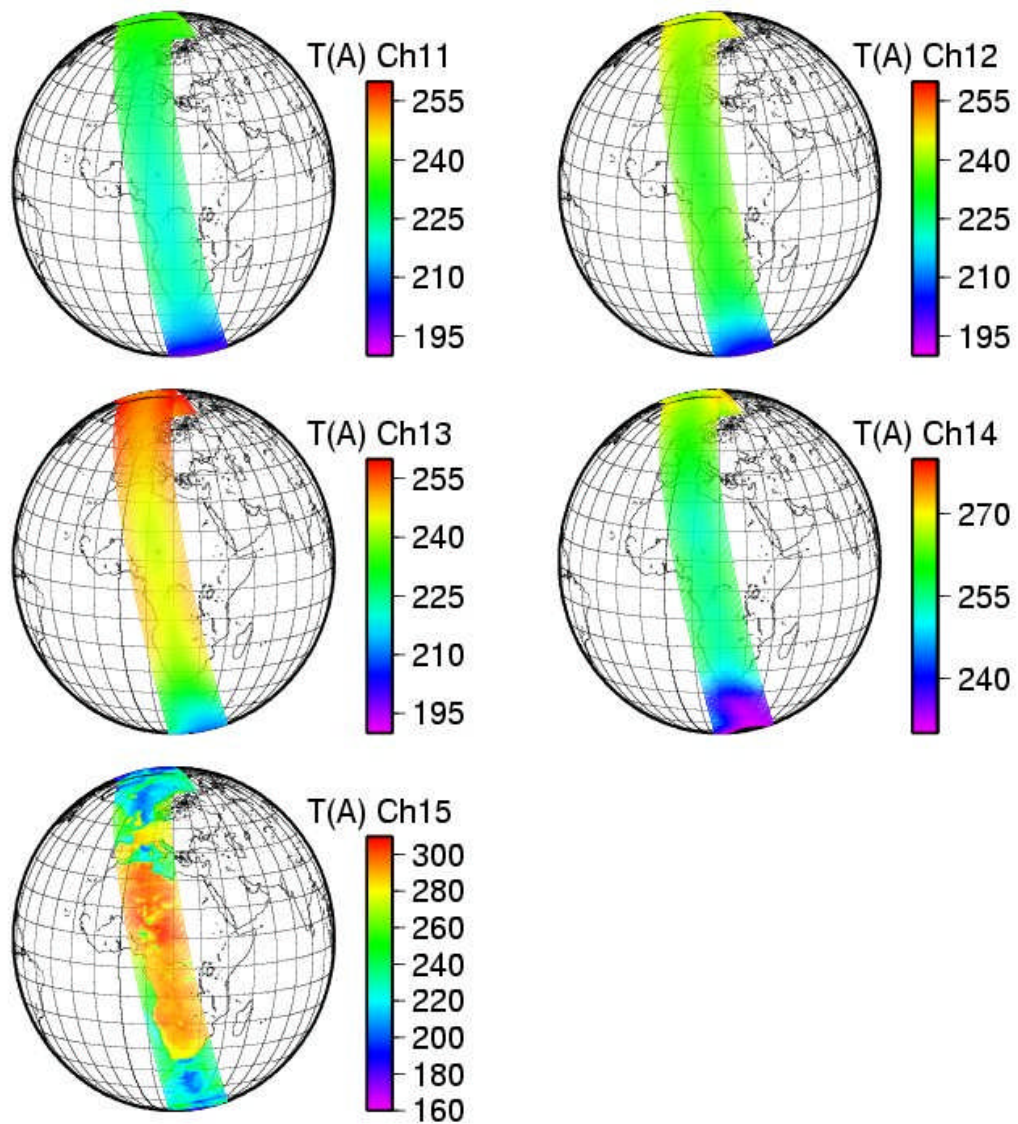


Figure 4a AMSU-A Channels 1-10 Brightness Temperatures, NOAA-18 Orbit 155.

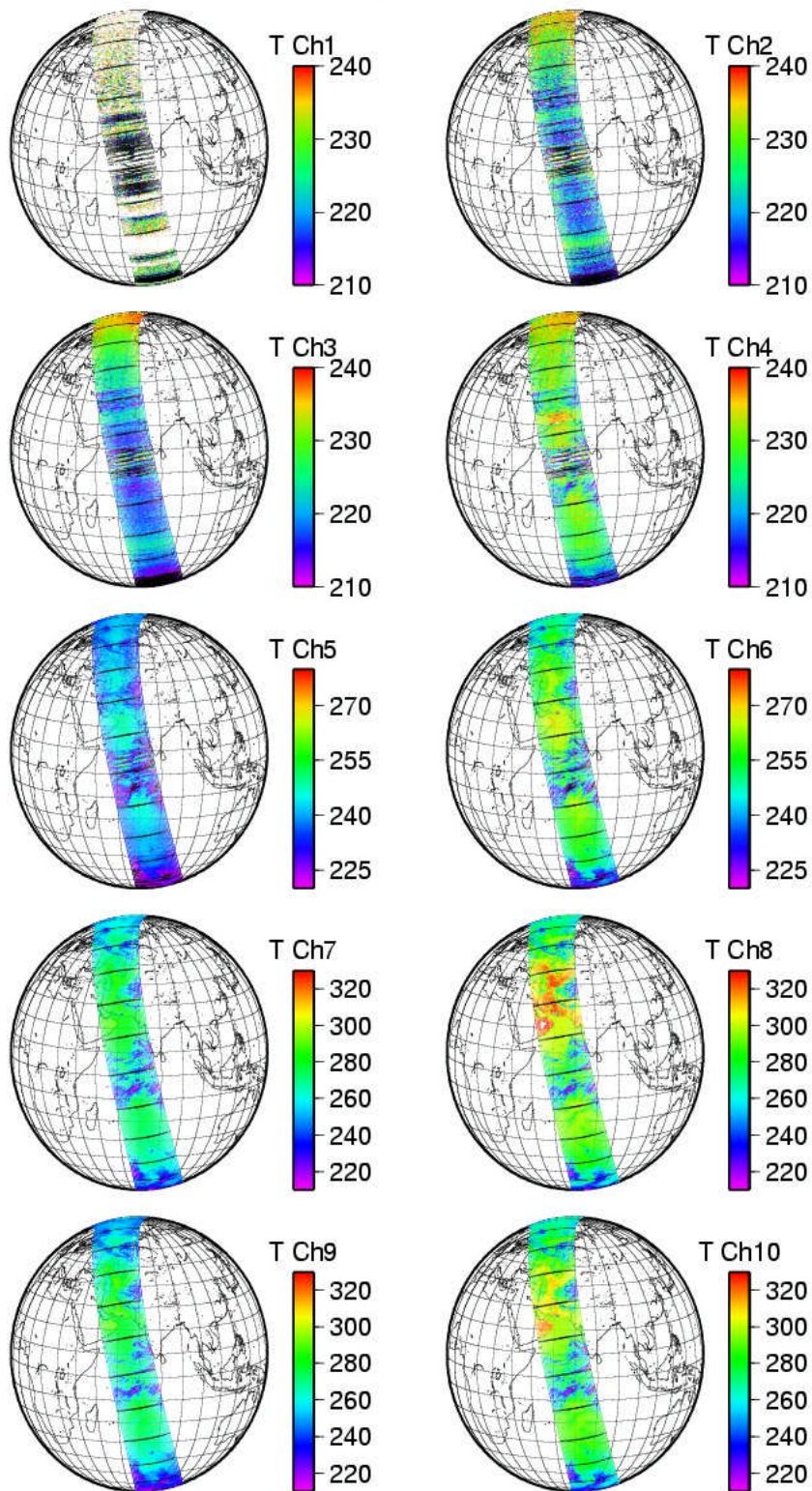
*AMSU-A Channels 11 to 15 (all scales in K)*



**Figure 4b AMSU-A Channels 11-15 Brightness Temperatures, NOAA-18 Orbit 155.**

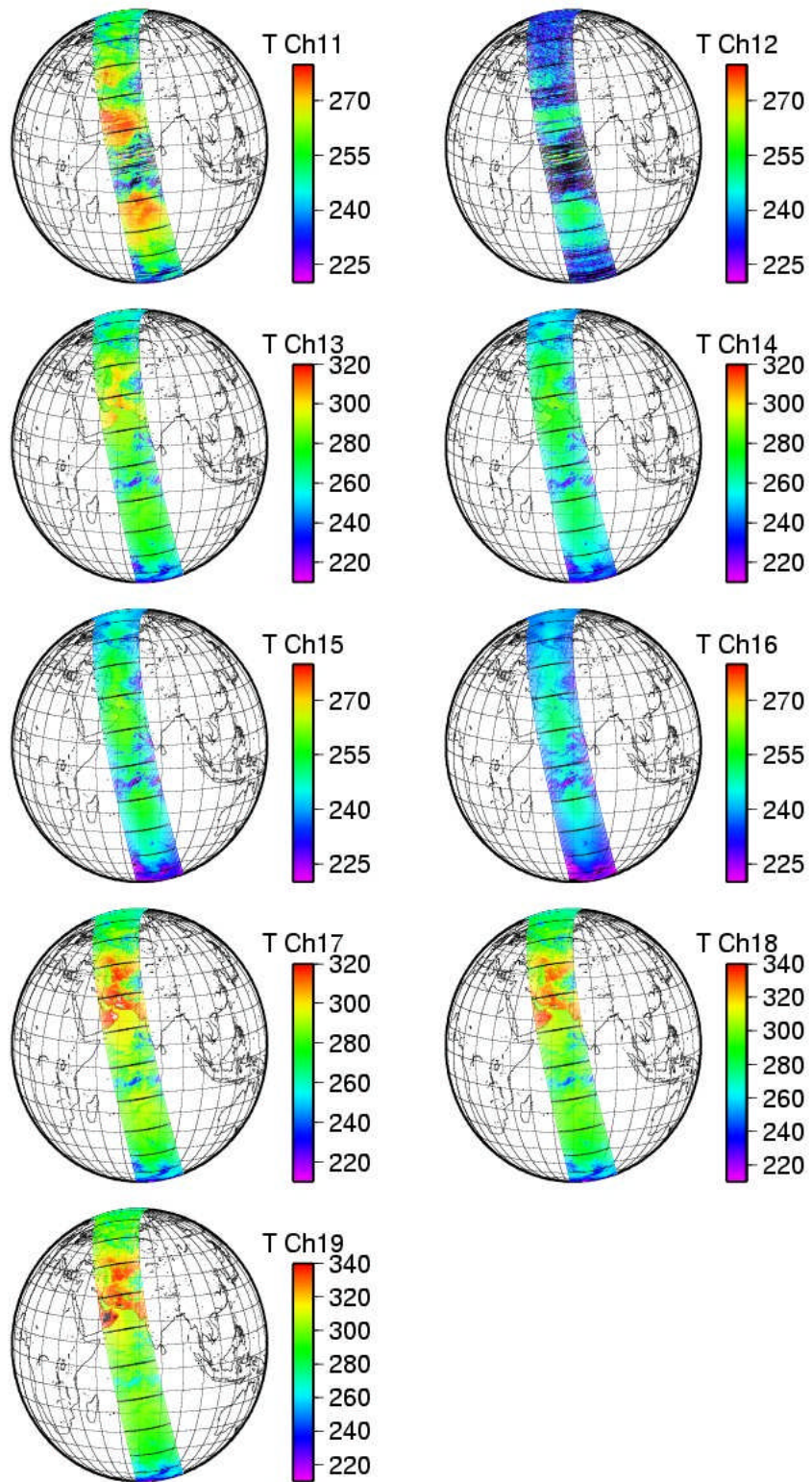


*HIRS Channels 1 to 10 (all scales in K)*



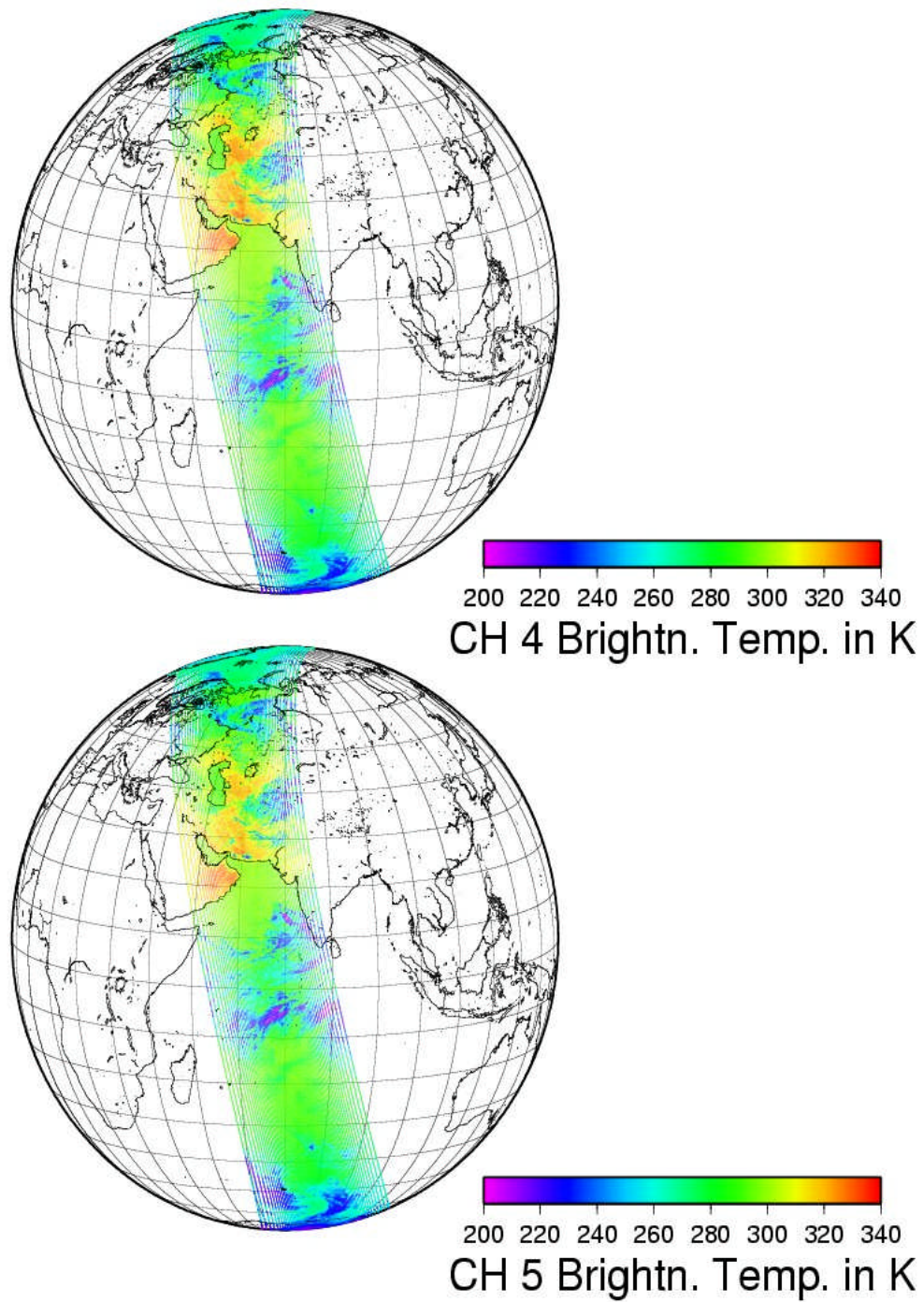
**Figure 4c NOAA-18 HIRS channel 1 – 10 Brightness Temperatures, Orbit 294.**

*HIRS Channels 11 to 19 (scales in K)*



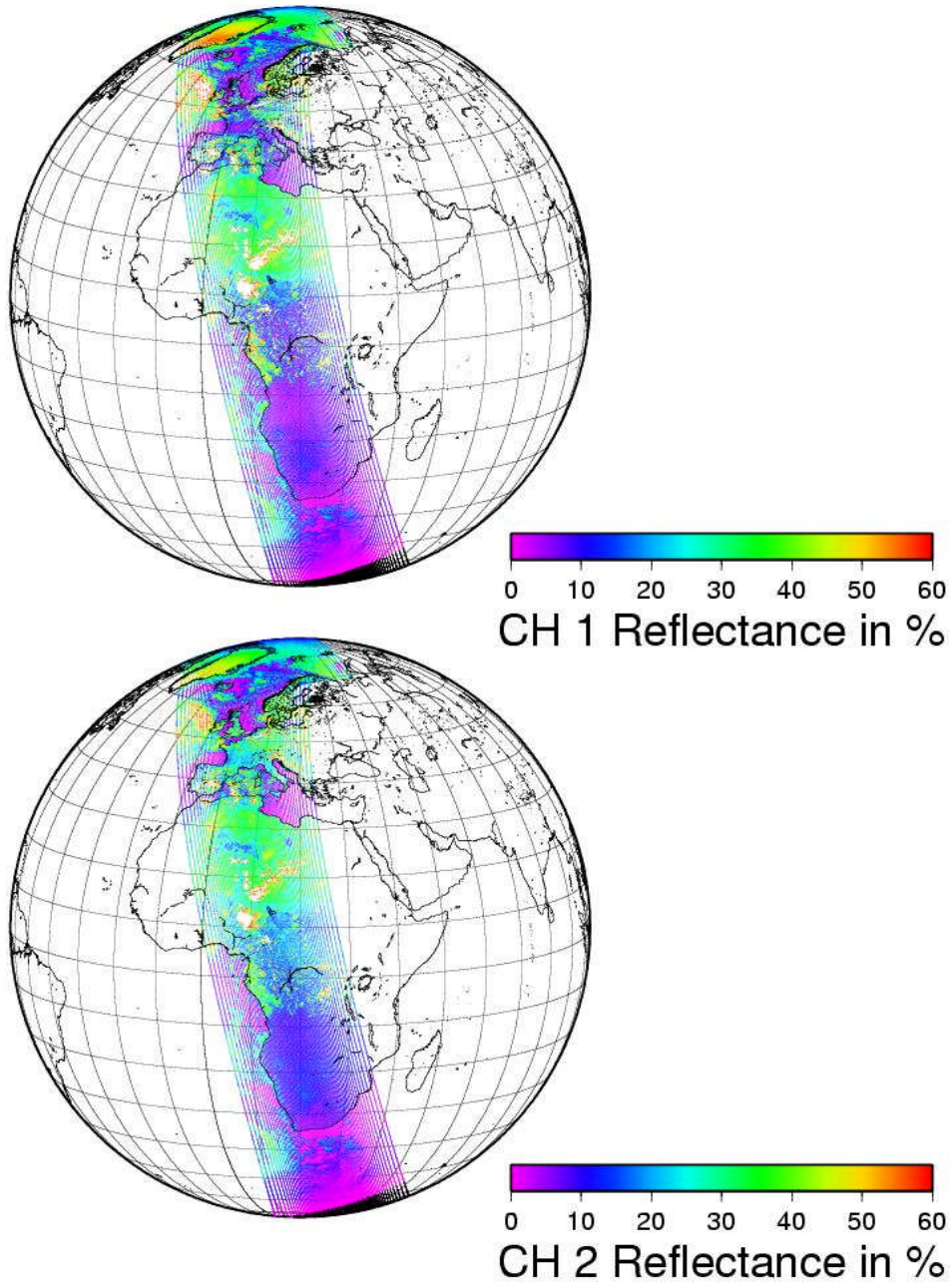
**Figure 4d NOAA-18 HIRS channel 11– 19 Brightness Temperatures, Orbit 294.**



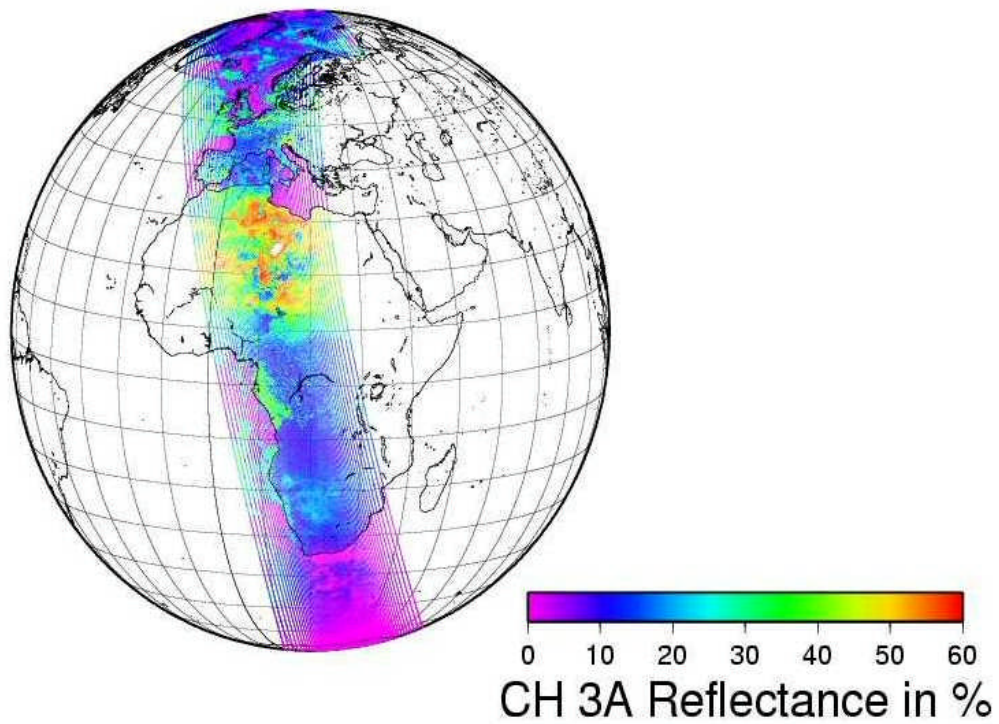


**Figure 4e NOAA-18 AVHRR IR channels 4 and 5 Brightness Temperatures, Orbit 294.**

The AVHRR visible and near IR channels were switched on first and were available and processed already for earlier orbits.



**Figure 5a: NOAA-18 AVHRR channel 1 and channel 2 Reflectances, Orbit 155.**



**Figure 5b. NOAA-18 AVHRR Channel 3 Reflectances, Orbit 155.**

With these data EUMETSAT has a complete reference set available for the testing of the Core Ground Segment (CGS) Product Processing Facility. A next step is to process NOAA-18 orbits in the CGS and to verify the results with the prototype output.



## **SUMMARY AND OUTLOOK**

EUMETSAT has processed the first data of the Initial Joint Polar System end-to-end with the available prototype and has provided the required reference data for a test of the CGS ATOVS PPF. This confirmed that the specifications of the algorithms were correct.

Current work is aimed to configure the CGS ATOVS PPF with NOAA-18 instrument parameters and prepare the testing of the operational chains with real data.

## **ACKNOWLEDGEMENTS**

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## **REFERENCES**

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