INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DATA BUOY COOPERATION PANEL

TWENTY-FOURTH SESSION

CAPE TOWN, SOUTH AFRICA
13-16 OCTOBER 2008

WORLD METEOROLOGICAL ORGANIZATION

DBCP-XXIV/Doc. 11.3
(24.IX.2008)

ITEM: 11.3

ENGLISH ONLY

ARGOS OPERATIONS AND DEVELOPMENT

(Submitted by CLS)

Summary and Purpose of the Document

As for past DBCP meetings, this document contains, in consolidated form, the summary report from CLS/Service Argos, covering report on 2007-2008 Operations and System Improvements.

ACTION PROPOSED

The Panel will review the information contained in this report and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices: A. Report on 2007 - 2008 Operations; and

B. Report on 2007 - 2008 System Improvements.

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

11.3.1 Bill Woodward and Christian Ortega presented a report from CLS / Service Argos, on 2007 - 2008 operations and system improvements.

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Appendices: 3

REPORT ON 2007 - 2008 OPERATIONS

1. 2007 OPERATIONS HIGHLIGHTS

- 2 ARGOS satellites decommissioned (NOAA-12 and -14);
- METOP A Data delivered to all ARGOS users on 1 August 2007;
- METOP HRPT OFF since 5 July 2007;
- ARGOS2001 Phase3 in operation since 9 September 2007;
- 9 new antennae added to ARGOS Real-time network;
- 2 Regional Processing Centers OFF; and
- Power outage test done successfully in October 2007.

2. CONTENT

3. SPACE SEGMENT

Argos constellation includes five satellites.

Satellites	Launch date	NOAA status	Real time data (HRPT)	Stored data (STIP)	Data AVHRR
METOP-A (MA)	19-Oct-06	AM Primary	ko	Svalbard	ok
NOAA-18 (NN)	20-May-05	PM Primary	ok	Gilmore, Wallops	ok
NOAA-17 (NM)	24-Jun-02	AM Backup	ok	Gilmore, Wallops	ok
NOAA-16 (NL)	21-Sep-00	PM Secondary	ok	Gilmore, Wallops	ok
NOAA-15 (NK)	13-May-98	AM Secondary	ok	Gilmore, Wallops	ok
NOAA-14 (NJ)	30-Dec-94	Decommissioned 23 May 2007			
NOAA-12 (ND)	19-Oct-06	Decommissioned 10 August 2007			
NOAA-11 (NH)	24-Sep-88	Decommissioned 16 July 2004			

Figure 1

Figure 2 shows Local Equator crossing time (ascending node) and associated predictions for 6, 12 and 24 months in March 2008.

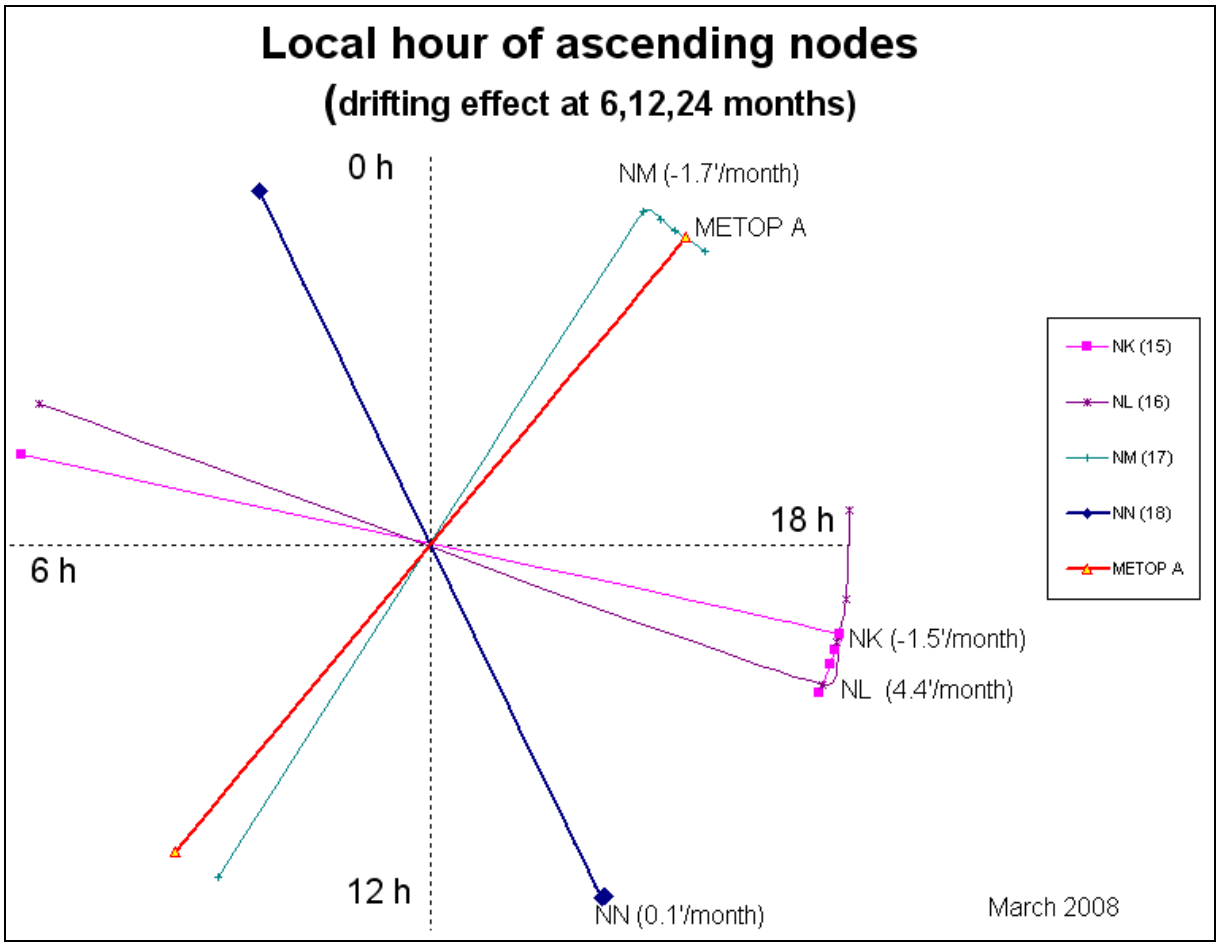


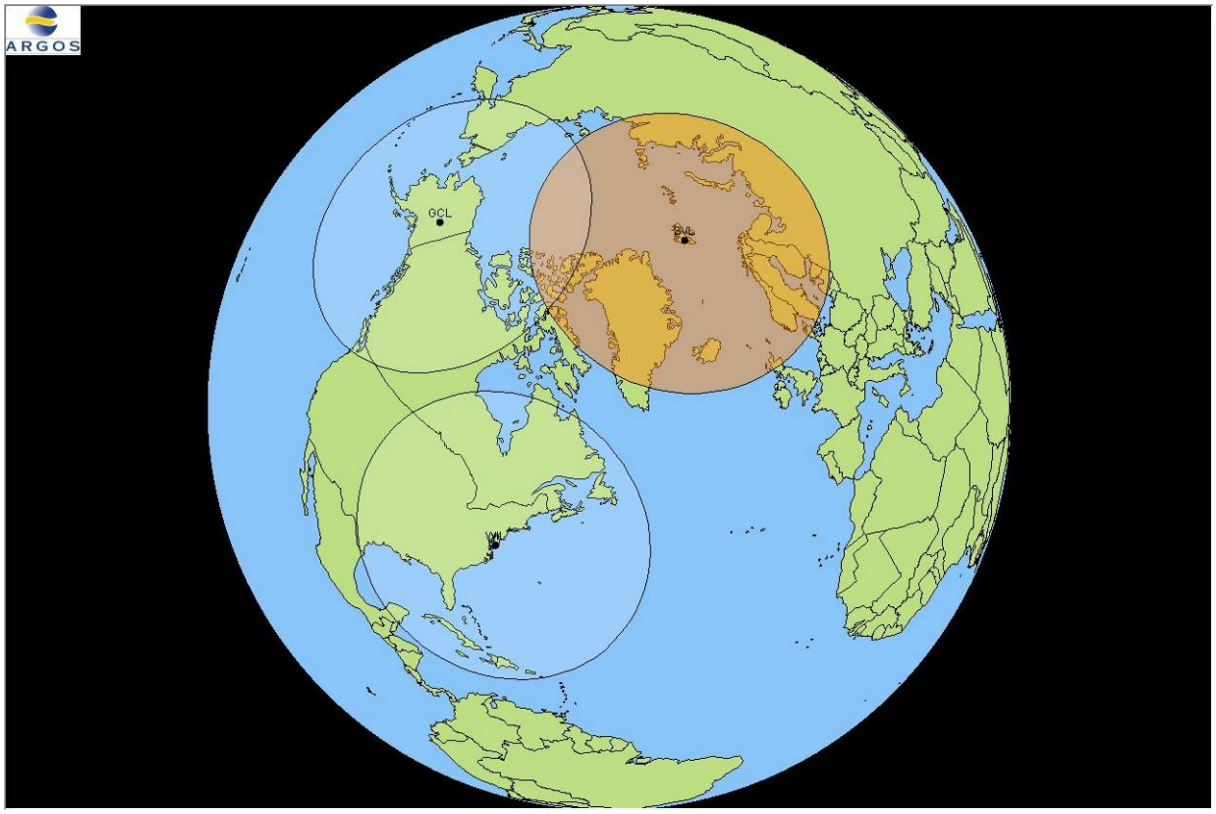
Figure 2

4. GROUND SEGMENT

4.1 Ground receiving stations

4.1.1 Global stations

Picture 1 shows Global stations



Picture 1

Operations were nominal on the two NOAA global stations (Fairbanks (AK, USA) and Wallops Island (VA, USA)) able to acquire the STIP telemetry from NOAA satellites.

Since METOP-A Launch, EUMETSAT global station (Svalbard (Norway)) is acquiring ADCS data and relaying these data through EUMETCAST network to CLS and CLSA (through NOAA / NESDIS).

On 7 August 2008, the blind orbit global datasets from the NOAA-18 spacecraft have been switched so that the data now comes through the Swalbard (SV) site instead of the Wallops Island (WI) and Gilmore Creek (GC) Command and Data Acquisition stations. Beginning on 7 August, the NOAA-18 blind orbits were no longer available from the DOMSAT. Users benefit from an immediate improvement in data timeliness since there is no more N18 blind orbits. In the event of problems retrieving the data through the Svalbard station, the Wallops Island and Gilmore Creek stations will capture the data.

NOAA-15, NOAA-16, NOAA-17 and NOAA-18 global datasets (STIP) data were delivered by these global stations (14 datasets per day on average).

Figure 3 shows daily NOAA global dataset acquisition
by the Global Processing Center in December 2007

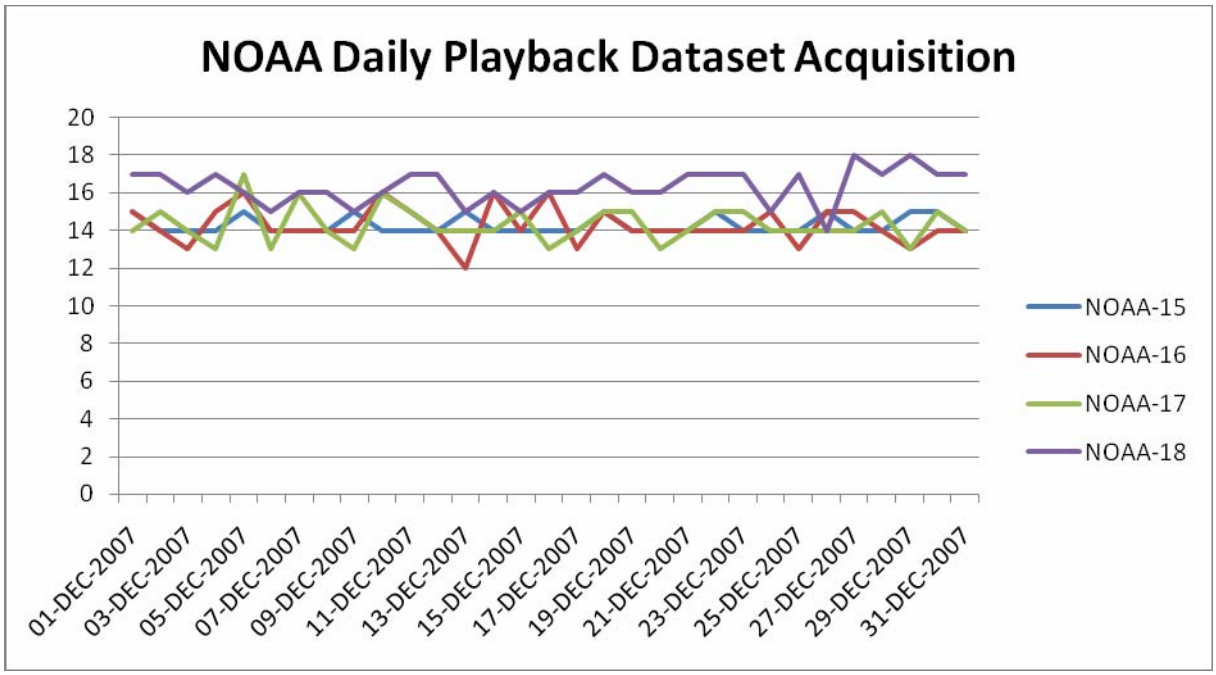


Figure 3

Figure 4 shows daily METOP-A global dataset acquisition into a Global Processing Center in December 2007 (METOP-A global dataset are 15 minutes data files)

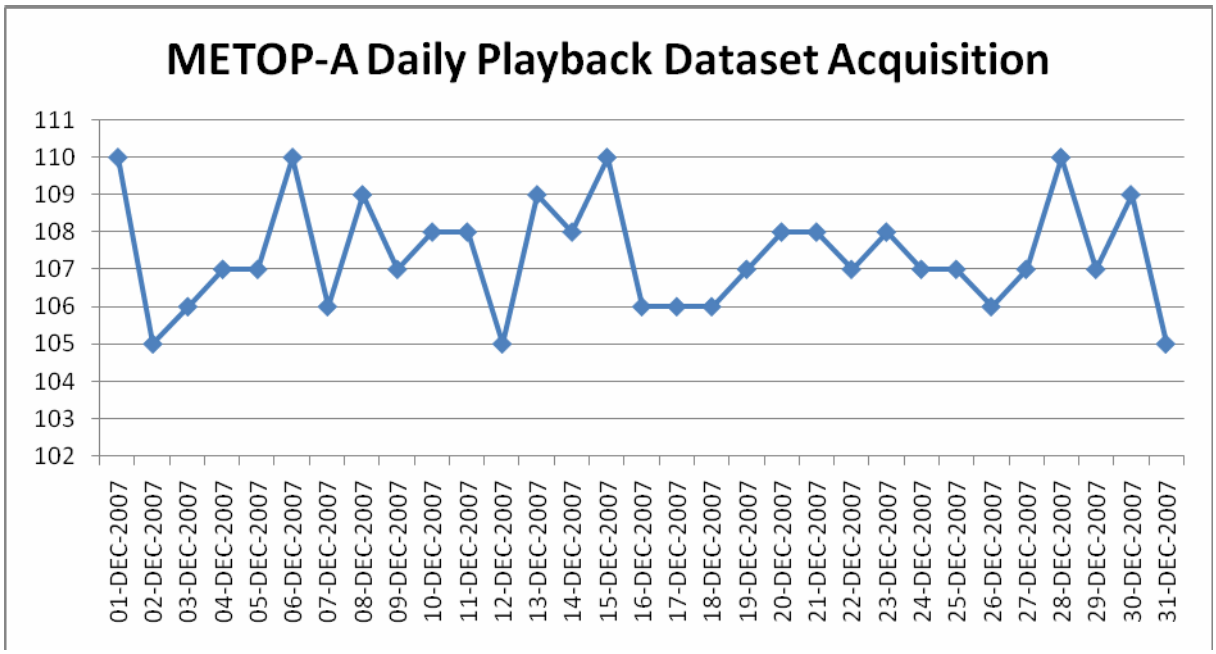


Figure 4

Figures 5 to 9 show global dataset arrival times
(On 31 December 2007) into a Global processing Center in 2007.

NOAA-15

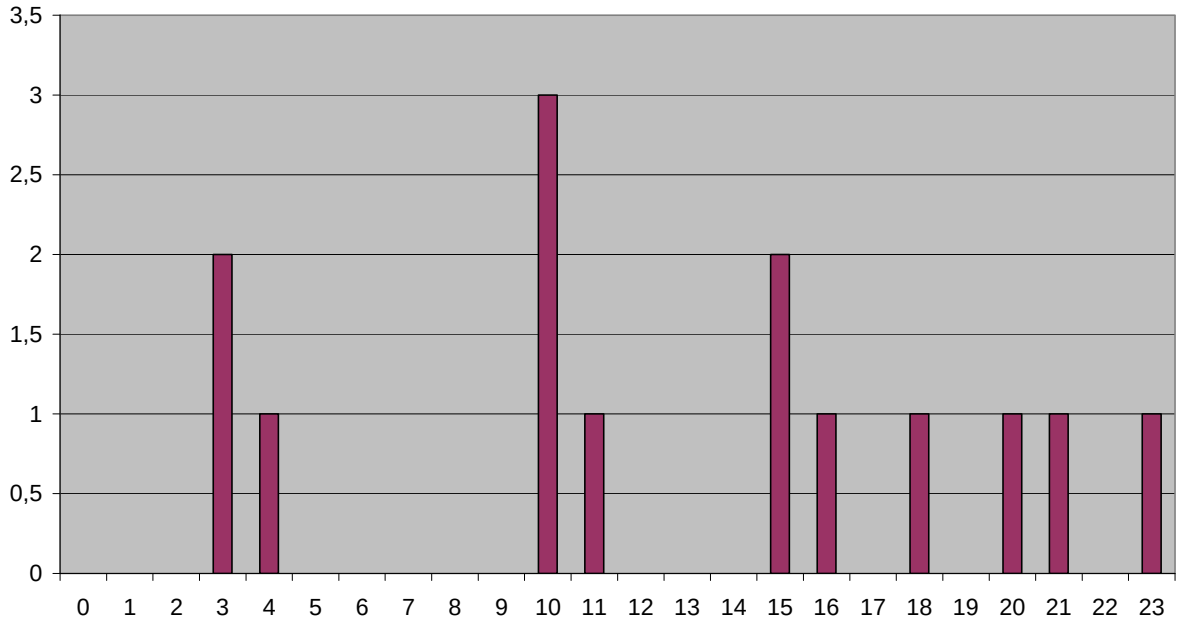


Figure 5

NOAA-16

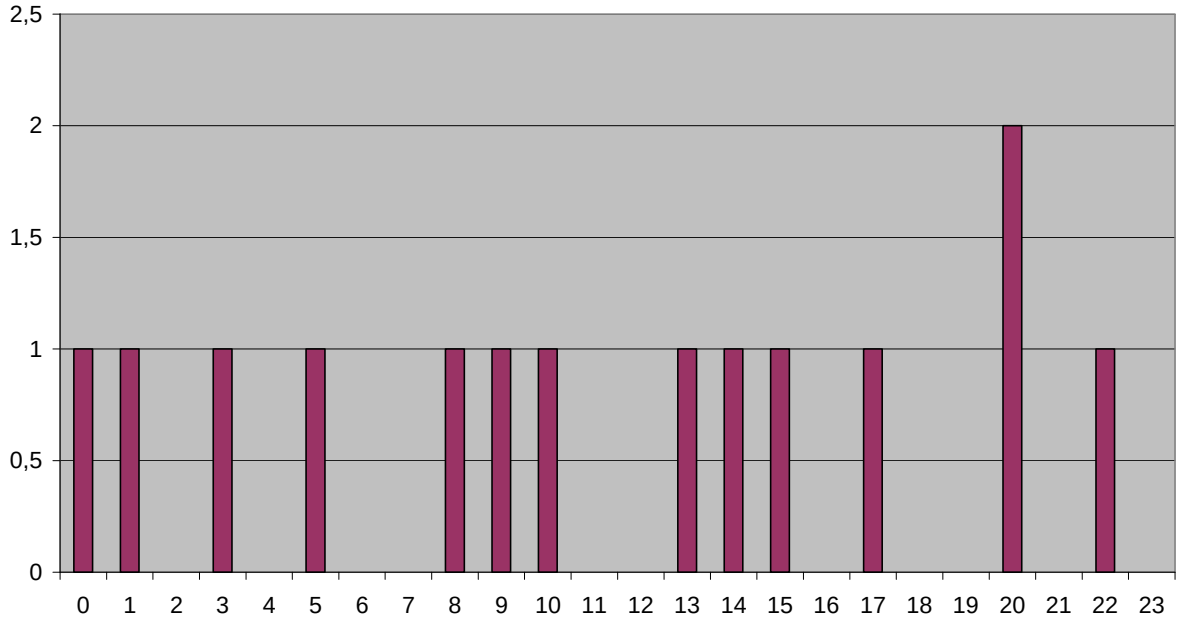


Figure 6

NOAA-17

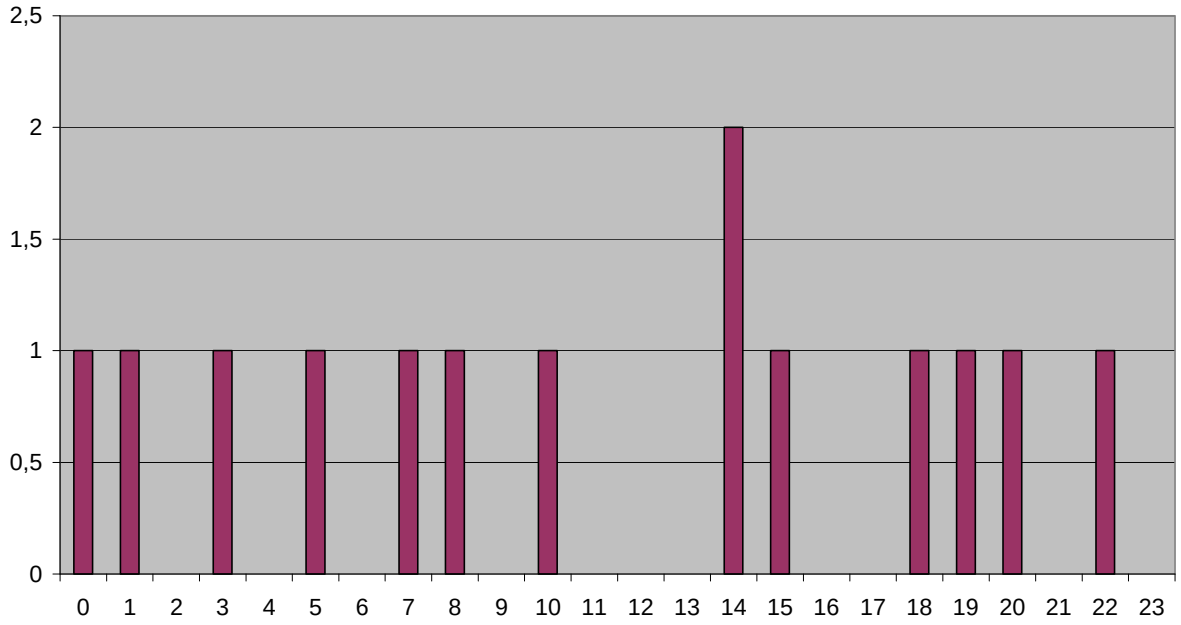


Figure 7

NOAA-18

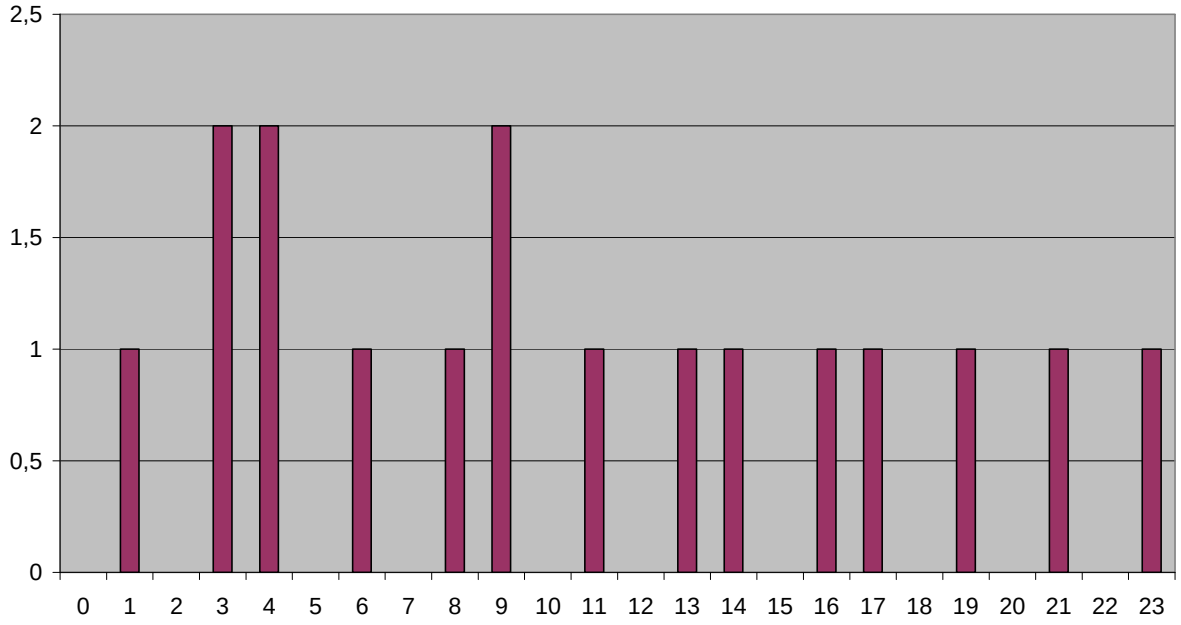


Figure 8

METOP-A

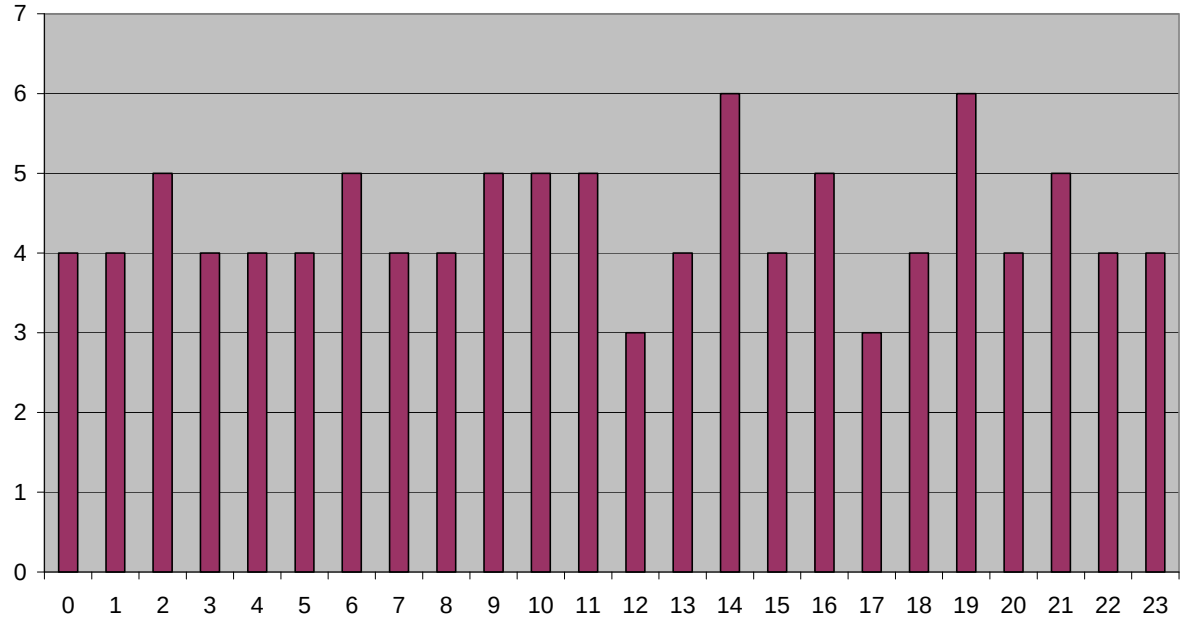
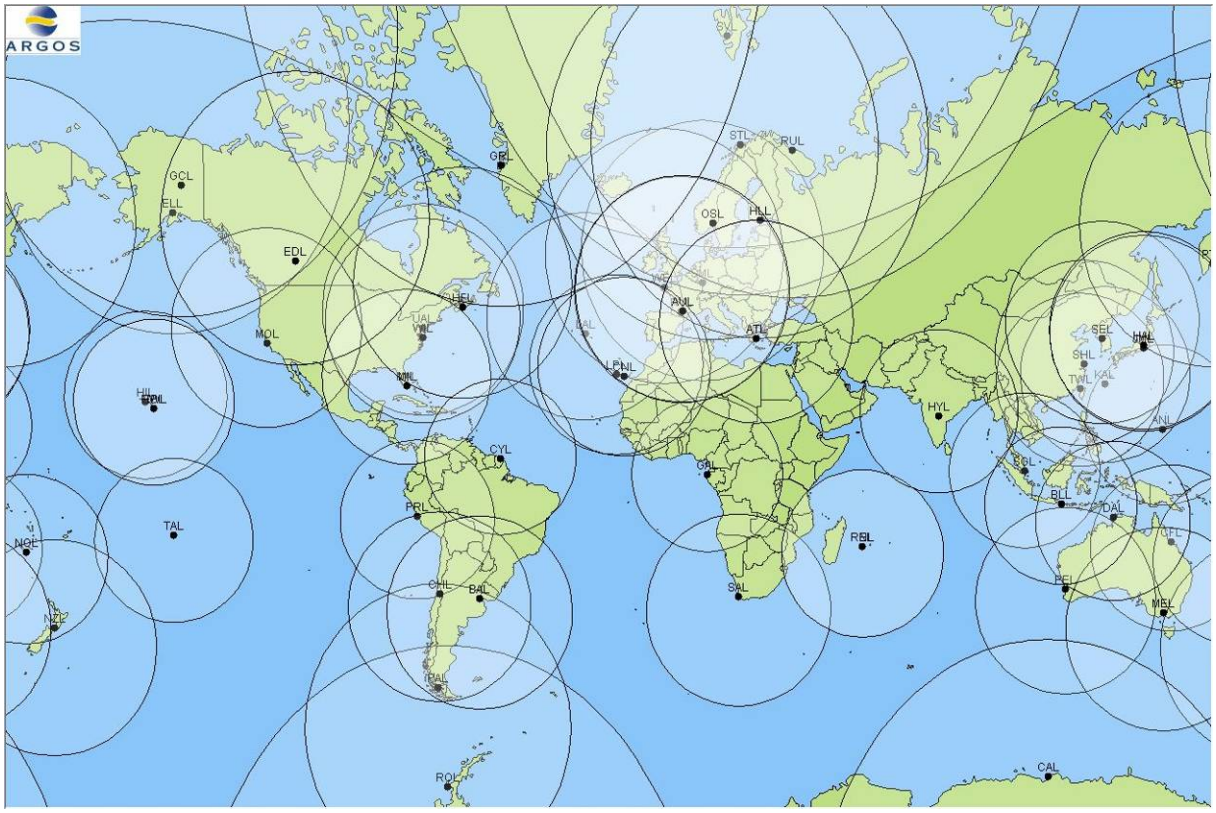


Figure 9

4.1.2 Regional stations

Picture 2 shows the 2007 / 2008 ARGOS real-time coverage

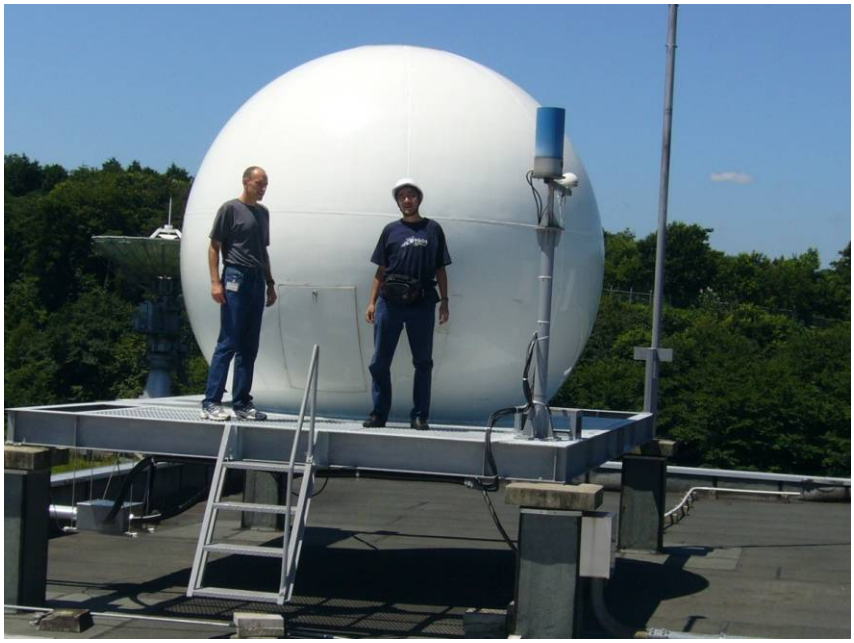


Picture 2

CLS and CLS America Inc. pursued their efforts in 2007 to increase and to consolidate the number of receiving stations able to provide TIP data sets from the NOAA and METOP satellites.

Nine stations joined the Argos network during the year:

- seven antennas operated by US Air Force;
- one antenna in Libreville (Gabon, CLS) operated by CNES; and
- one antenna in Hatoyama (Japan, CLS) operated by JAXA.



The seven USAF antennae are located in:

- Sembach (Air Base, Germany);
- Kadena (Air Base, Okinawa Japan);
- Andersen (Air Force Base, Guam ~Western Pacific);
- Hickam (Air Force Base, Honolulu Hawaii);
- Elmendorf (Air Force Base, Anchorage Alaska);
- Lajes (Air Base, Azores Portugal); and
- Valley Forge (Lockheed Martin Development / Test system, Pennsylvania).

Picture 3 shows the seven USAF antennae coverage

Picture 3

In 2007, they were 51 stations delivering real-time datasets (TIP) to CLS and CLS America Inc. Most of them process data from NOAA-18, NOAA-17, NOAA-16 and NOAA-15, allowing CLS to maintain a good throughput times for results delivery.

Bitung, Fidji and Ryadh antennae were removed from operation monitoring in 2007.

List of regional receiving stations:

Antennas	Sigle	Country	Operator	Possible satellites
Andersen USAF	AN	UNITED STATES	CLS	NK,NM,NN
Athenes	AT	GREECE	CLS	NK,NL,NM,NN
Aussaguel	AU	FRANCE	CLS	NK,NL,NM,NN
Buenos Aires*	BA	ARGENTINA	INTA	NK,NL,NM
Bali	BL	INDONESIA	PT CLS	NK,NL,NM,NN
Casey	CA	AUSTRALIA	BOM	NK,NL,NM
Cape Ferguson NOAA	CF	AUSTRALIA	NOAA	NL,NM,NN
Santiago	CH	CHILE	Meteo Chile	NK,NL,NM,NN
Las Palmas	CN	SPAIN	CLS	NK,NL,NM,NN
Cayenne	CY	FRANCE	IRD	NK,NL,NM
Darwin	DA	AUSTRALIA	BOM	NK,NM
Edmonton	ED	CANADA	Envir. Canada	NK,NL,NM
Elmendorf USAF	EL	UNITED STATES	CLS	NK,NM,NN
Libreville	GB	GABON	CNES/CLS	NK,NL,NM,NN
Gilmore	GC	UNITED STATES	NOAA/NESDIS	NK,NL,NM,NN,MA
Sondre	GR	GREENLAND	DMI	NK,NL,NM
Hatoyama	HT	JAPAN	JAXA/EOC	NK,NL,NM,NN,MA
Halifax	HF	CANADA	Can. Coast Guard	NK,NL,NM
Hickam USAF	HI	UNITED STATES	CLS	NK,NL,NM,NN
Helsinki	HL	FINLAND	CLS	NK,NL,NM,NN
Hawai	HW	UNITED STATES	NOAA/NWS	NK,NL,NM
Hyderabad	HY	INDIA	INCOIS	NK,NL,NM,NN
Tokyo	JM	JAPAN	Jamstec	NK,NL,NM,NN
Kandena USAF	KA	JAPAN	CLS	NK,NM,NN
Lajes USAF	LA	SPAIN	CLS	NK,NM,NN
Lima METOP	LM	PERU	CLS Perou	NK,NL,NM,NN,MA
Las Palmas	LP	SPAIN	Univ. Las Palmas	NK,NL,NM
Miami NOAA	MA	UNITED STATES	NOAA/AOML	NK,NL,NM
Melbourne	ME	AUSTRALIA	BOM	NK,NL,NM,NN
Noumea Meteo France	NC	NEW CALEDONIA	Meteo France	NK,NM,NN
Noumea IRD	NO	FRANCE	IRD	NK,NM
Wellington	NZ	NEW ZEALAND	Met Office	NK,NL,NM
Oslo	OS	NORWAY	NMI	NK,NL,NM,NN
Perth	PE	AUSTRALIA	BOM	NK,NL,NM,NN
Lima	PR	PERU	CLS peru	NK,NL,NM,NN
Petropavlosk	PT	RUSSIAN FEDERATION	Complex System	NK,NL,NM,NN
Ile de la Reunion	RE	FRANCE	IRD	NK,NL,NM
Ile de la Reunion	RN	FRANCE	Meteo France	NL,NM

Rothera	RO	INDONESIA	PT CLS	NK,NL,NM,NN
Cape Town	SA	SOUTH AFRICA	CLS/SAWB	NK,NL,NM,NN
Seoul	SE	KOREA, REPUBLIC OF	KMA	NL,NM,NN
Singapore	SG	CHINA	SMM	NK,NM
Shangai	SH	CHINA	East China Sea Fisheries	NK,NL,NM,NN
Sembach USAF	SM	GERMANY	CLS	NK,NM,NN
Tromsoe	ST	NORWAY	KSAT	NL,NM,NN
Papeete	TA	FRANCE	IRD	NL,NM,NN
Taiwan	TW	TAIWAN, REPUBLIC OF CHINA	National Taiwan Ocean Uni	NL,NM,NN
Valley Forge USAF	UA	UNITED STATES	CLS	NK,NL,NM,NN
Lannion	WE	FRANCE	Meteo France	NL,NM,NN,MA
Wallops	WI	UNITED STATES	NOAA/NESDIS	NK,NL,NM,NN,MA

*****the only station to locate the satellites when they are situated at a 20° or greater site angle

Antennas under agreement
CLS and subsidiaries antennas
Customer antennas under CLS maintenance contract
Antennas without written agreement ("Best effort")

Future METOP Real-time coverage is shown on Picture 4.

Picture 4

Today, Gilmore, Wallops, Lannion and Hatoyama are fully operational and compatible with METOP real-time.

Figure 10 shows daily real-time dataset acquisition into a global processing center in December 2007. High tracking Priority is given to NOAA-17 and Low priority tracking to NOAA-15.

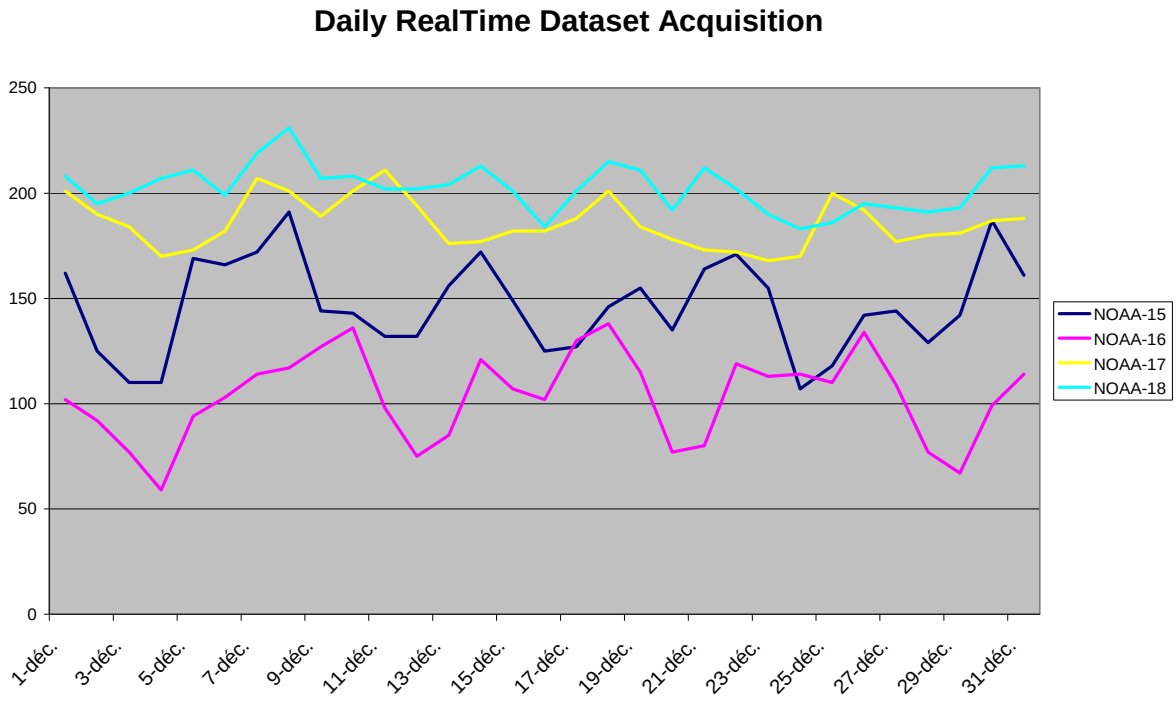
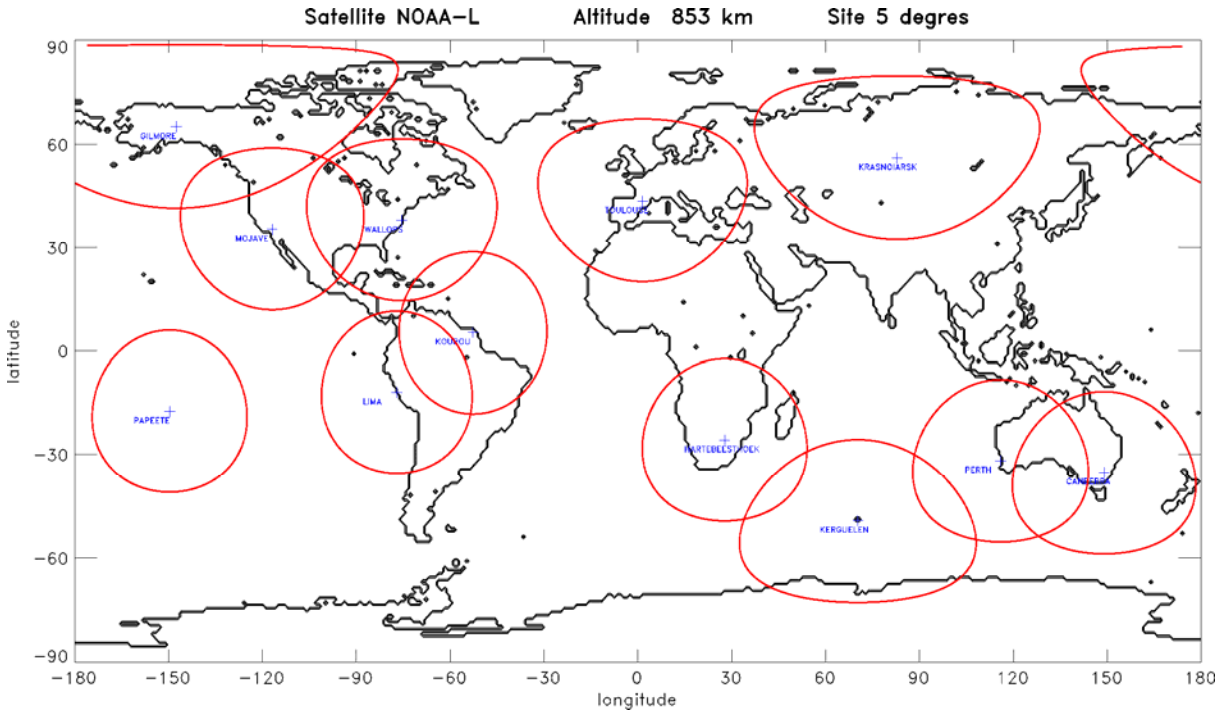


Figure 10

4.2 Orbitography PTT network

Picture 5 displays CLS Orbitography beacons location.



Picture 5

1- TOULOUSE	OK
108 - GILMORE_N	OK
109 - KOUROU_N	OK
111 - HARTBEES_N2	Small amount data on NOAA 12
112 - CANBERRA_N	OK
113 - LIMA-N	OK
114 - KRASNOIARSK	Stopped on 01/26/06. Expecting administrative paper in order to restart this PTT. A. Salman in charge.
116 - PAPEETE	OK
118 - WALLOPS	OK
119 - KERGUELEN_N	OK
149 - PERTH	OK
110 - MOJAVE	Stopped on 12/12/06. Power problem. CLS America in charge.

4.3 Processing centers

Picture 6 displays CLS Group processing centers.

Picture 6

4.3.1 Global processing centers

The two global processing centers in Toulouse and Largo were nominal. More than 800 (200 less than in 2006) data sets per day (200 global (STIP) data sets, 600 Real-time (TIP) data sets) are processed in each centers (see Figure 11).

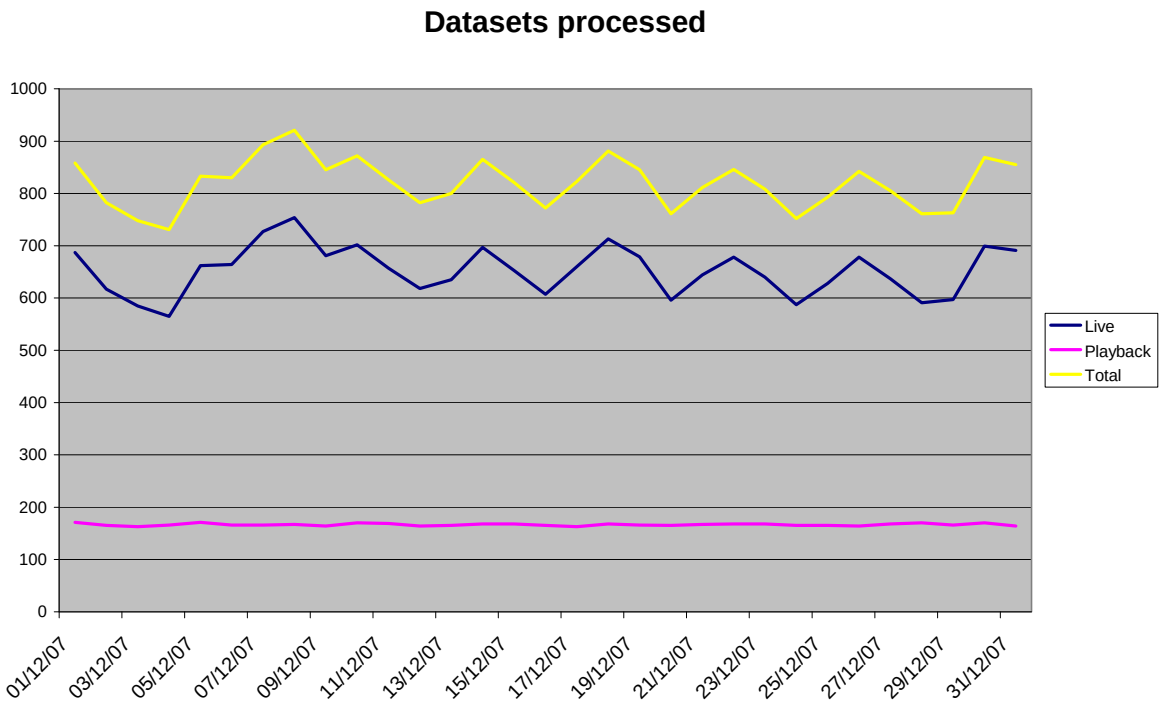
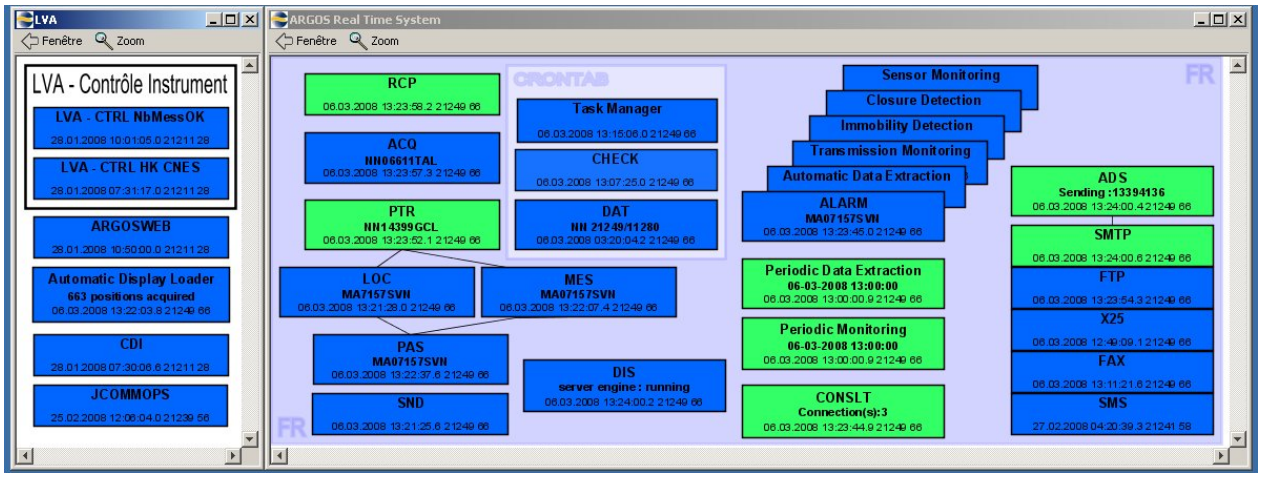


Figure 11

A major software change was implemented in both global processing centers in 2007. ARGOS2001 Phase3A is now in place and operated by CLS and CLS America, Inc. Operational teams.



CLS is monitoring JCOMMOPS Web Services and computer architecture since December 2007.

CLS is executing a power outage test once a year. The test in October 2007 went really well and all system operation procedures (SOPs) were successfully tested. CLS America, Inc. was in backup-mode during the test.

4.3.2 Regional Processing Centers

Two Regional Processing Centers were stopped in 2007. CUBIC-I (Japan) and PT CLS

Indonesia (Indonesia) are no longer hosting a Regional Processing Center architecture.
Lima (Peru) center was nominal.

Reminder: A regional processing center only process data sets from stations covering their region. Supplementary data providing global coverage are supplied by the Toulouse center or by the Largo center if necessary.

5. COMMUNICATION LINKS

CLS has improved his Internet link and are now connected each other to two different providers: Two lines (10M each) with Bandwidth Tunnelling by application.

The Internet is still the main communication link used to distribute processed data to users and to retrieve data sets from receiving stations. Security functionalities are available: SSH, PGP, HTTPS.

The X25 protocol is only used and maintained by the Toulouse center to send data to a few users (less than 20) concerned by security reasons.

6. STATISTICS

Daily and Monthly Active PTT

The number of Argos platforms operating continues to increase. In June 2007, more than 9500 platforms were seen on average per day. However, each of the two global centers processed data from 17,800 individual platforms during this month (Figure 11).

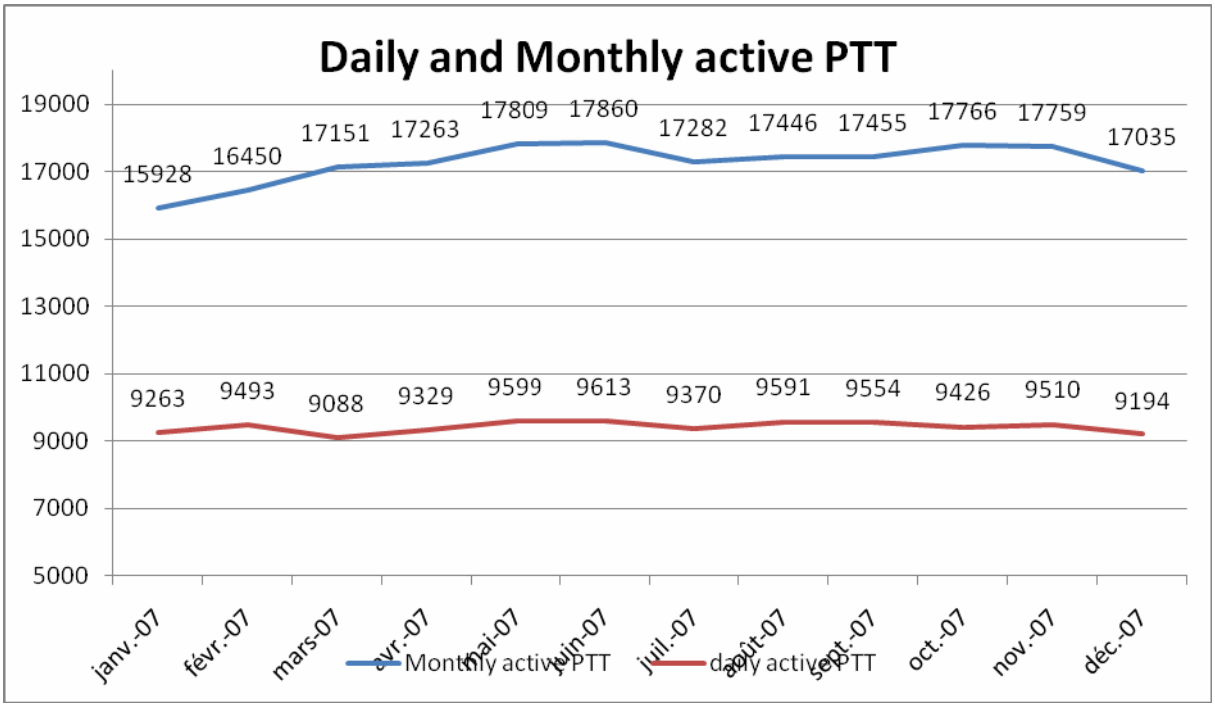


Figure 11

TELNET access

Figure 12 shows the connexion number on 1 July 2007
and the user number using TELNET that day.

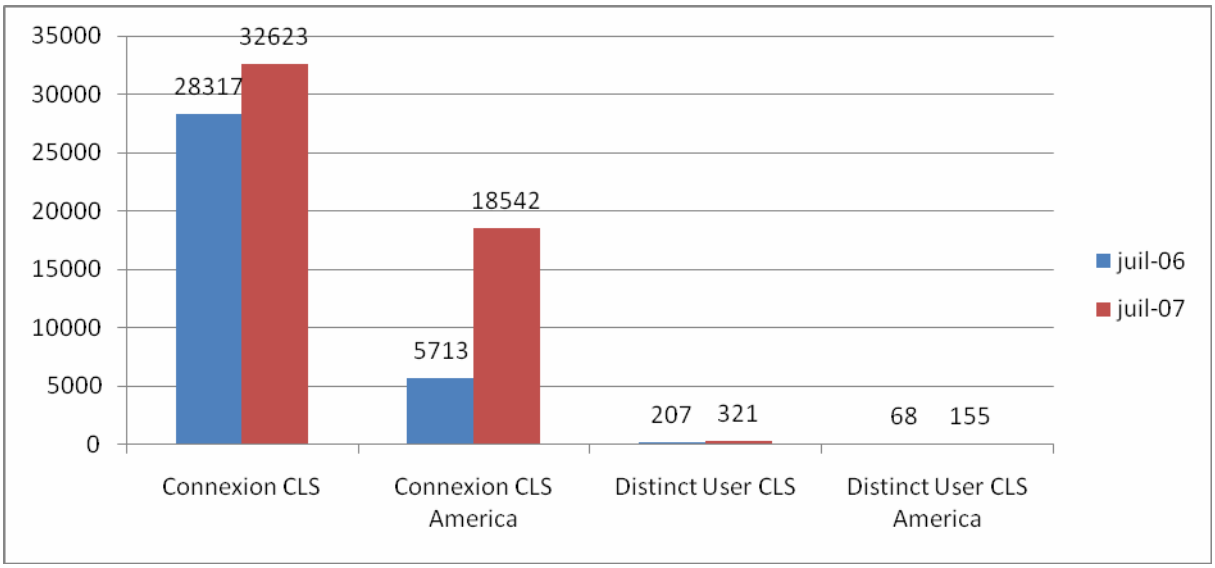


Figure 12

Figure 13 shows the number of commands used on
1 July 2007 per ARGOS available commands in CLS.

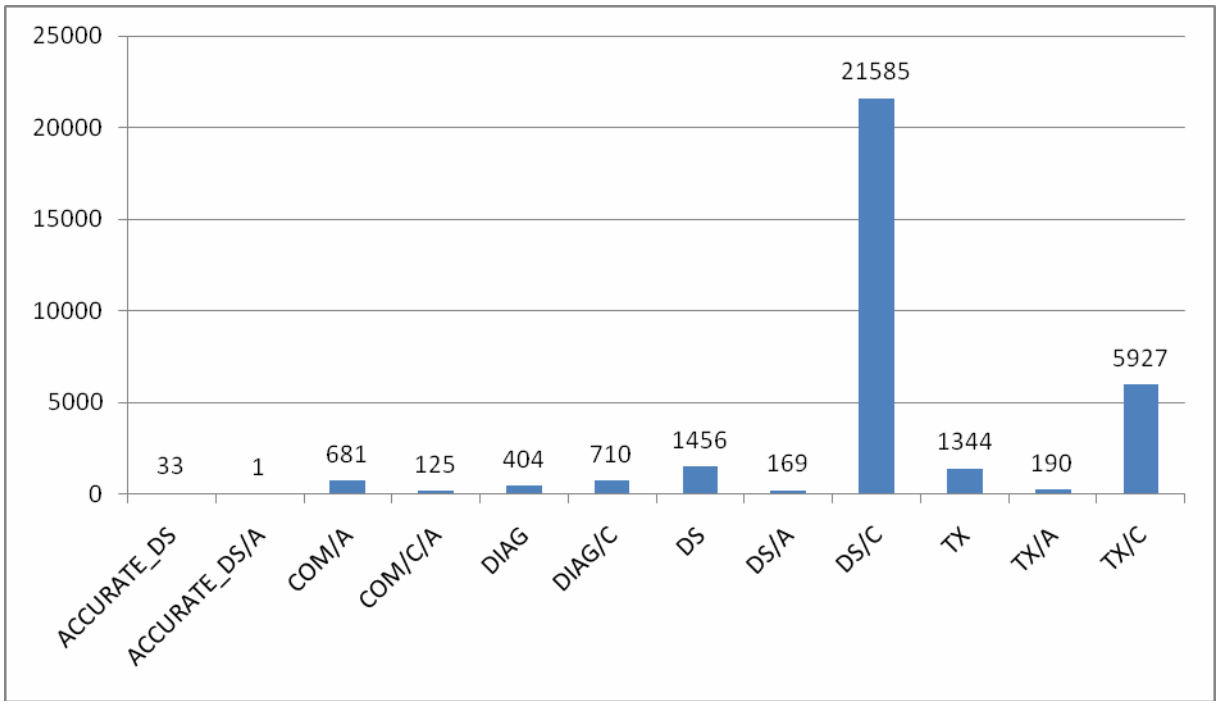


Figure 13

Figure 14 shows the number of commands used on
1 July 2007 per ARGOS available commands in CLS America, Inc.

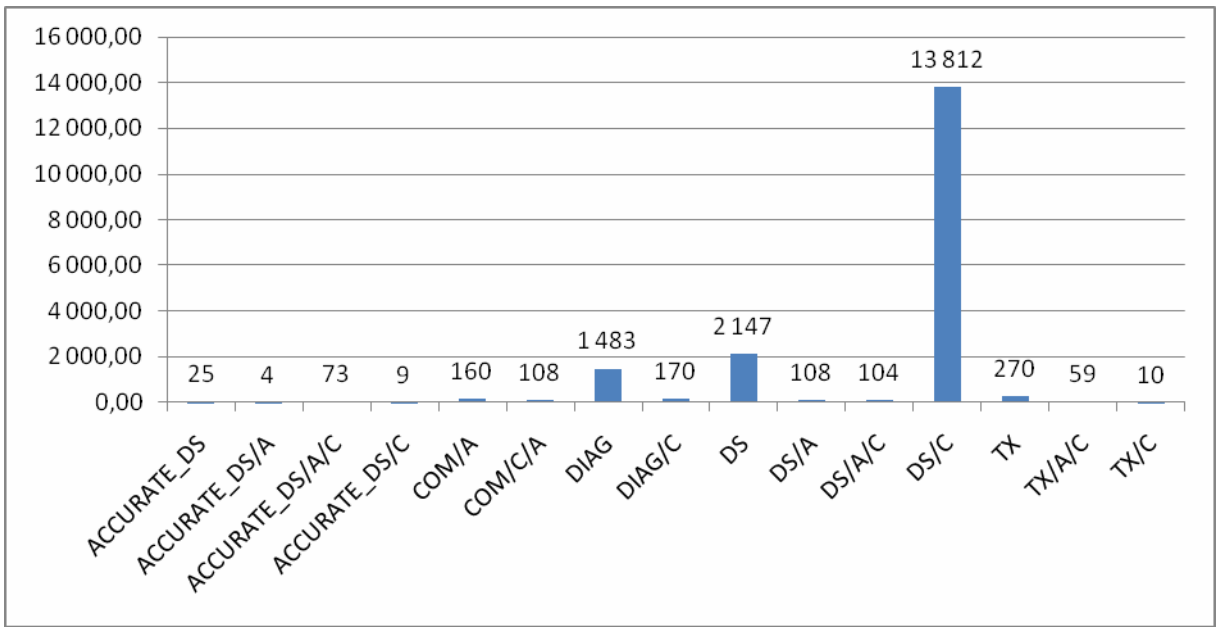


Figure 14

ArgosWeb access

Figure 15 shows average connections per hour on ArgosWeb (Operational only in CLS).

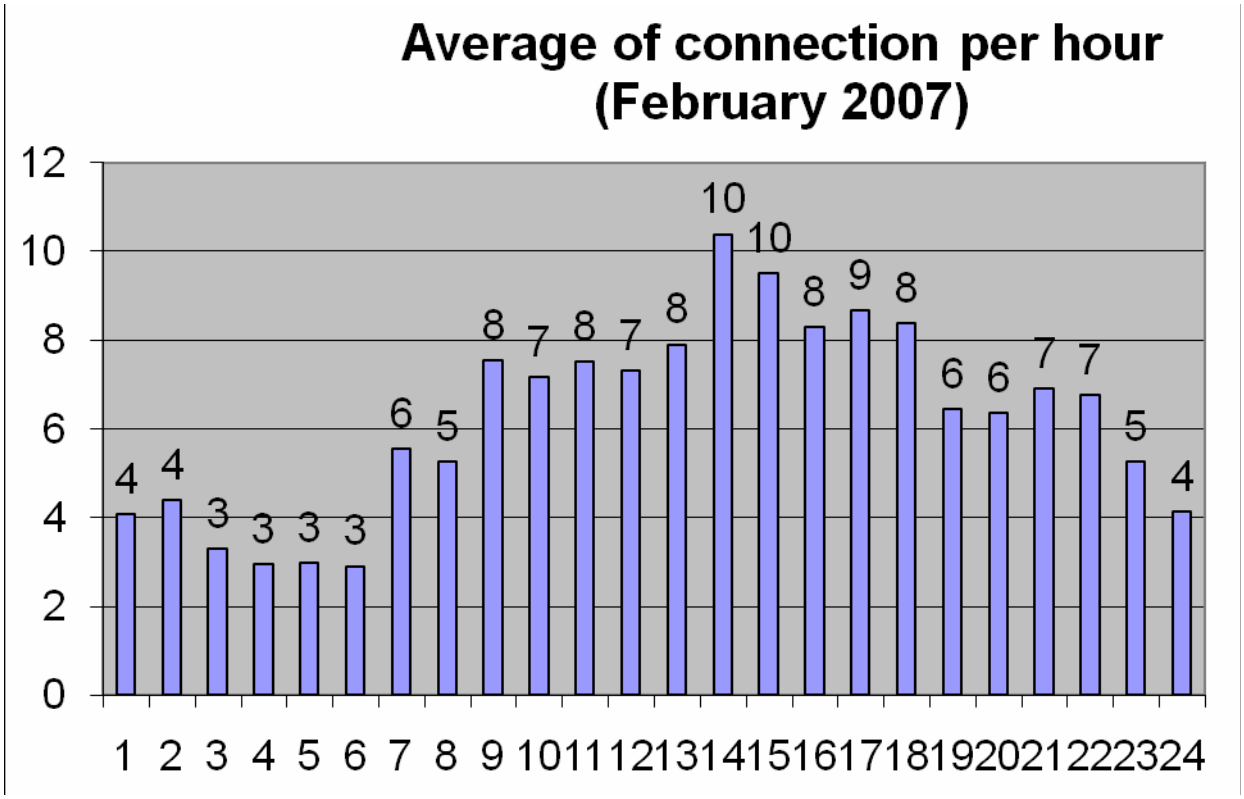


Figure 15

On average, ArgosWeb receives 150 connexions per day (80 during the W-E).

ARGOS Messages

In 2007, the number of locations and messages computed every day by the Largo and Toulouse centers are, in average:

Messages received: 1,957,500 / day
Distinct Messages received: 972,000 / day
Argos Locations: 66,750 / day
GPS Locations: 163,150 / day.

Access availability

The average availability is 99,77% in 2007.

Figure 16 shows the ARGOS Processing system availability at CLS in 2007. During the unavailability of the services in CLS, data was delivered by CLS America, Inc. in accordance with the back-up procedure.

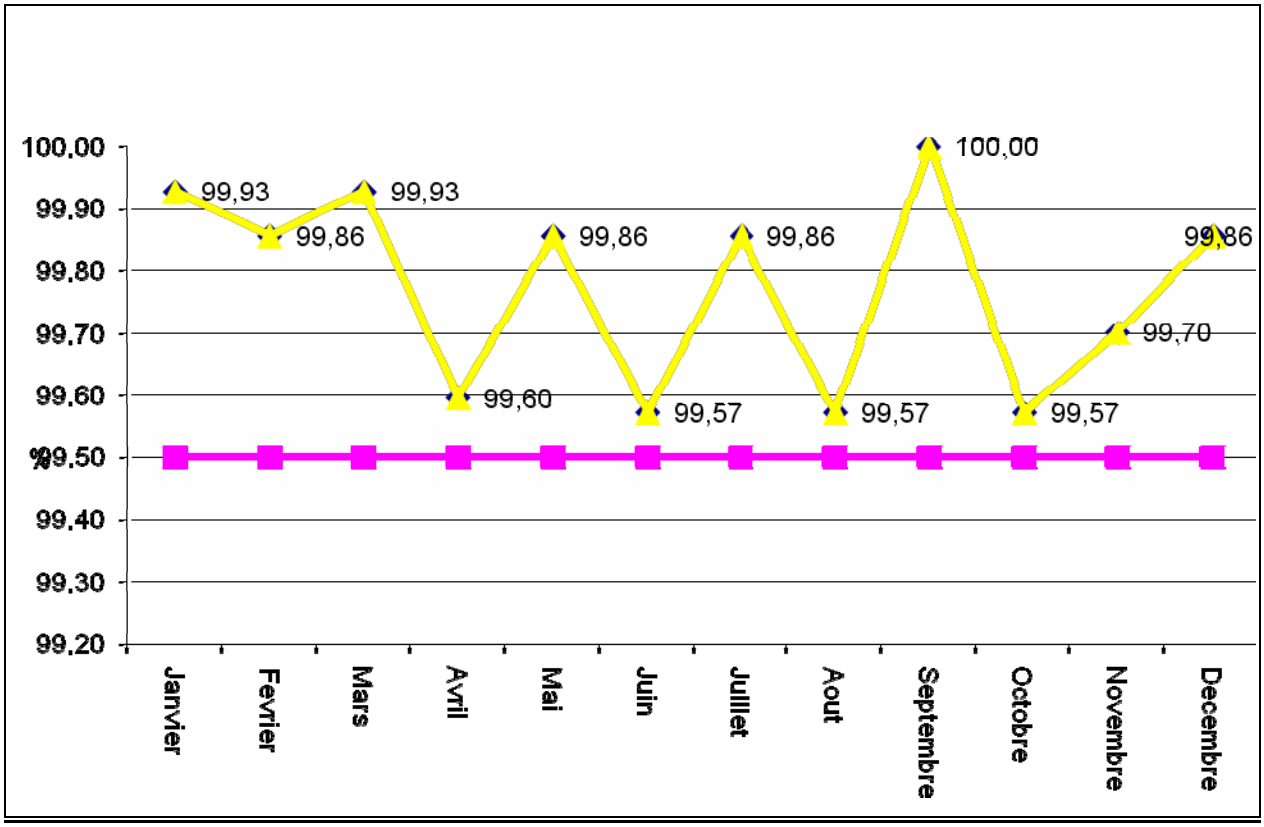


Figure 16

No major anomalies have impacted the ARGOS data availability.

7. 2008 PERSPECTIVES

- ARGOS3 (Downlink) into operation;
- New antennae with EARS network,
- Disaster Recovery implementation,
- ARGOS2001 Phase3B (GTS) in operation;
- Monthly Argos operation report available*;
- Throughput time calculation has been redefined and will be implemented in 2008. Statistics on throughput times will be again available in mid-2008.

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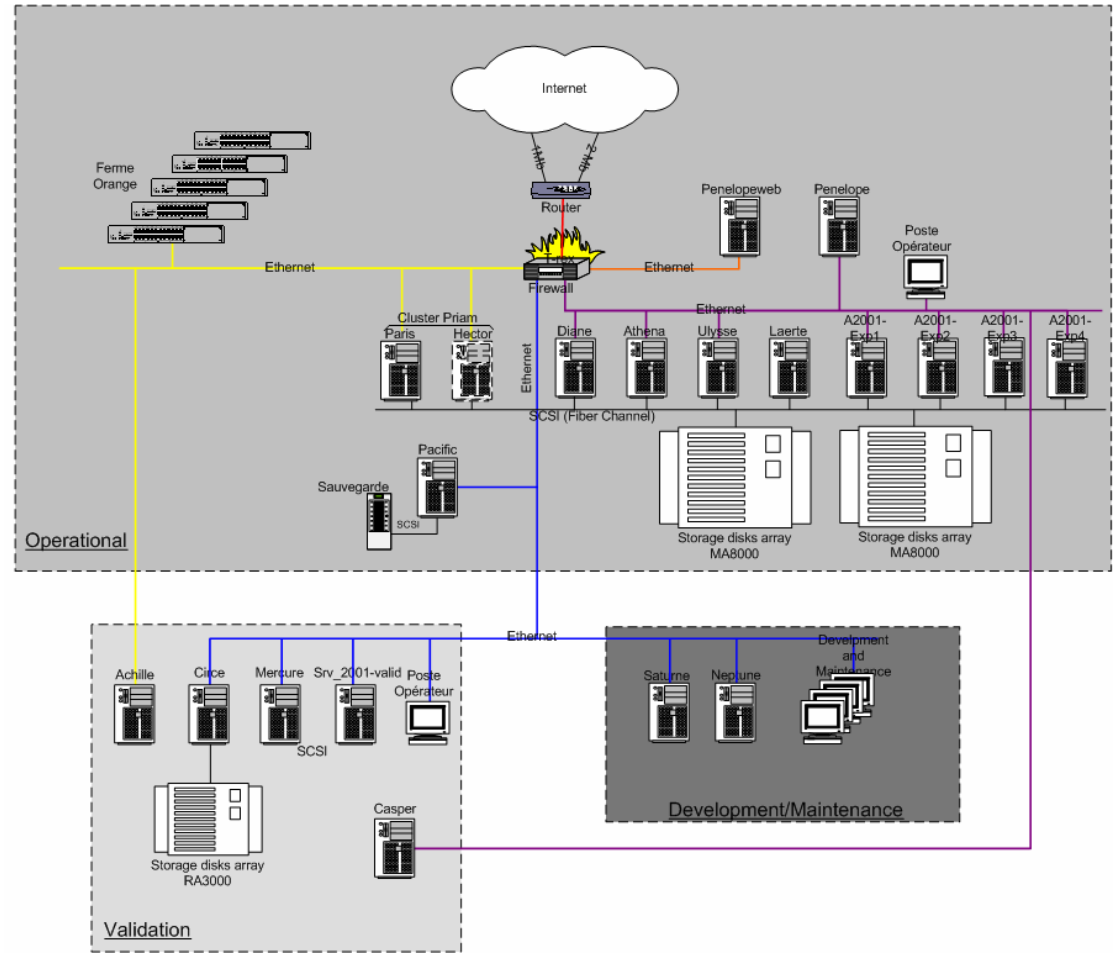
REPORT ON 2007 - 2008 SYSTEM IMPROVEMENTS

1. HARDWARE CONFIGURATION

The computing architecture dedicated to the Argos system is still the same and no significant modification is to be mentioned in 2007.



The heart of the architecture is composed of two high-performance disk storage arrays on which are connected, via fiber channel links, the servers involved in the processing of the Argos data. Most significant modifications which have been done in 2007 have concerned the increasing of the space disk.

The operational configuration is of course dedicated to the acquisition, the processing and the dissemination of the Argos data, 24-hours a day, all along the year. The development and the maintenance of the Argos software are performed on a dedicated architecture. The third configuration, the validation configuration, is used to validate all the software modifications and corrections before being installed at the level of the operational configuration.

In 2007, CLS did significant progress with our project of creating a second computing center in addition to the existing CLS computing center. CLS succeeded to fix most of the problems CLS had and now the project is running well. The second computer room, located in CNES premises, is ready (air conditioning, secured power supply, etc.) and is connected, via optical fiber links, to the CLS computer room. Servers, disk shelf arrays, switches,.etc. have to be moved now to the second computer room. This will be done in fall 2008.

This project aims at improving the operation level of our services as well as assuring the continuity of the processing and distribution of the Argos data even in case of disaster such fire, flooding, etc.

2. GROUND SEGMENT ARCHITECTURE

The Argos ground segment is composed as follow:

- the delayed-time acquisition network;
- the real-time acquisition network;
- the Global Argos Control and Processing centre;
- the PTT and PMT; and
- the regional processing centers.

2.1 The global mode acquisition network

It is composed of the three NOAA global stations (Fairbanks, Wallops Island and now Svalbard) for the acquisition of the NOAA satellites data and the Eumetsat antenna (Svalbard) for the acquisition of the MetOp data.

In August 2007, in order to eliminate the blind orbits, some successful trials of NOAA-18 data acquisition have been done by using the Svalbard antenna. Thanks to this antenna, there were no more blind orbits for NOAA-18.

Removing blind orbits from NOAA-17 & 15 by collecting the datasets by NPOESS antenna in Svalbard is still under study.

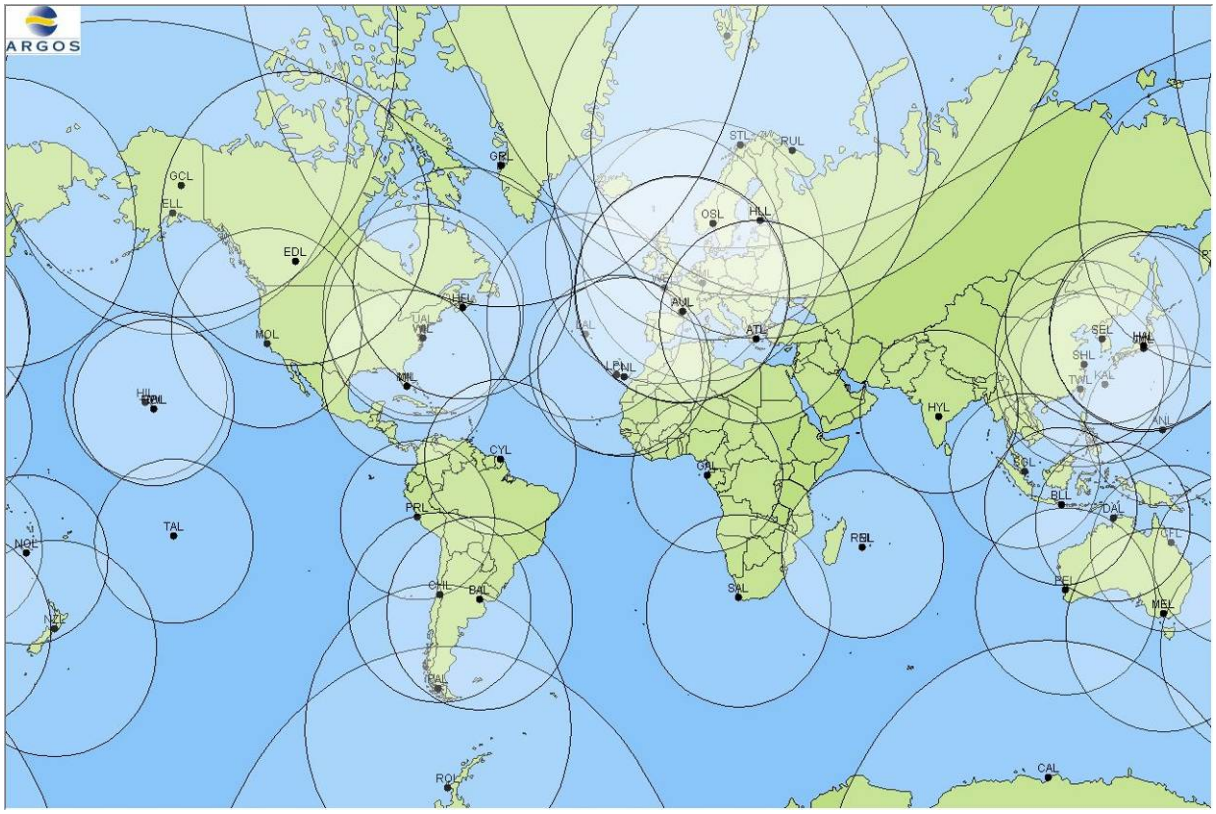
2.2 The real-time acquisition network

In 2006/2007, nine new NOAA HRPT ground stations have joined the Argos real-time acquisition network. On the other hand, three stations (Bitung, Fidji and Ryadh) have been removed, which brings the total number to 53 antennas.

The nine new ground stations added in 2006/2007 are as follows:

Location	Country	Operator	Satellites
Andersen	Guam	USAF	NOAA-18, NOAA-17, NOAA-16, NOAA-15
Elmendorf	Alaska	USAF	NOAA-18, NOAA-17, NOAA-15
Hickam	Hawai	USAF	NOAA-18, NOAA-17, NOAA-16, NOAA-15
Kadena	Japan	USAF	NOAA-18, NOAA-17, NOAA-15
Lajes	Portugal (Azores)	USAF	NOAA-18, NOAA-17, NOAA-15

Sembach	Germany	USAF	NOAA-18, NOAA-17, NOAA-15
Valley Forge	USA (Pennsylvania)	Lockheed Martin	NOAA-18, NOAA-17, NOAA-16, NOAA-15
Libreville	Gabon	CLS	NOAA-18, NOAA-17, NOAA-16, NOAA-15
Hatoyama	Japan	CLS	NOAA-18, NOAA-17, NOAA-16, NOAA-15, Metop-A



Argos real time acquisition network

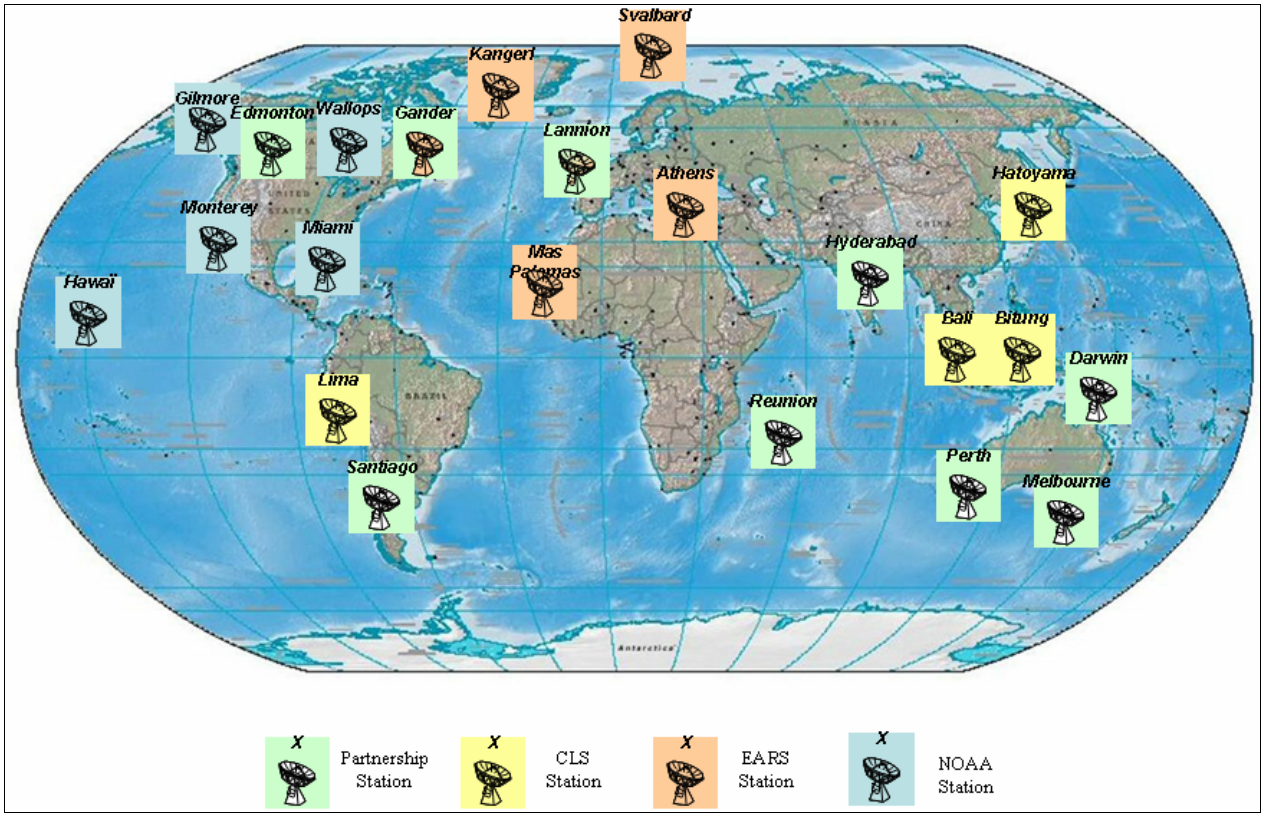
This network was built to answer to the needs of covering specific areas of the world and sometimes by taking advantage of the cooperation opportunities which were offered.

In the section of DBCP requirements below, performance of individual antennae is displayed. It can be noticed that though the number of antennae is high, the overall time performance is affected by the performance of some of these antennae. CLS keeps putting effort in getting enhancements from these antennae. This not an easy task since most antennae are not operated by CLS.

Even if CLS is ready to consider any new opportunity of cooperation, CLS wanted, in 2007, to focus our efforts on adding new ground stations compatible with NOAA and METOP satellites.

This is the reason why CLS bought three NOAA / METOP ground stations (Konsberg antennas) and started negotiation with NOAA, EUMETSAT (EARS network) and several other meteorological agencies such Environment Canada, Météo-Chile, Météo-France and Bureau of Meteorology (Australia) because they were in the process of upgrading their existing stations to be compatible with METOP-A.

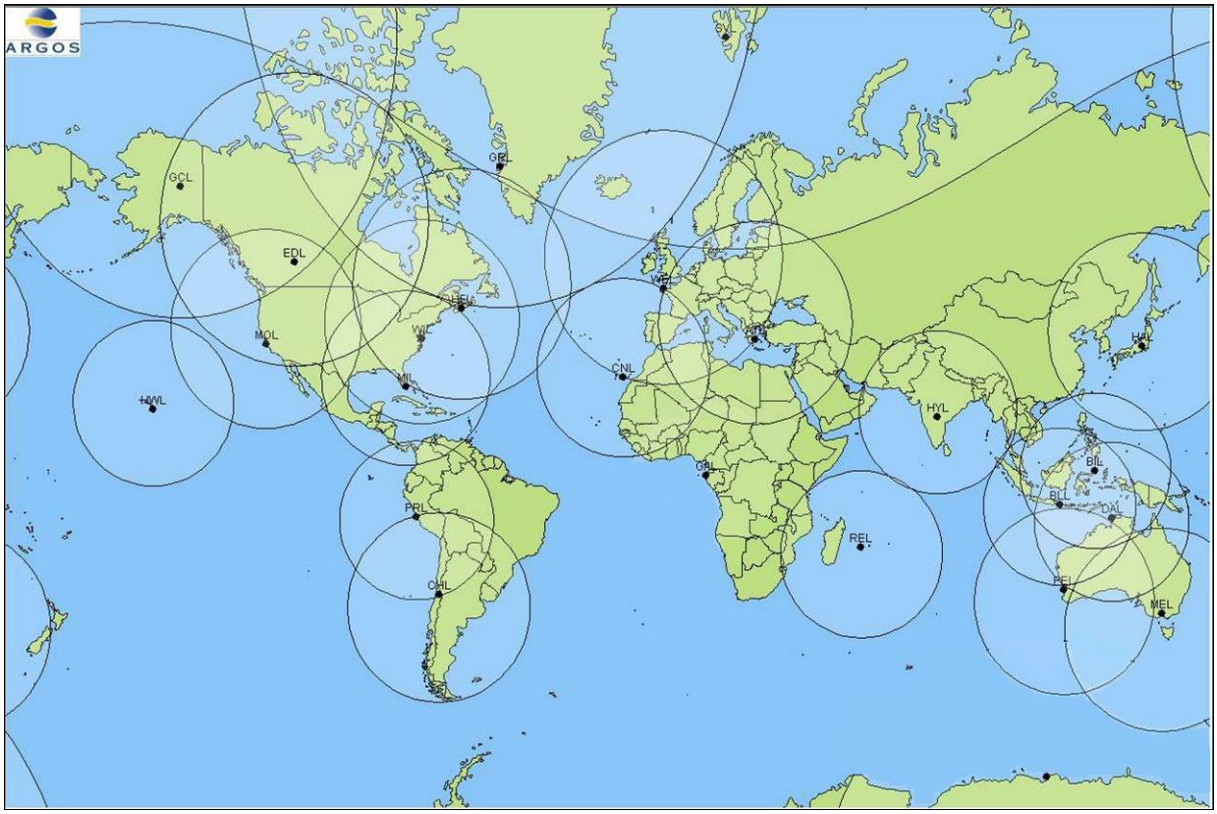
CLS plan for 2007 was to implement the following NOAA/METOP network



	Antennas	Country	Operator
1	Darwin	Australia	BOM
2	Melbourne	Australia	BOM
3	Perth	Australia	BOM
4	Bali	Indonesia	CLS
5	Bitung	Indonesia	CLS
6	Hatoyama	Japan	CLS
7	Lima	Peru	CLS
8	Kangerlussaq	Greenland	EARS - Danish Meteo Institute
9	Svalbard	Norway	EARS - EUMETSAT
10	Athens	Greece	EARS - HNMS (Meteo)
11	Mas Palomas	Spain	EARS - INTA
12	Edmonton	Canada	Environnement Canada

13	Gander	Canada	Environnement Canada
14	Hyderabad	India	INCOIS
15	La Reunion	France	IRD
16	Santiago	Chile	Meteo Chile
17	Lannion	France	Meteo France
18	Gilmore / Fairbanks	USA	NOAA
19	Hawaii	USA	NOAA
20	Miami	USA	NOAA
21	Monterey	USA	NOAA
22	Wallops	USA	NOAA

In term of coverage, CLS could expect:



Unfortunately, in July 2007, the failure of METOP-A HRPT transmitter stopped the implementation of this network. Today, we are still in the same situation. No HRPT data is transmitted by METOP-A and the upgrade of the ground stations was slowed down.

2.3. Argos Control and processing centre

The project Argos 2001, which consisted in renewing all the hardware and software components of the Argos Control and Processing centres, is now finished. The purpose of the Argos 2001 project was vital for the long-term continuity of the Argos system and needed to offer a better

level of services to our users in terms of new functionalities, reliability, availability and responsiveness to their requests.

In order to keep control of the developments, the Argos 2001 project was split into four different phases

Phase I: Development and implementation of a new user interface allowing users to access data and view and update technical files via a Web server. Data are stored and managed by a database management system designed to be responsive to users' needs. CLS objective was to give users more versatility if they require. Consequently, CLS expects to offer them quick and efficient support.

Phase II: Improvement and development of value-added services as well as tools for the Argos system monitoring.

Argos-3 project: This project, driven in parallel with the Argos 2001 phase III, aimed at taking into account all the changes in the current Argos ground segment brought by the third generation of Argos instruments. It includes the downlink and the new format for the uplink messages (new modulation, high bit data rate, etc.) as well as the interface with EUMETSAT.

The Argos-3 project covered the following developments:

- Argos-3 control and processing: it includes:
  - Evolutions of the Argos Core Processing and distribution i.e., all sub-systems modified due to the Argos-3 capabilities and characteristics; and
  - The DMMC (Downlink Message Management Center) dedicated to Argos-3.
- Time Reference Beacon;
- A new network of master beacons (High data rate platforms); and
- Argos PTT / PMT test bench.

Phase III: Fully redesign of the Argos Core processing called phase IIIA (i.e. mainly acquisition, preprocessing, location) and the GTS processing called phase IIIB.

The phase IIIB, the last one, has been opened to the users in May 2008.

GTS processing enhancements

Here, the list of GTS enhancements done in 2008 with the phase IIIB :

- In May 2008, A2001 phase IIIB is operational with:

- All GTS templates (#80) implemented and validated in the new system;
- Processing performances are improved;
- GTS processing is now more flexible (more calibration options, etc);
- Observation data available on ArgosWeb (can be a good monitoring tool for PI);
- Development of CFG tool (which replace GTSMOD) and FTP calibration for ATLAS.

- A GTS processing monitoring tool will be soon available (October 2008);

- Corrections on BUOY code;
- Buoy pressure is now distributed only on Air Pressure reduced at sea level in block 4 (section 1 of the BUOY);

- Block 0 in section 1 is not providing if no wind data (no more 0////);

- Better filtering on Argos location quality (no more loc 0;0 + minimum Argos location class is 1 + Ql = quality control indicator is now fixed with the radius error < 7 km);

- GTS Iridium data processing for IPP (only SBD format) has been operational since July 2008.

- Corrections on BUFR code, CLS BUFR processing is now in agreement with WMO regulation BUFR V.3. Next step in BUFR development = BUFR V.4.

- GTS templates description: all GTS templates use in the CLS subsystem are described (message length, binary cutting and WMO code) in an Excel file available on request via useroffice.

- CLS is working on BUFR code to develop BUFR for TESAC, SHIP and SYNOP (soon available).

- WMO historical table updates and monitors in Argos system for JCOMMOPS.

- A monthly meeting with JCOMMOPS is done at CLS.

- A monthly report on Argos Science activities and GTS monitoring provided to JCOMMOPS.

2.4 PTT / PMT for users

The Argos-3 instrument generation provides to users a two-way communication as well as a larger data bandwidth through the high data rate channel. To benefit from these new capabilities, users need to implement a PMT (Platform Message Transceiver) in place of their current one-way PTT.

The PMT, which works as a modem, supports:

- transmission of uplink messages using several possible modulation links as well as satellite pass predictions;

- reception and processing of the commands (system and user predefined commands, satellite acknowledgement, etc.); and

- Interactive data transfer mode: satellites acknowledges the receipt of (good) messages sent by the PMT.

In terms of strategy, we decided to develop:

- A first generation of PMT so that users can quickly access to the new Argos-3 functionalities;

- Industrial PMT for global use.

2.4.1 First generation PMTs

First PMTs were developed in 2002 / 2003 by Bathy Systems (Boston / USA) in collaboration with Seimac Ltd. (Halifax / Canada), a major transmitter manufacturer. These units worked only with uplink BPSK modulation (400 bits / sec.) and a downlink BPSK modulation (200 bits / sec.). They were built around existing modules making the end-product rather large and expensive but fine for running demos.

This work, as well as the collaboration between different manufacturers, gave CLS the opportunity to order in May 2005 a set of 80 of these “First generation PMTs” to Seimac Ltd. with the implementation of some evolutions to take into account the Argos-3 main new features (downlink at 400 bits / sec. and new high data rate uplink). Seimac delivered 80 of these units in June 2006.

Seimac PMT RFM

Following the authorization given by Cnes to communicate with MetOp A, CLS did the first interactive communication sessions on 10 May with a user PMT!

2.4.2 Industrial PMT RF module

The success of the Argos-3 project is certainly based on the availability of low cost, low consumption and tiny “PMT RF modules”. These modules functionally correspond to the previous first generation PMT demo units but designed “from scratch”. I n other words, instead of building a final product with the assembly of existing modules CLS has redesigned the complete product to make it simpler on a single “electronic board”. This work started early in 2005 with some consultancy studies on possible technical solutions as an analysis of the volume of the market.

CLS issued late 2005 a Tender to select the best candidates for this development. Selection of providers was done late February 2006 with the choice of Kenwood in Japan and Elta in France. Both companies presented to CLS an excellent and complete proposal (technical financial, quality, etc.).

Today, both manufacturers successfully fulfilled the certification process and delivered their final product version in December 2007. This development has reached its goals in terms of product definition and constrains (size, consumption, etc.) as well as on the costs.

Elta PMT RF

Kenwood PMT RFM

The first 500 Kenwood PMT units have been received by CLS in May 2008.

2.5 Argos-3 and PMT implementation project

Today, all the Argos-3 components – that is the instrument, the platforms (PMT) as well as the processing centres – are operational and perfectly capable of acquiring, processing and disseminating the Argos-3 data. So, the system is ready and operational.

Yet, actual PMT implementation by users was delayed because:

- Argos-3 is a new system and the transition between Argos-2 and Argos-3 requires more important changes than the ones needed for the transition between Argos-1 and Argos-2;
- There is only one Argos-3 instrument for the moment;
- The commissioning of this totally new Argos-3 instrument and the few incidents which impacted MetOp delayed by some six months the operational set-up; and
- In this context, manufacturers were reluctant to invest in new generations of Argos platforms which would include the Argos-3 PMT and, without any PMT products off-the-shelf, no user will use the new Argos-3 functionalities.

In order to encourage user access to these new capabilities, CLS together with CNES, has begun a large Argos-3 implementation and promotion plan.

The objectives of this plan are:

1. To enhance our knowledge and control of the Argos-3 system;
2. To promote the Argos-3 system; and
3. To deploy, in 2009, a significant number of Argos-3 platforms of various types.

In terms of organization, the project will be divided into two phases.

A first phase, the Evaluation phase, intended for:

- improving CLS knowledge of the system performance and setting up control tools; and
- defining strategies and scenarios well adapted to user needs and the various platform types based on test on prototypes.

A second phase, a Large scale implementation phase, intended for:

- Communication and involvement of both users and manufacturers in the Argos-3 launch program;

- Signing contracts with manufacturers for the integration of PMTs in their platforms and the manufacturing of units (Argo floats, drifting buoys, animal platforms);

- setting-up pilot projects with users and coordinating bodies such as DBCP and ARGO for the deployment and the follow-up of these platforms during a significant time period (about nine months);

- Comparing performances with the ones from Argos-2; and

- Organizing an Argos-3 forum where results will be presented to the Argos user community.

This project is planned over 2008 and 2009.

A separate document describes terms of reference and principles of a DBCP Pilot Project which would include PMT units.

2.4 Regional processing centers

As announced last year, the Indonesian and Japanese processing centers have been closed. The Peruvian centre is the only Argos regional centre to still in existence.

At the origin (the first one dates from 1989), the regional centers were created to be a local structure capable of processing and disseminating Argos data faster and cheaper than a global processing center to the users of a specific area. With the generalization of Internet and the multiplication of the regional ground stations, the global processing centers offer the same level of service and even better if we consider the high level of availability of the global centers.

Moreover, the new functionalities of the Argos 2001 software cannot be implemented without deeply modifying the hardware architecture of the regional center.

A new concept of Argos regional processing center has been developed by CLS in order to offer a solution to users who wish to be autonomous and not to depend on the global processing centers.

2.5 DBCP Requirements

Data Timeliness and Monitoring

Overview

"To offer solutions for improving data timeliness and to develop data timeliness and to develop monitoring tools" (5.2).

Data timeliness depends on:

1) the number of satellites;

2) the real-time antenna network and the performance of each antenna;

3) the recovery of the global dataset at each orbit (elimination of blind orbits); and

4) Ultimately, the data processing time.

Monitoring system time response

"To develop further the tool regarding status of local receiving stations (percentage of time they are operational) so that to display additional information such as what operational satellites are being received via each station." 5.10-iv.

Delivery times are now closely monitored in with the new processing system implemented at the end of June 2008. Statistics are based on platform type and templates. The first results will be presented during the DBCP session.

Delivery times are affected primarily by the performance of each real time receiving station.

The table below displays the antenna performance characteristics:

Name	City	Country	Antenna Operator	# satellites processed	% datasets received/ expected	Mean dataset availability at CLS	Comments
AN	Andersen	USA	CLS	3	64%	00:28:14	
AT	Athens	GREECE	CLS	4	4%	00:18:24	**Electrical problems**
AU	Aussaguel	FRANCE	CLS	4	49%	00:17:41	
BA	Buenos Aires	ARGENTINA	INTA	3	31%	00:30:25	**Connection failure since July 4th**
BL	Bali	INDONESIA	PT CLS	4	26%	00:21:57	**Antenna problem in January 2008**
CA	Casey	AUSTRALIA	BOM	4	59%	00:25:02	
CF	Cape Ferguson	AUSTRALIA	NOAA	3	84%	01:11:44	
CH	Santiago	CHILE	Météo-Chile	2	74%	00:39:04	
CN	Las Palmas	SPAIN	CLS	4	42%	00:17:31	**Computer problem from February to May 2008**
CY	Cayenne	FRANCE	IRD	3	45%	01:56:56	

DA	Darwin	AUSTRALIA	BOM	4	74%	00:27:26	
DV	Davis	AUSTRALIA	BOM	4	16%	00:18:37	**Start in July 2008**
ED	Edmonton	CANADA	Envir. Canada	4	87%	00:21:57	
EL	Elmendorf - Anchorage	USA	CLS	4	27%	00:29:08	
GB	Libreville - N Koltang	GABON	CNES / CLS	4	70%	00:25:45	
GC	Gilmore Creek	USA	NOAA / NESDIS	4	61%	00:23:08	
GR	Sondre	GREENLAND	DMI	4	72%	00:16:18	
HF	Halifax	CANADA	Can. Coast Guard	3	86%	01:22:47	
HI	Hickam - Honolulu	USA	CLS	3	65%	00:20:41	
HL	Helsinki	FINLAND	CLS	4	51%	00:17:54	**Antenna in repair at CLS since July 2008**
HT	Hatoyama	JAPAN	JAXA / EOC	4	81%	00:13:18	
HW	Hawaïi	USA	NOAA / NWS	4	68%	00:37:56	
HY	Hyderabad	INDIA	INCOIS	3	65%	02:49:03	**datasets are sent by pack of 5-6 passes**
JM	Jamstec - Tokyo	JAPAN	Jamstec	4	74%	00:17:23	
KA	Kandena-Okinawa	JAPAN	CLS	4	62%	00:29:45	
LA	Lajes - Azores	SPAIN	CLS	3	0%	00:00:00	**Antenna problem since May 2007**
LM	Lima	PERU	CLS Perou	4	69%	00:12:55	
LP	Las Palmas	SPAIN	Univ. Las Palmas	2	81%	02:03:53	**Antenna problem**
MA	Miami	USA	NOAA / AOML	4	68%	01:06:57	
ME	Melbourne	AUSTRALIA	BOM	4	91%	00:31:37	
MO	Monterey	USA	US Navy / NWS	2	69%	00:42:01	
NC	Nouméa	NEW CALEDONIA	Météo-France	3	34%	00:59:39	**PC problem since July 2008**
NO	Nouméa	FRANCE	IRD	3	55%	02:01:00	
NZ	Wellington	NEW ZEALAND	Met Office	4	68%	00:25:38	

OS	Oslo	NORWAY	NMI	2	26%	00:15:39	
PE	Perth	AUSTRALIA	BOM	4	65%	00:21:56	
PR	Lima	PERU	CLS peru	4	82%	00:18:36	
PT	Petropavlovsk	RUSSIA	Complex System	4	43%	00:18:26	**Computer replacement in March & April 2008**
RE	Reunion Island	FRANCE	IRD	3	59%	01:54:54	
RN	Reunion Island	FRANCE	Météo-France	2	100%	00:21:59	
RO	Rothera	INDONESIA	PT CLS	3	57%	00:12:37	
SA	Cape Town	SOUTH AFRICA	CLS / SAWB	4	77%	00:20:31	
SE	Séoul	KOREA	KMA	2	52%	00:17:11	
SG	Singapore	CHINA	SMM	2	83%	00:39:26	
SH	Shanghai	CHINA	East China Sea Fisheries	4	16%	00:19:14	**Data transfer problem until May 2008**
SM	Sembach	GERMANY	CLS	3	56%	00:27:19	
ST	Tromsoe	NORWAY	KSAT	3	51%	00:24:27	
TA	Papeete	FRANCE	IRD	3	72%	02:11:06	
TW	Taïwan	TAIWAN	National Taiwan Ocean Uni	4	33%	00:30:40	
UA	Valley Forge	USA	CLS	4	34%	00:22:09	**Test station**
WE	Lannion	FRANCE	Météo-France	2	100%	00:14:07	
WI	Wallops Island	USA	NOAA / NESDIS	4	85%	00:20:20	

Real time receiving stations - 2008 performance (Januay 2008 to August 2008)

Top performers are indicated in green. Explanations on poor performance are given in "comment" column when available.

Delivery times

Global datasets

The next table shows the throughput time for the global datasets result delivery from NOAA-18, NOAA-17, NOAA-16 and NOAA-15 in August-2008:

Satellite delivery	**NOAA-15, NOAA-16, NOAA-17, NOAA-18**
< 1 h	**18%**
< 1 h 30	**37%**

< 2 h	**58%**
< 2 h 30	**77%**
< 4 h	**91%**

Stored data availability for NOAA-18, -17, -16 and -15

The delivery times are significantly improved: ~60% of the data in less than two hours to be compared to 45% in 2007. This is mainly due to the Svalbard stations and the removal of the blind orbits: NOAA-18 datasets are collected by orbits the Eumetsat station and NOAA-17 & 15 ones by the NPOESS antenna.

The throughput time for stored data result delivery from MetOp-A:

Satellite delivery	**MetOp-A**
< 2 h	**25%**
< 2 h 30	**50%**
< 4 h	**99%**

Stored data availability for MetOp-A

Real-time datasets

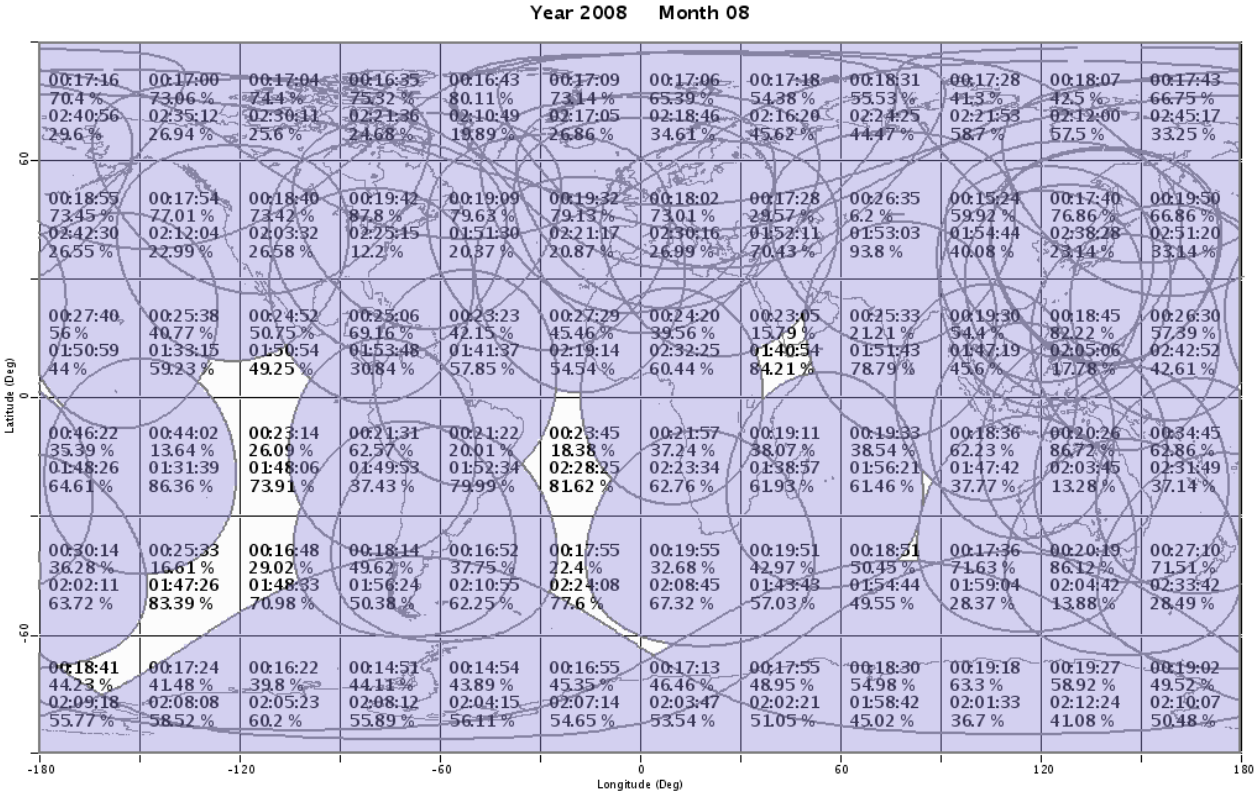
Next table shows the throughput time for real-time delivery from NOAA-18, NOAA-17, NOAA-16 and NOAA-15 in August-2008:

Satellite delivery	**NOAA-15, NOAA-16, NOAA-17, NOAA-18**
< 10 minutes	**12%**
< 15 minutes	**42%**
< 30 minutes	**87%**
< 45 minutes	**91%**

Real-time data availability

87% of the data are received in less than 30 mn to be compared to the 85% of last year. CLS needs to pursue our work to enhance receiving antennae performance. The performance table above will help CLS direct its efforts.

The figure below shows, per 30°x30° square, the real-time mean data availability delay and the percentage of data received in real time via the regional stations during the month of August 2008. It also shows the delayed mode mean data availability delay for the rest of the data.



Improving data timeliness

Enhancing antenna network

"To install new antennas according to the following priority areas: the South Atlantic, the Indian Ocean, and the Southwest Pacific Ocean." 5.3.

Nine new antennas were installed in 2006 / 2007 –see above (North Pacific, Central Pacific, Atlantic, Japan). There's a need to complete Indian Ocean network. First of all, CLS needs to enhance performance of existing stations.

CLS is discussing with SAWS the installation of two or three receiving stations (at least Marion and Gough islands). This would enhance coverage in South Atlantic and Indian Ocean. This is planned for 2009.

Brazilian satellites

"To make the Brazilian Satellites data available via the new Argos data processing system" 5.10-v.

Data was made available through the old Argos 86 processing system and solely for the Peruvian fishing vessels. Some piece of software has been developed on the new processing system which needs completion and tests prior operational implementation. However, the current agreement with INPE is only for the fishing vessels in Peru. On another hand, only a few tens of buoys are currently under the footprint of the Brazilian antenna.

Anti-vandalism

"To print and distribute the vandalism leaflets in appropriate languages to the fishing industry

or fishing authorities" 5.3.

CLS provided information to fishing fleets about data buoys. CLS provided the Secretariats with a list of countries using Argos VMS and in we received in return leaflet in pdf translated in several languages.

These leaflets were provided to our agents for disseminations to the fisherman.

As preliminary actions:

- Leaflets were disseminated in Russia in a seminar in Sakhaline (14-20 June). They were also given in a meeting of the National Fishing vessel monitoring center, the regional centers and scientific institutes which were held at the Fishing federal agency;

- Leaflet was translated in Japanese and disseminated to fishermen in contact with CLS agents; and

- Our Australian representative disseminated them to fishing administrations of Tonga, Niue, Samoa, PNG, Cooks, Marshalls, Australia, NZ and also SPC and FFA. See e-mail below:

"Dear All,

We have been requested by:

WMO (World Meteorological Organisation)
DBCP (Data Buoy Cooperation Panel)
IOC of UNESCO (Intergovernmental Oceanographic Commission of United Nations Educational, Scientific and Cultural Organization)

to distribute the attached document to as many Fisheries administration and regional agencies as part of our work on ocean-weather data buoys.

We would very much appreciate if you could forward the document your local fishers and/or fisheries co-operative.

Thank you very much,

Sincerely,

Guan Oon
Managing Director
Satellite IT Pty Ltd / CLS Argos Aust-NZ-South Pacific"

New feed-back on these actions will be reported at the DBCP session.

Argos-3 Data Buoy evaluation Pilot Project (proposal)

A Pilot Project proposal for Argos-3 Data Buoy Evaluation is being proposed to the Data Buoy Cooperation Panel. Refer to DBCP-XXIV document 7.2 for details.

Opscom

"To bring the issue of cost implications for installing METOP compatible antennas to the attention of the next OPSCOM (GTS delays)" 5.2.

CLS compiled the elements below in answer to this question:

HRPT instrument on MetOp-A is still not operative. Next Argos-3 instrument is on NOAA satellite and so it is compatible with the current Argos antennas network.

Next launch of MetOp satellite is scheduled in 2012, so there is time to implement the MetOp compatible antennas network. However, three actions are in course at CLS on this subject:

- CLS will soon integrate the EARS network (Argos processing system is already ready). EARS antennas are compatible with NOAA and MetOp satellites;

- The EUMETSAT antenna in Svalbard will soon work also like a real-time antenna; and

- In 2009, a new project will be launched with the CNES with the aim to replace Argos real-time network with antennas compatible Argos-3 (NOAA and MetOp) + SARAL (Satellite with ARgos and ALtika) + Argos-4.

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