System Improvements

Space Agency collaboration
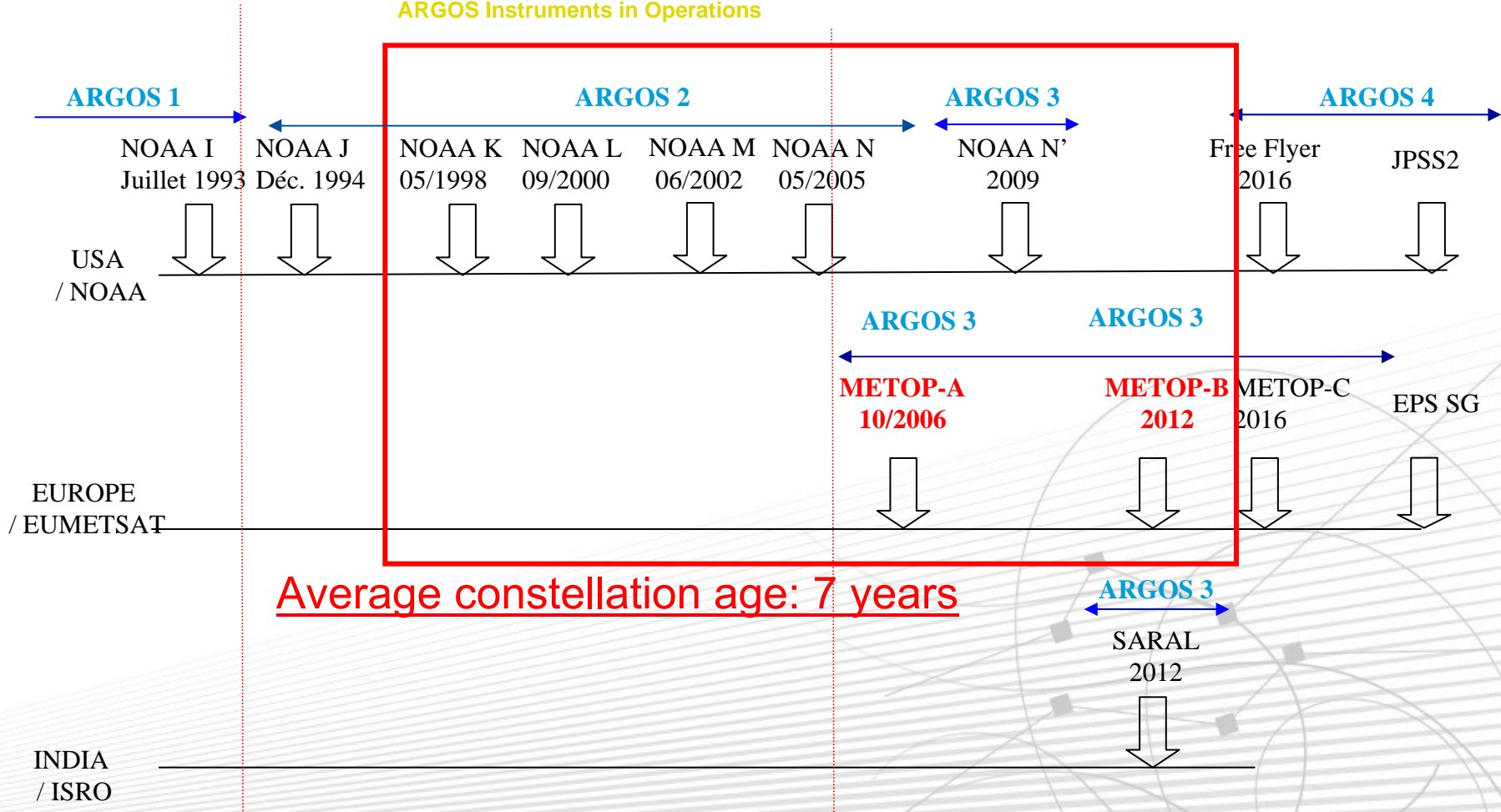
Argos-3 satellites

- Metop A
 - Launched on October 19th 2006
  - Operational downlink
- NOAA 19
  - Launched on Feb 6th 2009
  - Downlink stopped on Friday 13/11/2009
- Metop B
  - Launched on Sept 17th 2012
  - Same orbit than MetOp A but ½ orbit later.
- Saral (A3 + AltiKa = Altimetry in Ka band)
  - Launch planned for December 12th 2012
  - Download of 100' orbit in real time
- Metop C:
  - Launch planned for October: 2016
  - Metop A replacement

Metop B Launch September 17th 2012
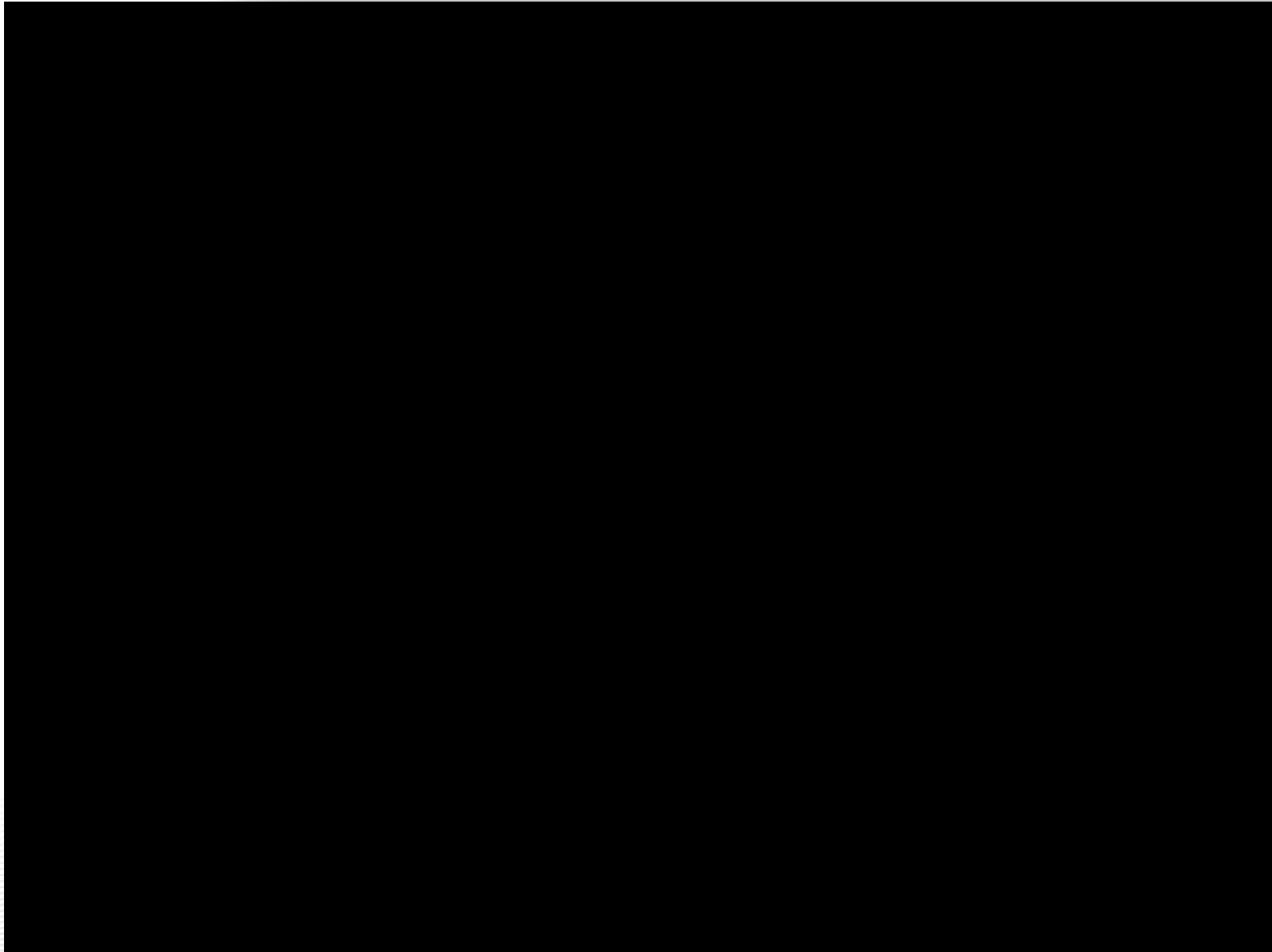
Argos system status
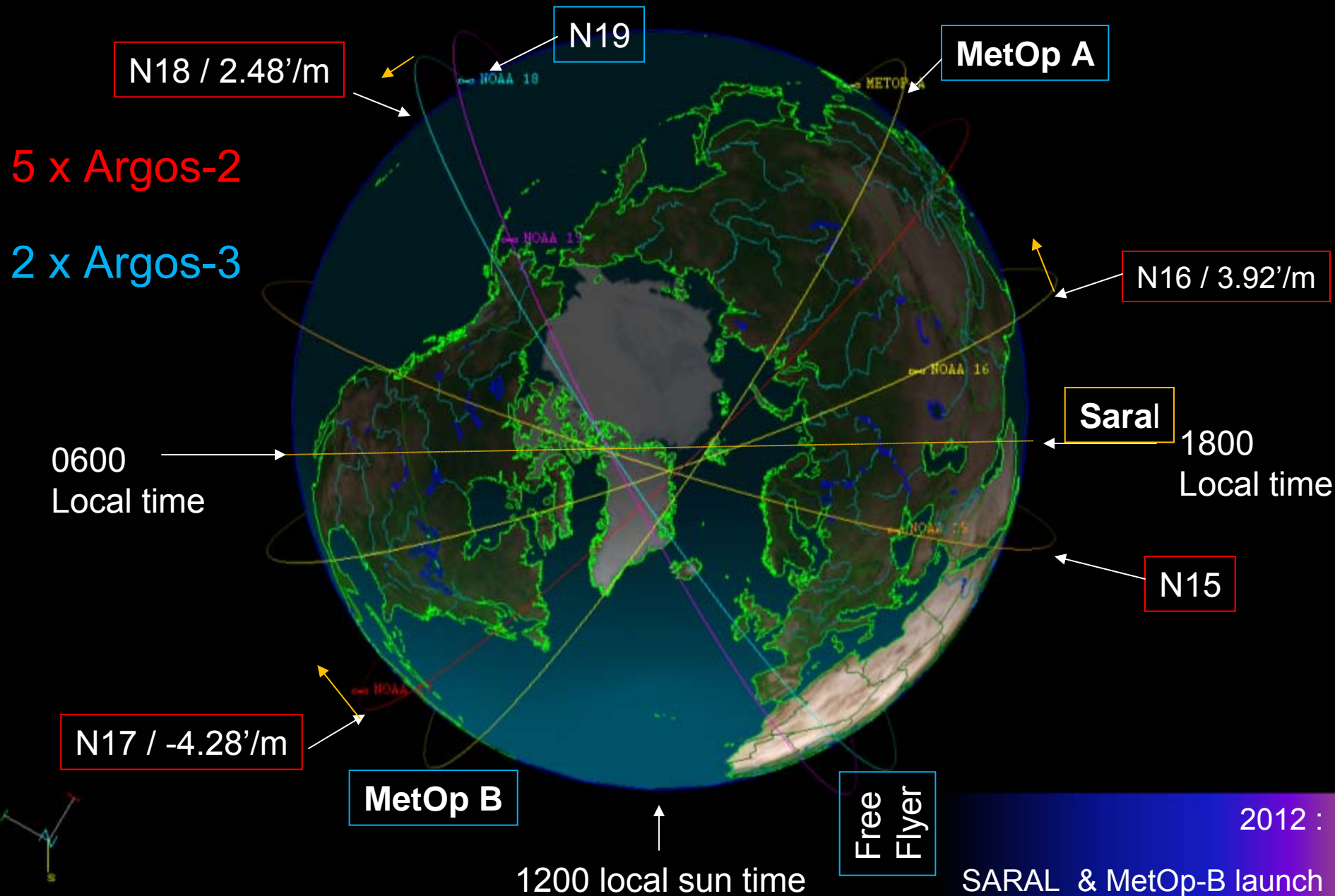
Argos-4 features

- **Uplink:**
  - Low data rate @ 400 bps / 401.650 MHz +/- 30 KHz
  - **Very low data rate** PM @ 124 bps (200mW) - CV
  - **Medium and High Data Rate** GMSK @ 1200/4800 bps (3 watts) - TC
  - Frequency band: **640 KHz** at satellite level (8 freq. bands)

- **Downlink:**
  - Spread spectrum over 2 MHz & centered on 465.9875MHz
    - Code length: 1023 chips
    - Code rate: 1 Mc/s
  - Output power (10 watts): 40 dBm +/- 0.5 dBm
    - Spread spectrum allows a 30 dB flux reduction at ground level (regulation over USA)

New modulation VLDA4 for very low power transmitters (50 to 200 mWatt)

◆ Argos standard modulation, performance is:

	Probability to receive a correct message	BER
C/N0 ≥ 37 dB.Hz	≥ 99 %	< 10-5
34 ≤ C/N0 < 37 dB.Hz	≥ 70 %	< 10-4

◆ Objective : to work with output power around 100 mWatt

◆ With VLDA4 modulation, performance is :

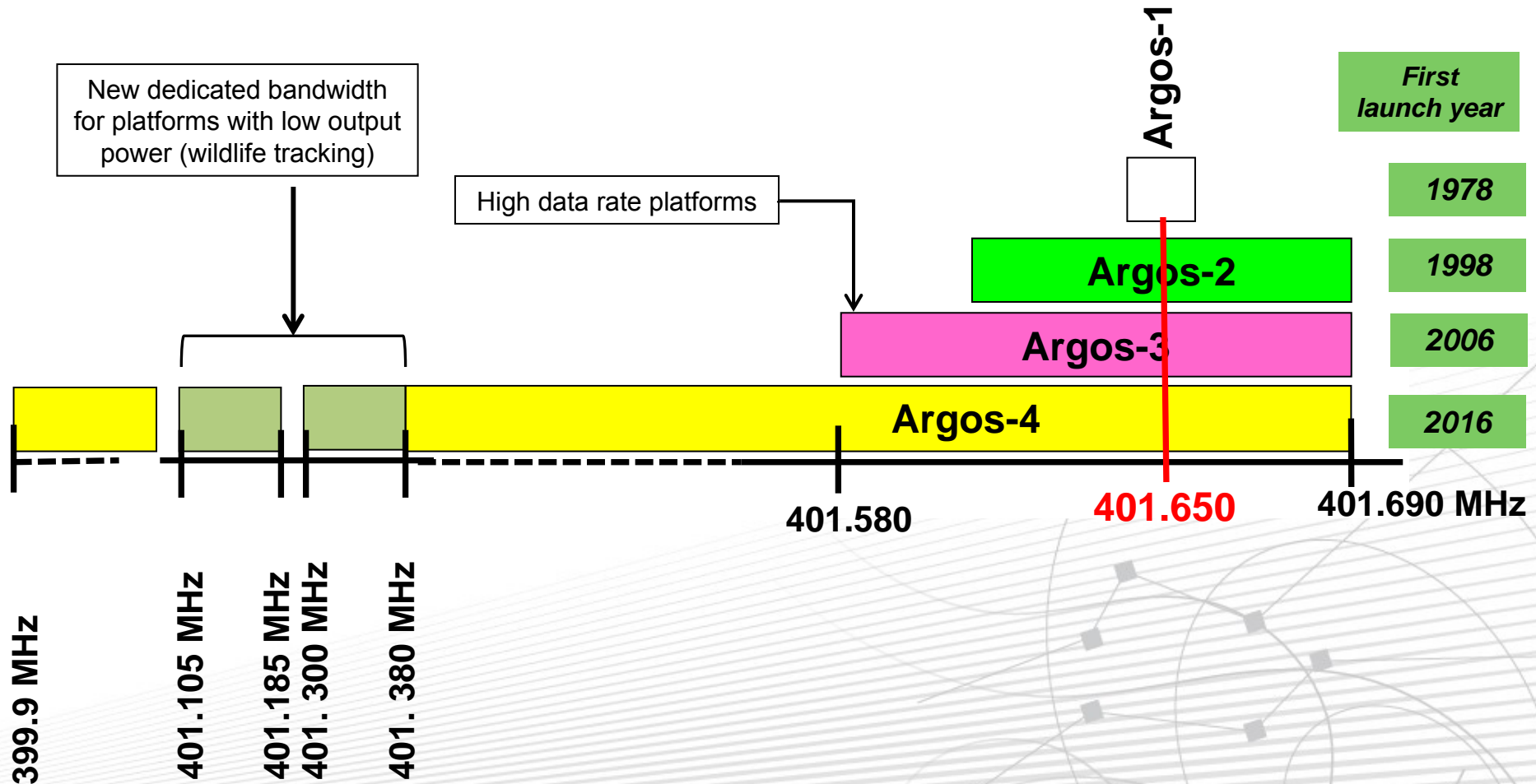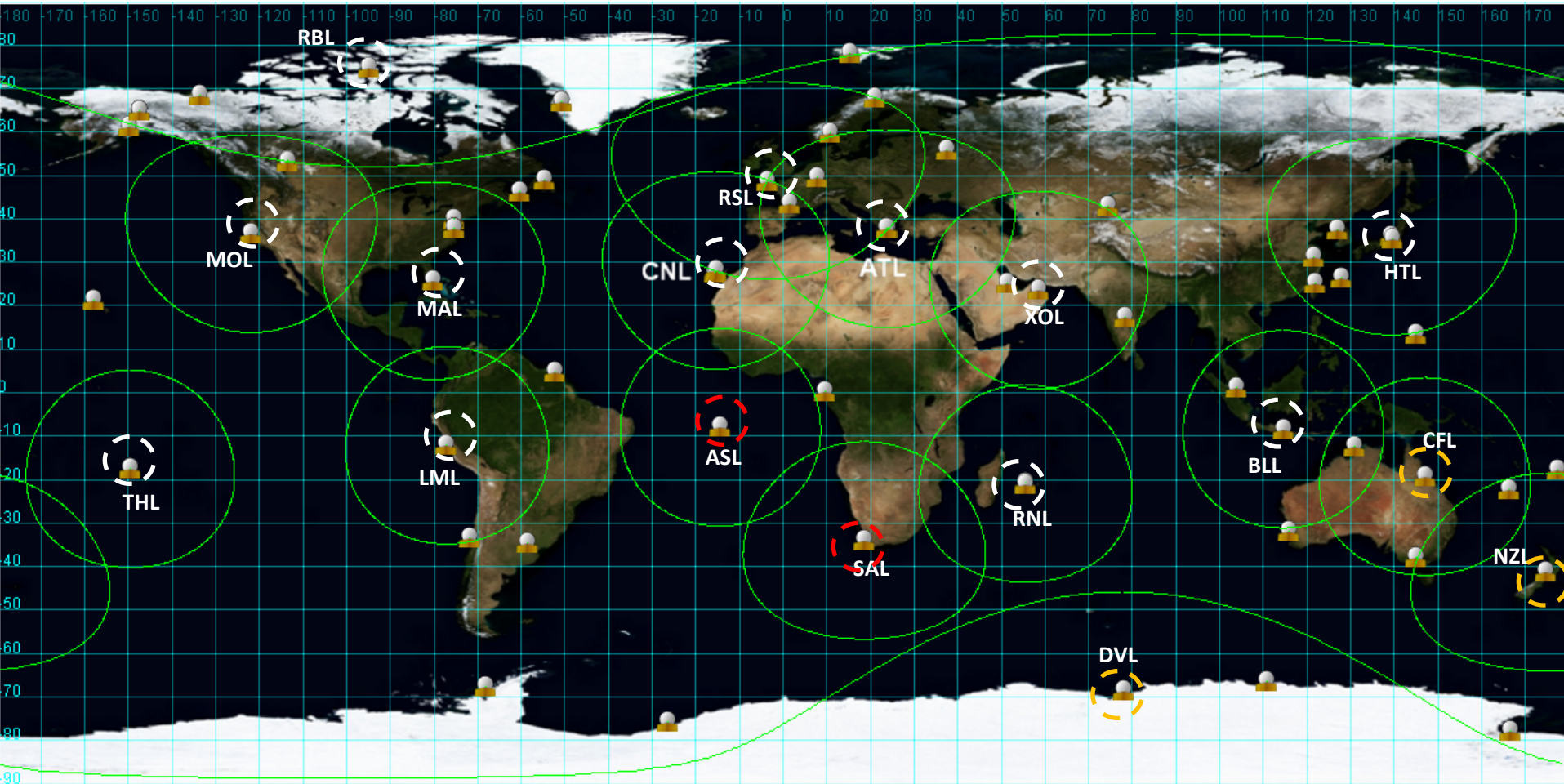|	Probability to receive a correct message	BER
C/N0 ≥ 32 dB.Hz	≥ 99 %	< 10-5
30,5 ≤ C/N0 < 32 dB.Hz	≥ 95 %	< 10-4

Argos-4 satellites

- « Free Flyer »
  - Launch planned between: Oct. 2015 and Dec. 2016
  - 3 instruments TSIS (Total Solar and Spectral Irradiance), Argos and Sarsat on 13h30 (N19) orbit
  - NOAA is currently working with NASA for the satellite definition

- JPSS2: Work in collaboration with NOAA to select satellite at 13h30 orbit

- EPS SG (Eumetsat Polar System Second Generation)
  - 2-satellite configuration
  - Metop SG: 2019

Argos frequency plan
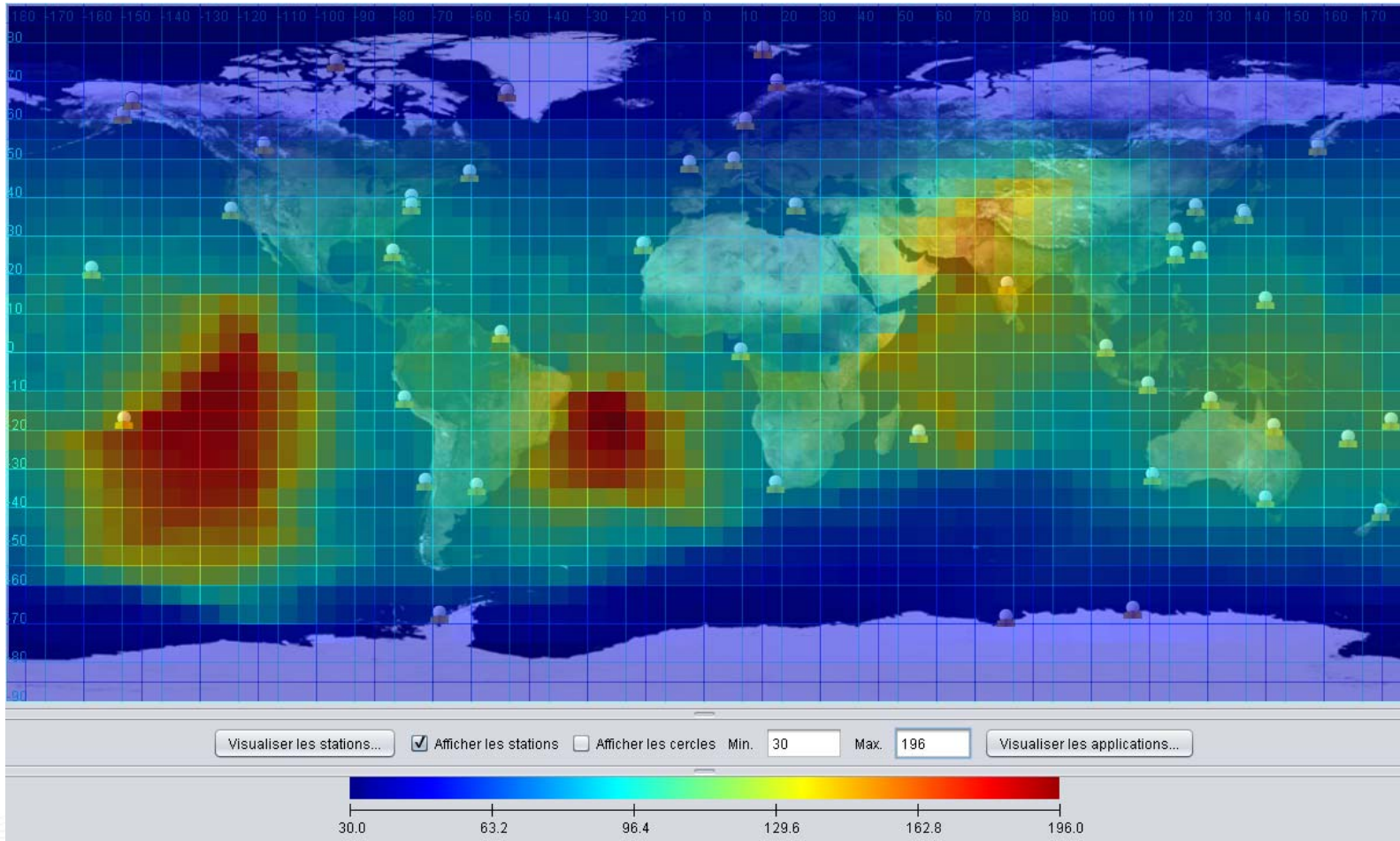

New dedicated bandwidth for platforms with low output power (wildlife tracking)

High data rate platforms

Argos-1

Argos-2

Argos-3

Argos-4

First launch year
1978
1998
2006
2016

401.580

401.650

401.690 MHz

399.9 MHz

401.105 MHz

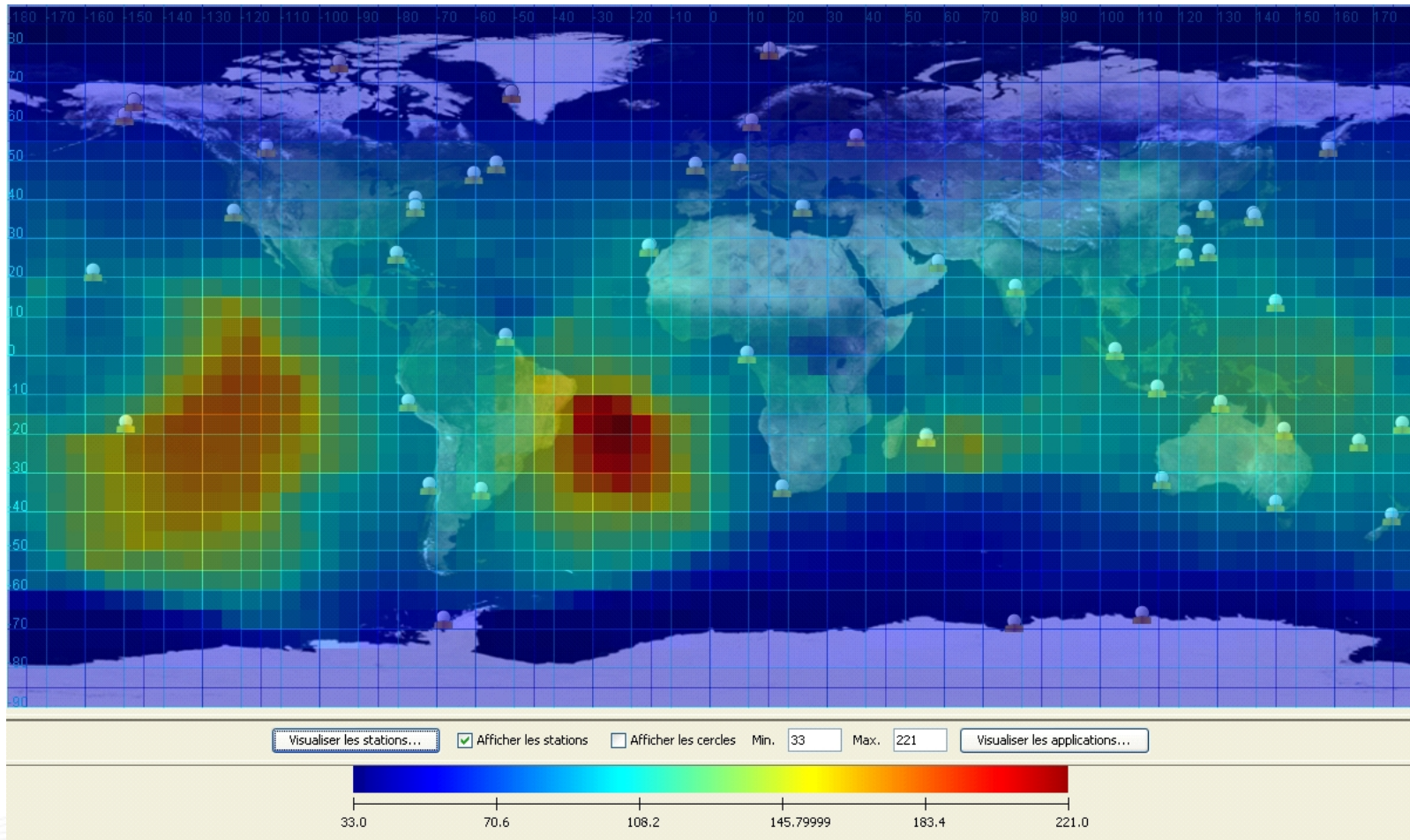401.185 MHz

401. 300 MHz

401. 380 MHz

Existing stations (3 CLS – 9 non-CLS)   New Station (2)

ES&S / New Zealand and Australian stations (3)

http://www.cls.fr

GLOBAL Data time availability Mar. 10

GLOBAL Data time availability Sep. 11
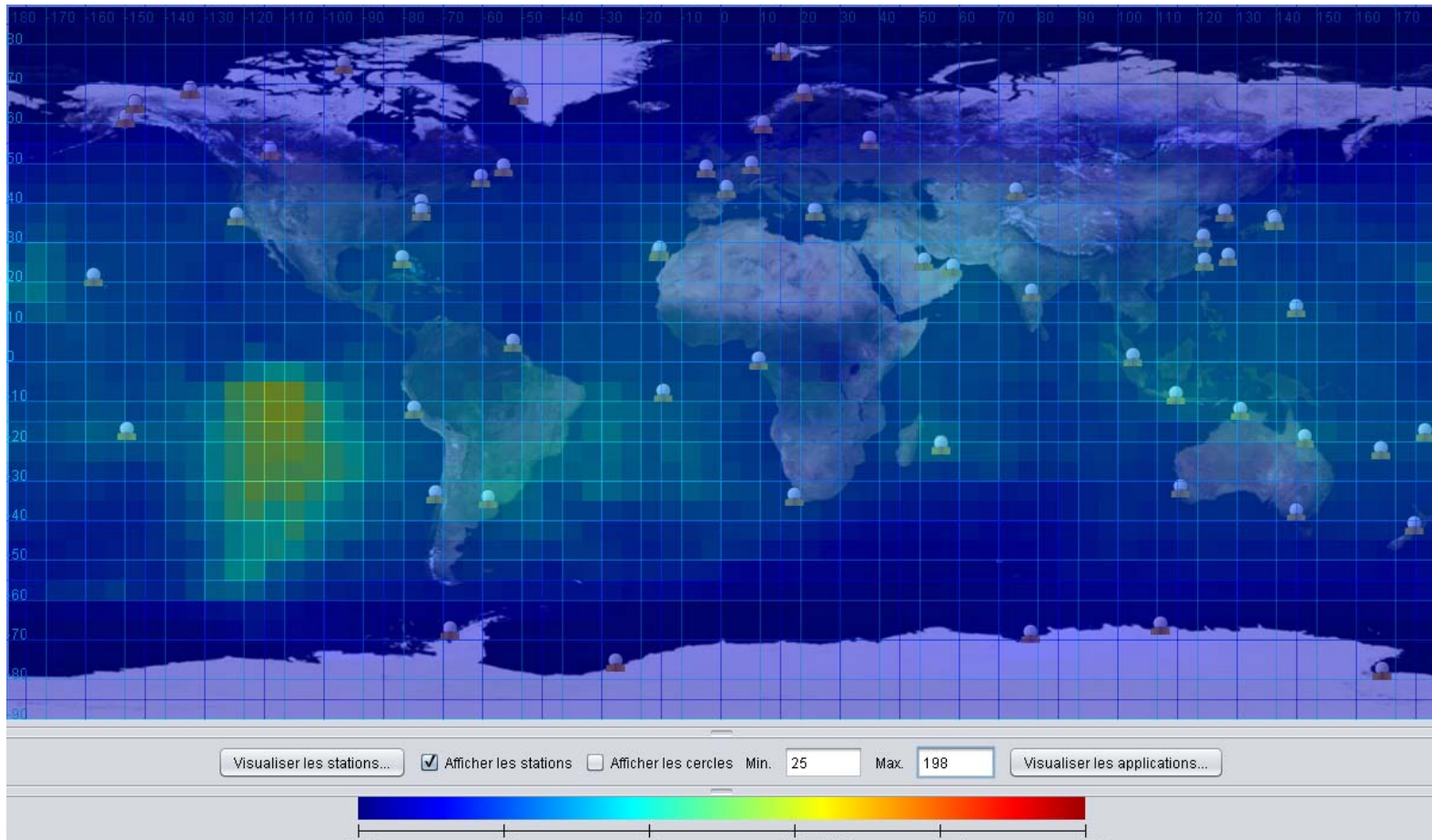
Expected status in December 2013

System improvements

- SARAL-ready

- BUFR V4 ready with excellent performances in heavy charge (average: 4 minutes for +15M bulletins/year)

- Developments to improve Argos Ground Segment Operation monitoring

Current Software Developments

2012

- Development of the new Argos orbitography to not use OpenVMS anymore

- Development of new tools to monitor station network and delays

- Migration of Argos operating system (OS) which are obsolete (Linux -> CENTOS)

- Study for migration from Oracle 10g to Oracle 11g

- Study to migration screens developed with Forms to java screens

Operations Improvements

- Define and implement OLA (Operations Level Agreements) between CLS Operations Division and others CLS internal entities involved in Argos matters as well as SLA (Services Level Agreements) between CLS and his customers,

- Define and implement an Operational Risk Management Process,

- Improve, secure and optimize Operational Monitoring and Control Processes
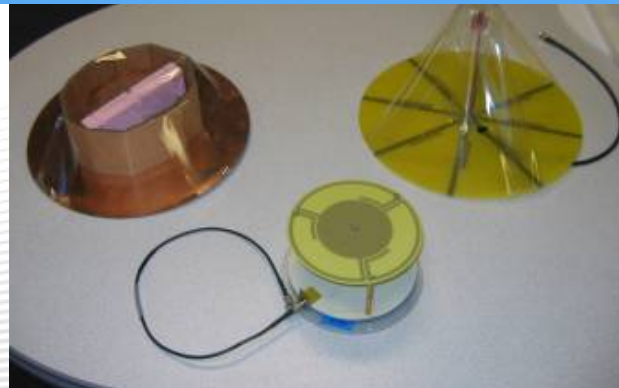
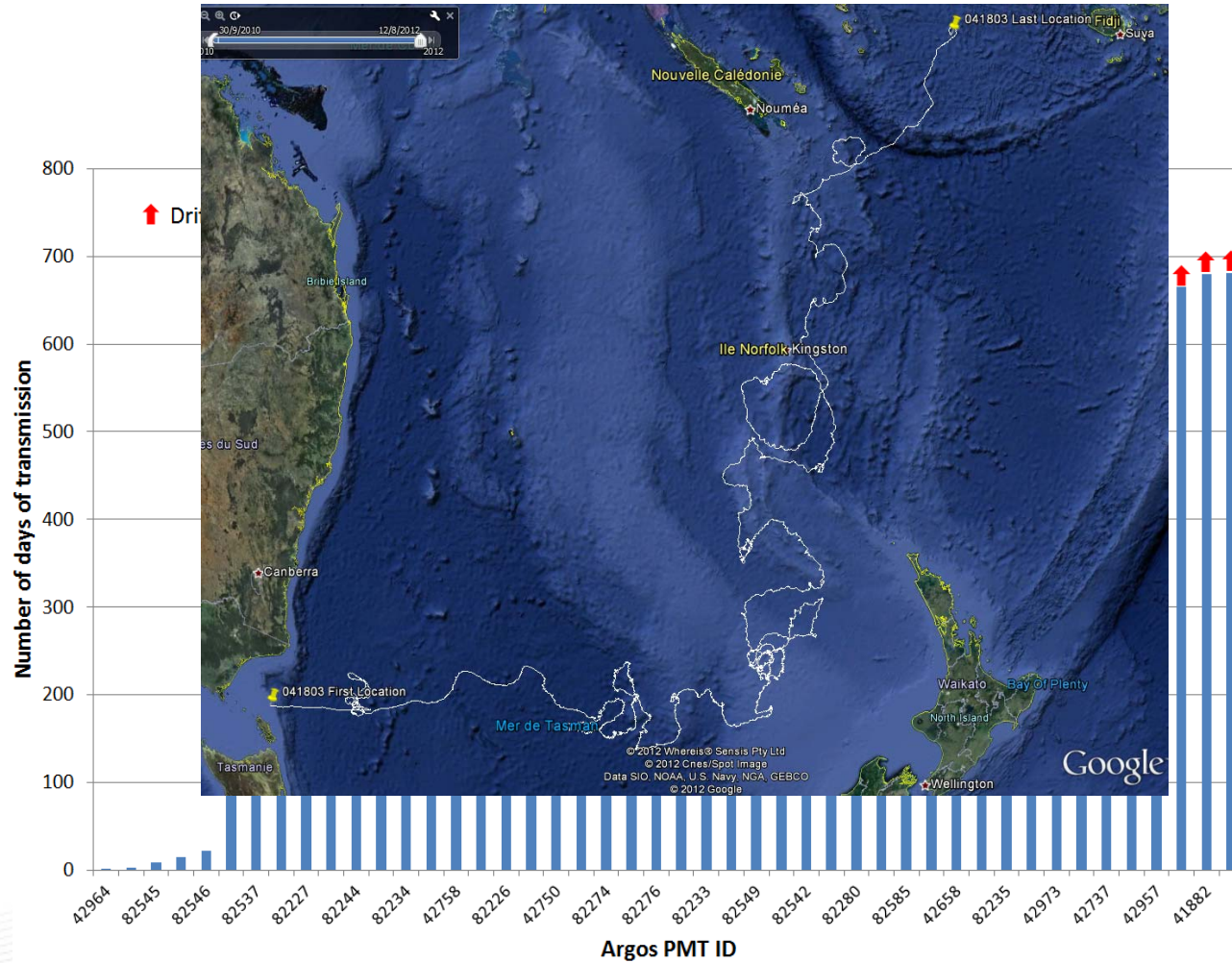- New offices for local support: Brazil & China

Argos-3 implementation plan

Pmt 42758
Sept. 2010 to au July 2011
Nb observations per day
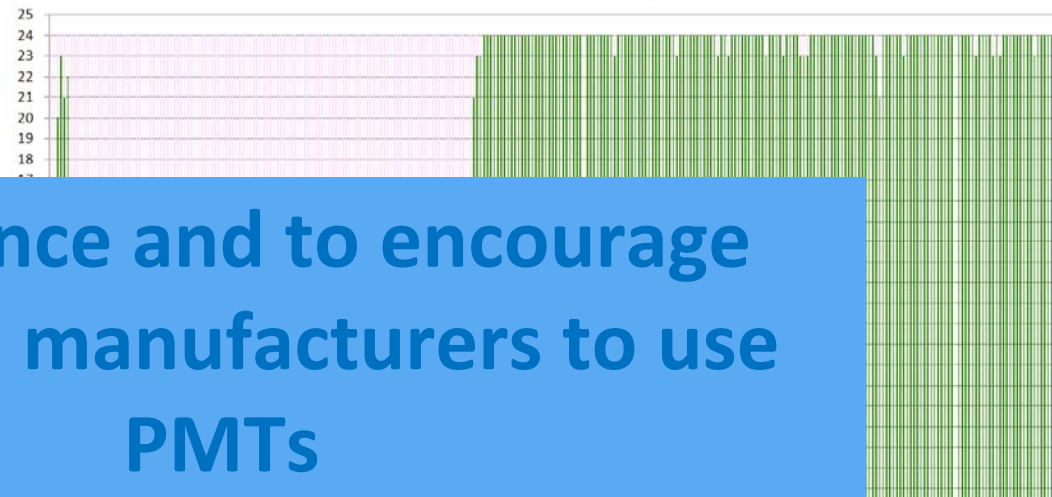
To convince and to encourage users and manufacturers to use PMTs and Argos-3 functionalities

http://www.cls.fr

More than 680 days at sea

Argos-3 Improvements

- Multi-broadcast of Argos-3 commands,
- Best practice proposal for the GDP for Operational deployments in A3 modes,
- Use of email to send commands to platforms,
- Antenna reference design to access free of charge to antenna definitions,
- Implementation program to implement specific coding for error bit corrections,

The SHARC Project

- SHARC: **S**atellite **H**igh-performance **AR**GOS-3/-4 Receive/transmit **C**ommunication

- Goal: 30-month Project to develop and produce very cheap Argos-3/4 XCVR

- ESA funding: For the development of the Argos-3/4 chipset as well as PTT prototypes dedicated to track marine animals.

- Additional funding for chipset production
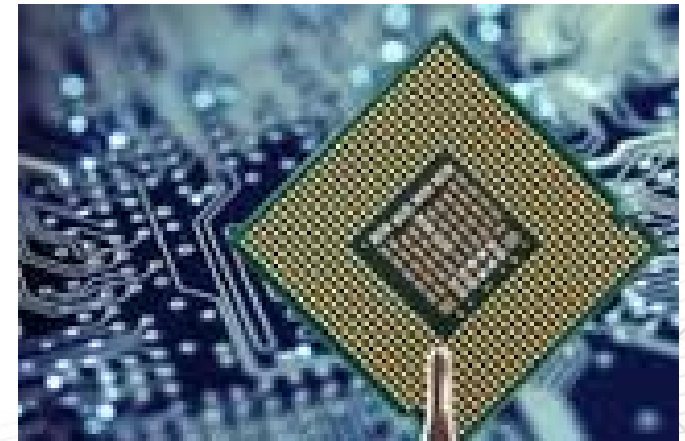
Evolution of technology
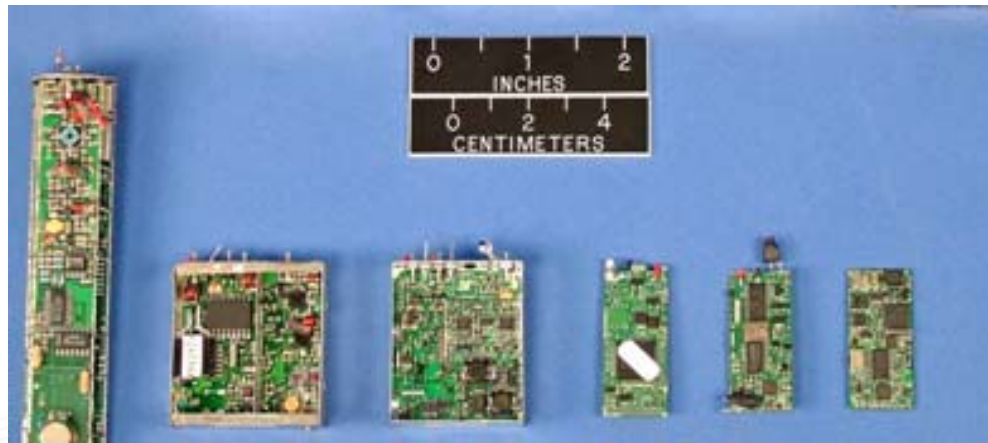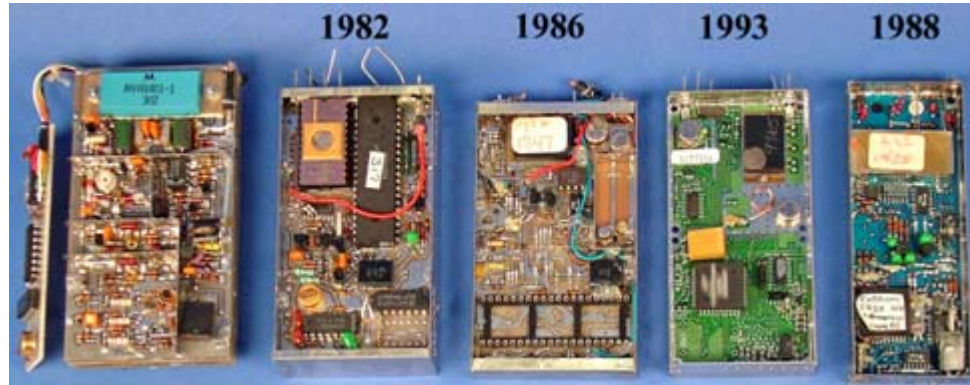
1989 – 1990 – 2001 – 2002 – 2003 - 2007

The RF chipset:

– Argos-3/Argos-4 Rx

– Argos-3 LD/VLD/HDA4 Tx

– Coding and modulation

Future is bright

More satellites,

More capacity on board,

New modulations,

Low cost & smaller transceivers,

And more to come…

Thank you!