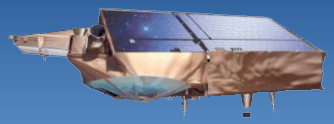
DORIS NETWORK
2010 STATUS REPORT



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DORIS NETWORK
2010 STATUS REPORT

- Organization
- Current status
  - Equipment progress
  - System requirements
  - Improvement actions
  - Co-location
- Perspectives

Reorganization

- New agreement between CNES and IGN signed 31 December 2008

  - SIRS (IGN): maintenance operations relating to antennas
  - SMOS (CNES): maintenance and ongoing monitoring relating to beacons

- New unit at IGN "Worldwide Networks & Services"

  - Networks

    DORIS network management: deployment, maintenance, and geodetic survey
    ITRF : local surveys on co-location sites, international geodetic sites database
    SLR measurements using the French Transportable Laser Ranging Station

  - Data and analysis centers

    IGS, EUREF and IDS data centers: data flow, data & products archiving
    IGS reference frame coordination
    EPN Local Analysis center

  -Head of unit: Bruno Garayt

    Network's representative at IDS and IGS Governing Board

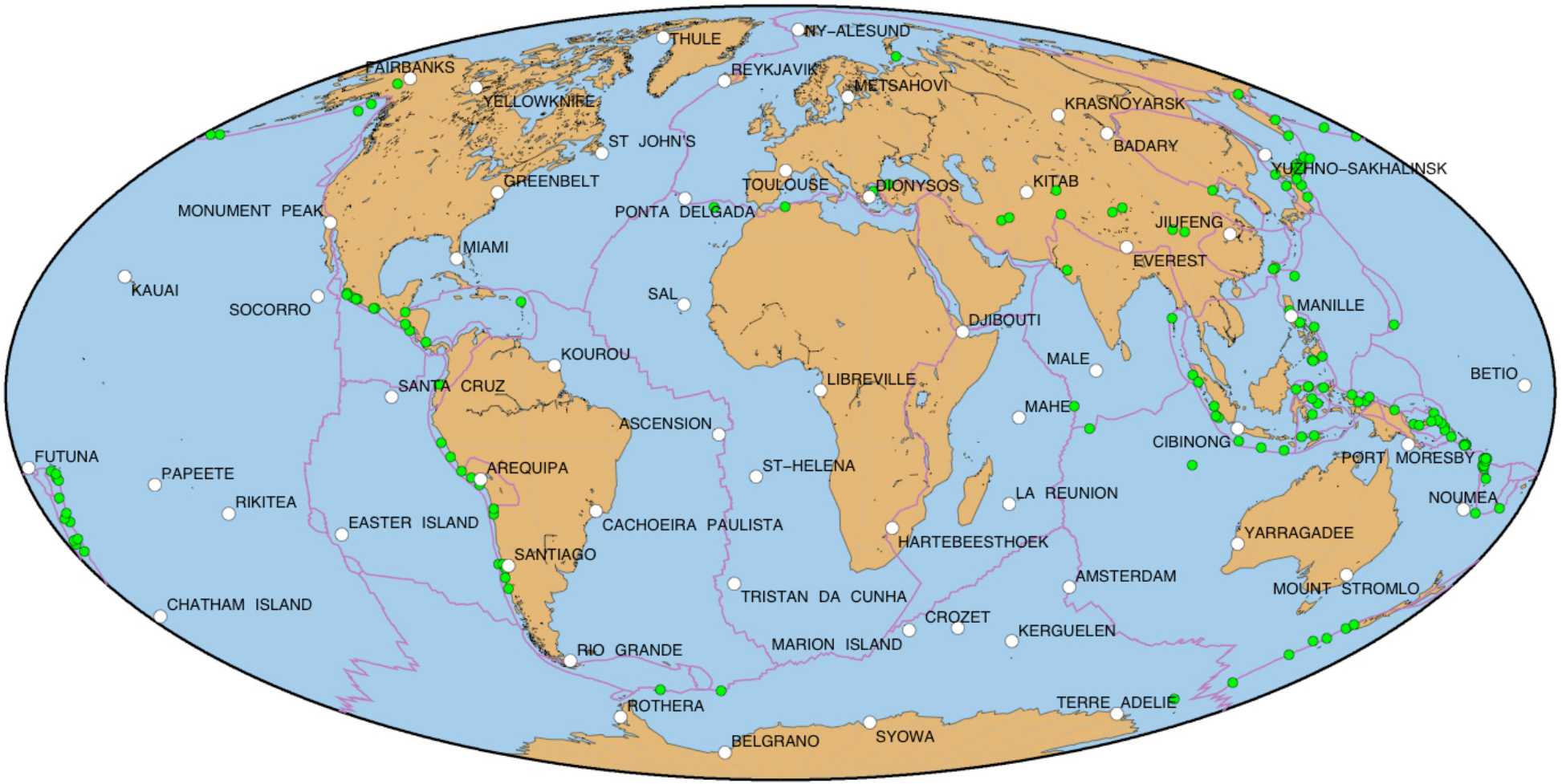
Network events, 2009

2009	Station	Event
January	Tamanrasset Cibinong	Reconnaissance with a view to install Antenna raising
February	*La Reunion*	*Beacon replacement*
March	Rikitea Crozet	Monument replacement following damage Antenna raising
April	*Mahe* Amsterdam **Riyadh**	*Beacon replacement* Antenna raising **Reconnaissance and signature of agreement**
May	*Greenbelt* *Kauai* *Sal*	*Beacon replacement* *Beacon replacement* *Equipment upgrade*
June	*Ponta Delgada*	*Beacon replacement*
August	Grasse	co-location survey
September	**Badary**	**Restarting (interruption of 4 years)**
October	**Krasnoyarsk**	**Major renovation**
November	Fairbanks *Rothera* **Papeete**	Reconnaissance in Alaska to search for new site *Beacon replacement* **becomes the 4th master beacon**

Network events, 2010

2010	Station	Event
February	**Monument Peak**	**Shutdown**
April	*Easter Island* Santiago *Marion Island*	*Equipment upgrade* Coordinates update following earthquake *Equipment upgrade*
May	*Male* *Cibinong* Libreville *Mount Stromlo*	*Equipment upgrade* *Equipment upgrade* Local tie survey (new GNSS station) *Equipment upgrade*
June	*Santa Cruz* **Ascension** Saint Helena	*Beacon out of order (remains unsolved)* **Major renovation (antenna moving…)** Local tie survey (new GNSS station)
October	*Kourou* **Cold Bay (AK)**	*Equipment upgrade at* **New station in progress...**

DORIS network and earthquakes (since 1973)



● **Earthquake of magnitude greater than 7.5 (USGC Database)**

○ **DORIS Stations**

Network evolution

Since November 2008:

- 2 existing stations were completely renovated (complete equipment upgrade and new antenna support): Krasnoyarsk, Ascension
- 1 antenna was repaired following damage: Rikitea
- 3 antennas supports were modified (antenna raising) in order to respect the minimum cable curvature radius: Cibinong, Crozet, Amsterdam
- 1 station is on the way to be added: Cold Bay (replacing Fairbanks)

Current status:

- 52 stations (out of 58 in the current network) were either installed, or renovated after 2000.
- To be considered: Kitab, Kourou, La Réunion, Socorro, St John's, Syowa

Network improvement

- **Beacon model 3.0 deployment almost completed :**
  - **Fairbanks, Futuna : 2.0**
  - **Socorro : 1.0**
- **Installation of a remote management system (13 stations)**
- **Maintenance operation on each master beacon every year**
- **Standardization of the stations configuration**
- **Respect for system requirements**



System requirements

- **Preliminaries: frequency authorizations, interference, co-location**
- **For the beacon (and other indoor equipment):**
  - **Reliable and stable power supply**
  - **Clean environment**
  - **Limited temperature changes**
- **For the antenna support and connection:**
  - **Short and long-term stability**
  - **Direct connection of the cables (no bent connectors)**
  - **Increased minimum curvature radius of the cables (minimal mechanical constraints)**
  - **Cable length: 15m**
- **For the antenna environment:**
  - **Clear sky view above 5° (formerly 10°), measured from the antenna base**
  - **No metal object (likely to cause multipath) in a 5 m radius around the antenna, except the antenna support itself**
- **For the host agency:**
  - **Should be made aware of these requirements, and of the need to maintain them on the long term**

Antenna support evolution
Example: Crozet

2003

Bent connectors

2007

Curvature radius < 20cm

2009

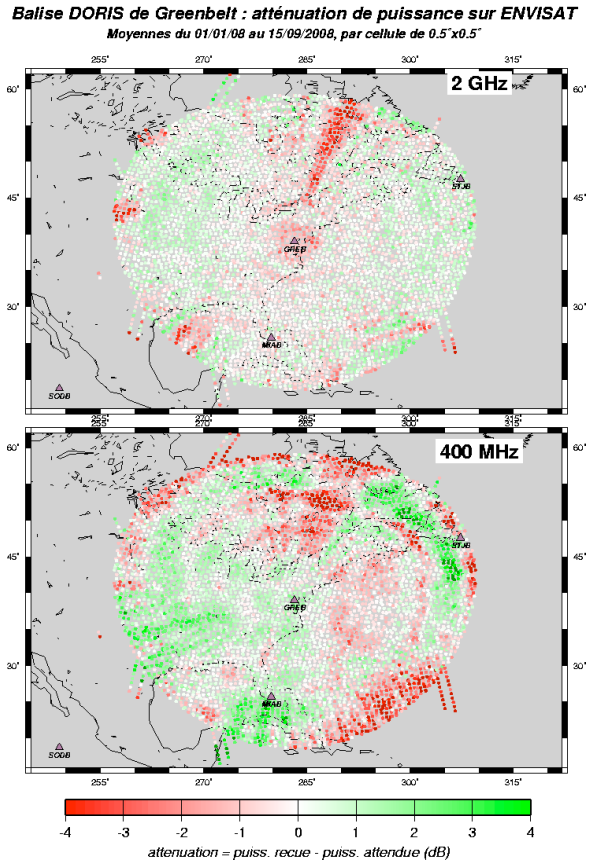
Custom made

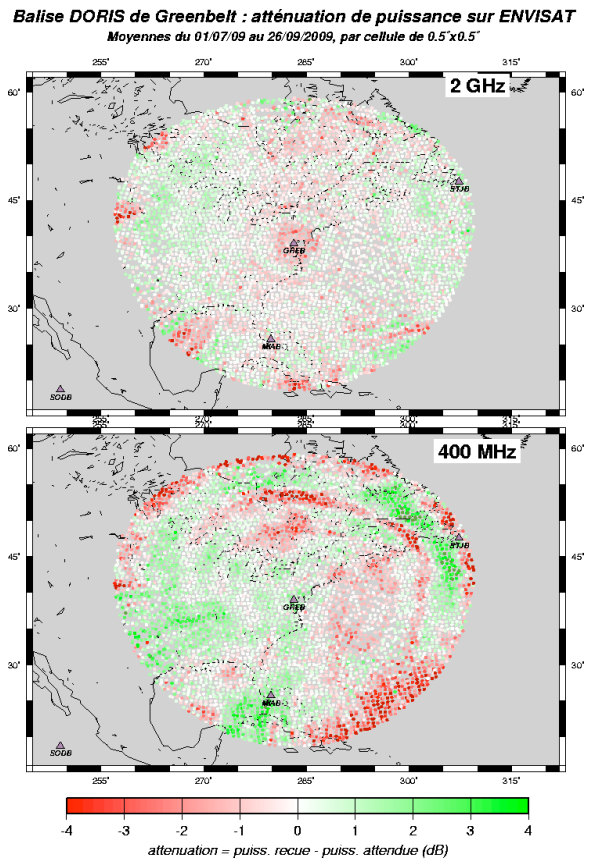
Antenna environment improvment
Example: Greenbelt

GGAO Microwave tower

After 22 June 2009

Power attenuation*





* Courtesy of P.Yaya, CNES

Tracking data coverage improvement
Example: Fairbanks > Cold Bay

Fairbanks

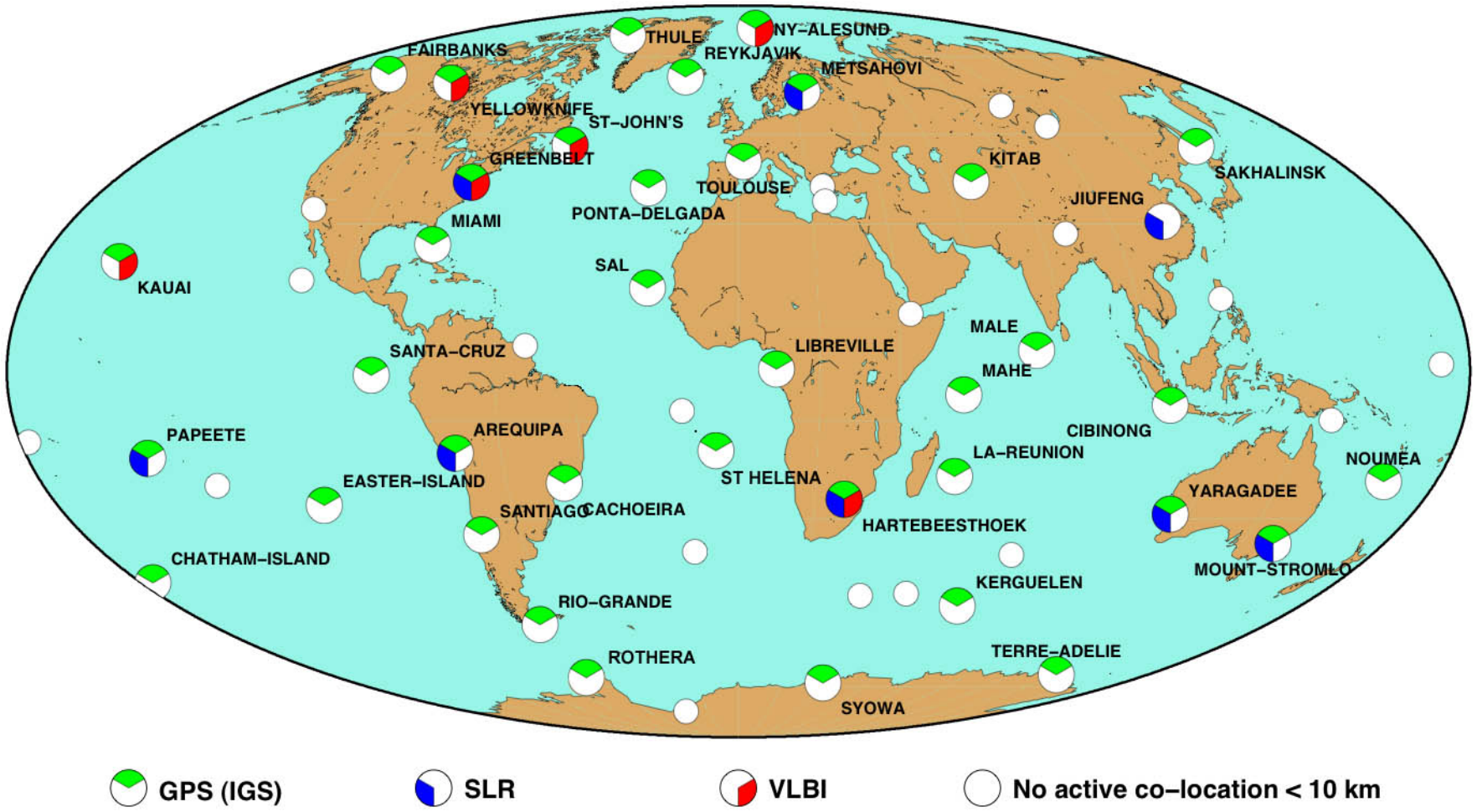
Cold Bay

Quality indicators

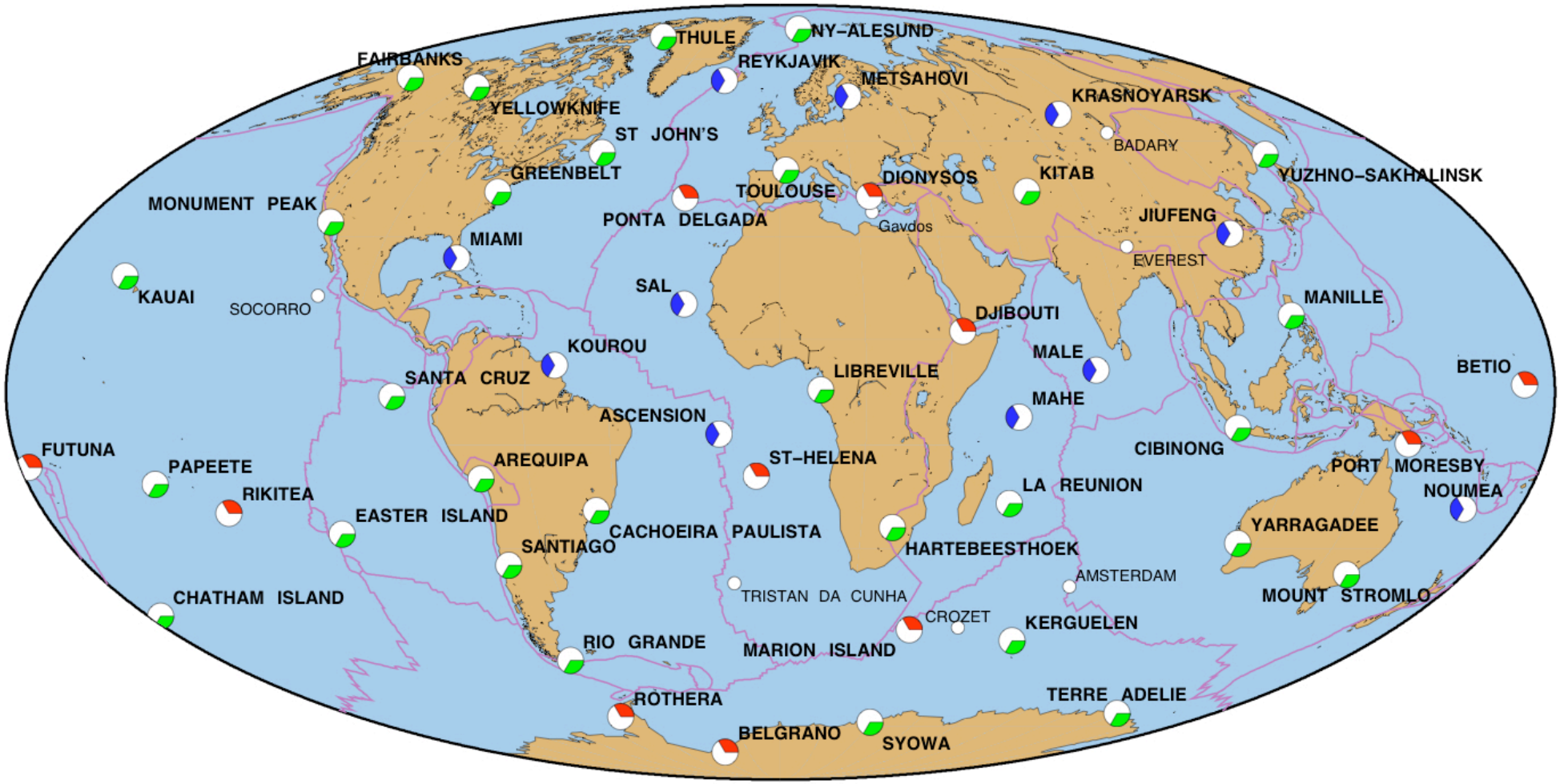
- **Context : internal quality at IGN**
- **Goal : set up indicators relating to DORIS activity**
- **Based on DORIS system requirements (DSR)**
- **3 classes of station :**
  - Class A : at least 80% of DSR satisfied
  - Class B : 50 to 80% of DSR satisfied
  - Class C : less than 50% of DSR satisfied

	Class A	Class B	Class C
Score	70%	26%	4%
Nb Stations	40	15	2
Target	93%	7%	0%

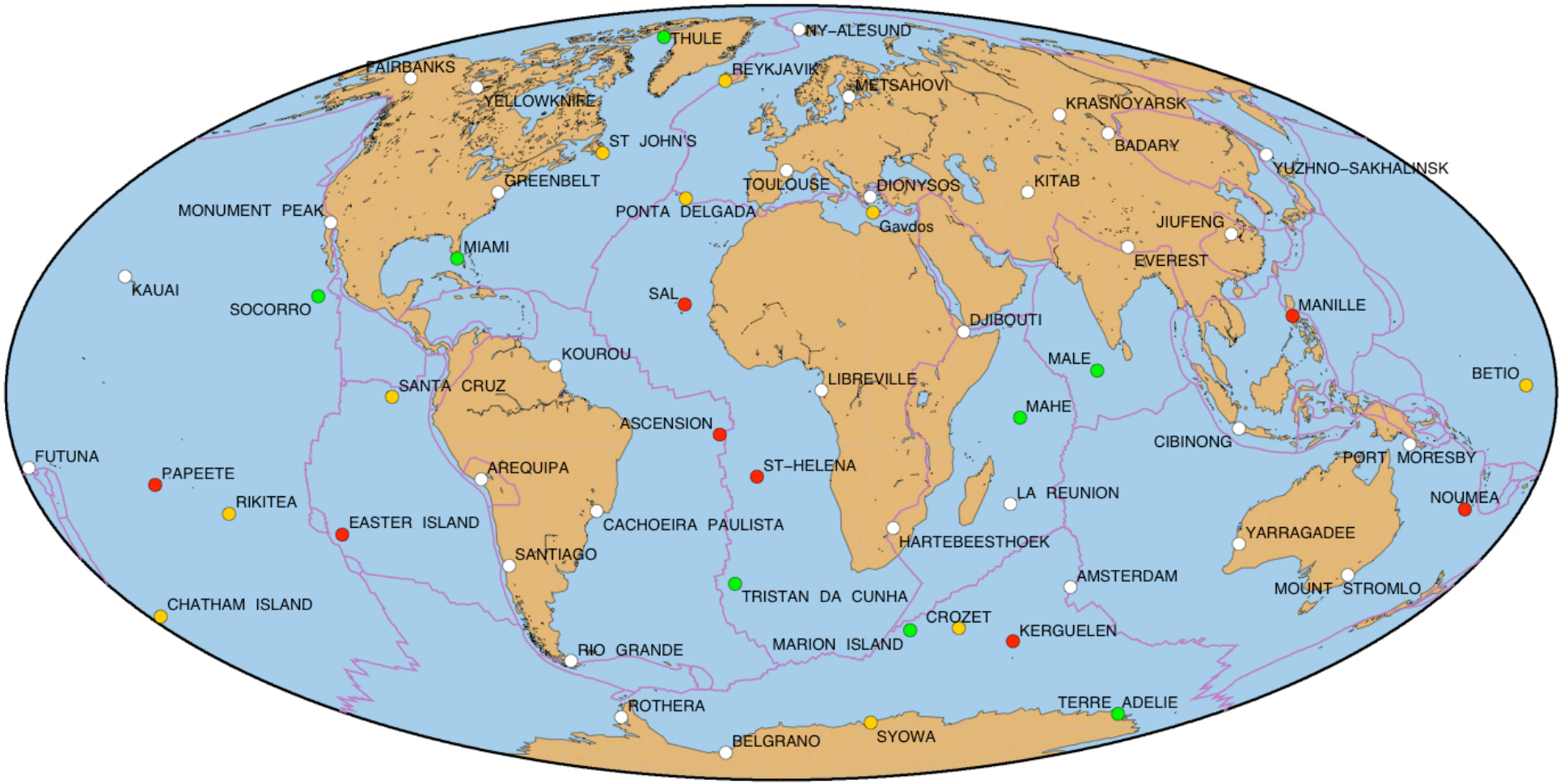
Co-location with other active IERS techniques



GNSS co-location



Tide gauge co-location (<10 km)



● Distance DORIS – Tide gage < 500 m ○ Dist. < 3.6 km ● 3.6 km < Dist. < 10 km ○ No co–location

Perspectives

- **Equipment evolution (beacon model 3.1, 3.2 available as of 2011)**
  - **More freedom for the choice of the antenna setup and support**
  - **Easier to meet the sky view + stability requirements**
  - **Simplified weather data acquisition (pressure sensor only)**
- **Network densification**
  - **IDS**
  - **CNES GNSS Network densification**
  - **GGOS 2020**
- **Follow up renovation**

Planned actions

- **Remaining renovations:**
  - **Socorro: new agreement signed, reconnaissance next November**
  - **Tristan Da Cunha: agreement in progress**
  - **Kourou: antenna support change**
  - **Greenbelt & Futuna: antenna support change and beacon shelter replacement**

- **New stations in project:**
  - **Riyad, Saudi Arabia: SLR + GPS co-location (agreement ready)**
  - **Goldstone: replacing Monument Peak**
  - **Chichijima, Japan: reconnaissance next December**
  - **Tamanrasset, Algeria (replacement for Arlit): GPS, planned SLR**