

IGN

INSTITUT NATIONAL
DE L'INFORMATION
GÉOGRAPHIQUE
ET FORESTIÈRE

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DORIS NETWORK

2012 STATUS REPORT



1. CONTEXT AND EVOLUTION

BACKGROUND

REGINA PROJECT

MAINTENANCE AND EVOLUTION

NETWORK DEPLOYMENT

LOCAL TIE SURVEY

GEODETTIC DATA

1. BACKGROUND

■ REORGANIZATION

- Agreement CNES/IGN renewed (end 2008)

■ SYSTEM REQUIREMENTS

- Specifications for station installation

■ CO-LOCATION WITH OTHERS SPACE GEODETIC TECHNIQUES

- ITRF
- GGOS

■ AGEING NETWORK

- Revisit the stations as far as possible
- Installation of remote management system (35/56)

■ REGULARIZATION

- Bring into general agreements with host agencies
- Have frequencies clearances put in order

1. REGINA PROJECT

■ “RÉSEAU GNSS POUR L’IGS ET LA NAVIGATION”

- Global network of over 30 stations, based on DORIS network, well distributed
- Project launched by CNES with the support of IGN
- Main objectives:
 - Global multi-GNSS real-time network:
 - Positioning: real-time determination of orbits and clocks
 - Contribution to: IGS, EUREF, ITRF

■ REGINA AND DORIS

- Contribution to ITRF: co-location GNSS/DORIS
- Improvement of the local tie survey accuracy
- Opportunity to strengthen contacts with host agencies
- Follow-up visit of many DORIS sites



1. DORIS NETWORK MAINTENANCE



- **COLLABORATION UNDER AGREEMENT BETWEEN CNES & IGN**

- **ORGANIZATION**
 - CNES is responsible for the operational issues of the stations (signal integrity monitoring, maintenance, support, development, shipment).
 - IGN is put in charge of all relevant geodetic activities for the network maintenance (station installation and renovation, global geodetic survey and all operations upon antenna, the reference point).
 - IGN also deals with negotiation with host agencies, agreements drafting, frequency clearance applications, ...

- **REGULAR CONTACT AND COORDINATING MEETINGS**

1. NETWORK DEPLOYMENT BY IGN

■ 1986-1990: OPERATIONAL SET-UP

- First station installed in 1986
- 32 stations in 1990 (launch of Spot-2 = start of the system)

■ 1990-2000: DENSIFICATION

- Global network design ensuring a homogeneous coverage
- Possible co-location with GPS
- 54 stations

■ 2000-NOWADAYS: RENOVATION

- System more exacting and effective
- Instruments upgrade
- Stability and better environment for the antenna

■ TODAY

- Well distributed geographically worldwide
- Keep up performance level
- Increase co-location with other space geodetic techniques and tide gauges

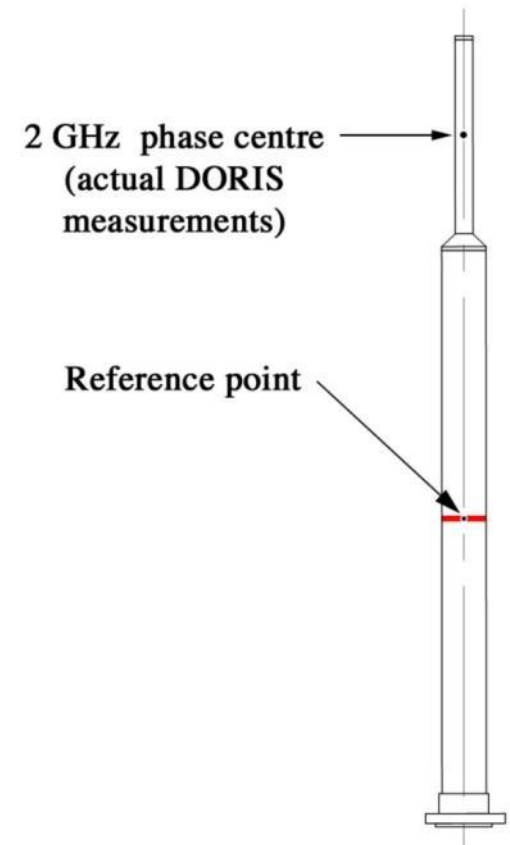
1. LOCAL TIE SURVEY

■ DORIS NEEDS

- Determine coordinates of the antenna reference (ARP)
 - New station: tie vectors with available points
 - Renovation: tie vector with the former reference point
- Tie DORIS to other local geodetic point
 - mark, GNSS, SLR, VLBI, tide gauge...

■ DORIS REFERENCE POINT

- Physical point: intersection of the antenna axis and the red disk
- In theory: vertical projection of the measurement point (2GHz phase centre) on the horizontal plane containing the 400MHz phase centre
- Problem : link physical point and measurement point
 - Phase centers location to within 5mm (specifications)
 - Manufacturing defect (bad alignment)
 - Installation defect (verticality)
- We measure physical points \neq virtual points (phase centers)
- Necessity: mark under the antenna = geodetic print of DORIS



1. LOCAL TIE SURVEY

■ CONVENTIONAL METHOD

- Combining terrestrial measurements of angles, distances and height differences
- Computing differential coordinates expressed in a topometric frame
- Referencing into a global frame (ITRF)

■ OPERATIONAL CONTEXT

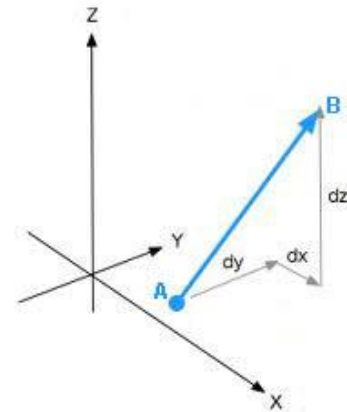
- Big equipment to forward: shipping- customs clearance difficulties
- Remote areas: unforeseeable delivery time and inactivity of our equipment
- Many local ties were done with GPS surveying method

■ DORIS GOVERNING BOARD DECISION (23/01/12)

- Favorable context with REGINA : high precision local tie surveys
- Objective : submillimetric tie vectors precision

■ OTHER ACTIONS

- Equipping sites with geodetic control points in order to monitor the monumentation stability
- Qualifying all former tie vectors through a new computation



2. NETWORK STATUS AND PERSPECTIVES

NETWORK EVENTS

NETWORK AVAILABILITY

QUALITY INDICATORS

CO-LOCATIONS

NETWORK EVOLUTION

NETWORK DENSIFICATION

2. NETWORK EVENTS



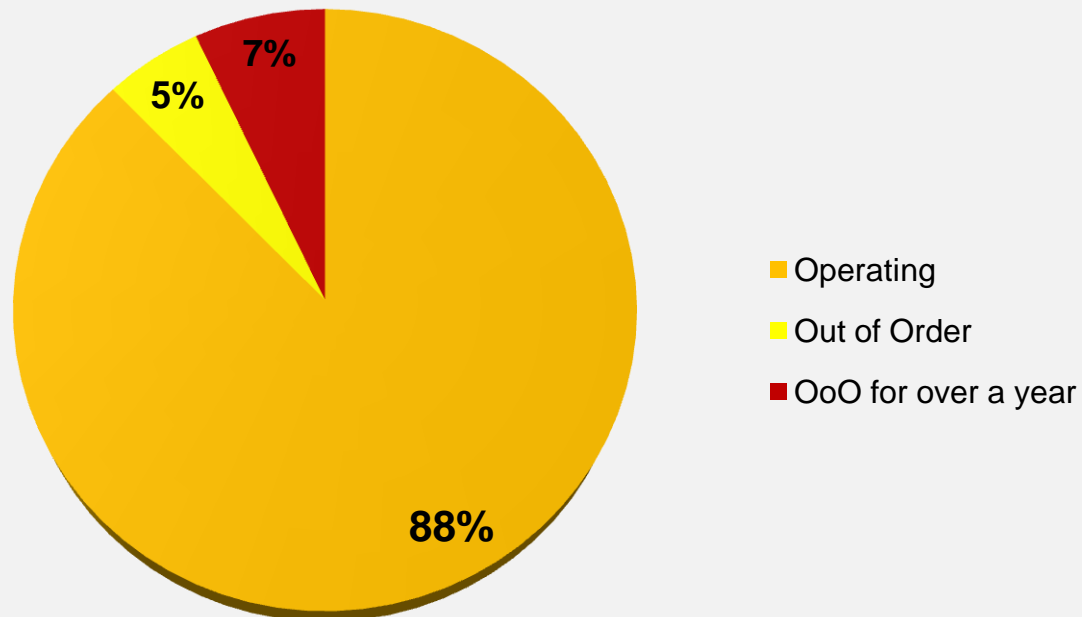
2011	Station	Event
December	Chichijima	Reconnaissance JAXA / GSI
January	<i>Toulouse</i> Papeete	<i>Equipment upgrade (3.1)</i> Local tie survey (new REGINA station) + reconnaissance 3.2
February	<i>Terre Adélie</i> Rothera Kourou	<i>Beacon replacement</i> Renovation (antenna raising) + local tie survey Renovation + local tie survey (new REGINA station)
March	Socorro	Reconnaissance for major renovation
May	Dionysos	Local tie survey (new REGINA station)
June	<i>Yarragadee</i>	<i>Equipment upgrade (3.1) + remote control system</i>
July	<i>Easter Island</i> Nouméa	<i>Beacon replacement</i> Renovation (antenna raising and equipment replacement)
August	Futuna Rikitea	Reconnaissance (preliminaries before renovation) Equipment replacement + local tie survey (new REGINA station)
September	<i>Arequipa</i> Sakhalinsk	<i>Beacon replacement</i> Removed from the network (out of order since 2006)
October	<i>Manille – St Helena</i> Metsähovi Mahé	<i>Beacon replacement + remote control system</i> Reconnaissance with a view to colocate with GNSS + SLR+VLBI Beacon 3.2 installing, reconnaissance with a view to move

2. NETWORK EVENTS

2012	Station	Event
January	All	New coordinate and velocity set (DPOD/ITRF2008)
February	<i>Rikitea</i> <i>Sal – Réunion - Kitab</i>	<i>Beacon replacement</i> <i>Remote control system installation</i>
March	All <i>Reykjavik</i> French West Indies Rio Grande	New set of site logs (major data updating and revision) <i>Beacon replacement</i> Reconnaissance in Guadeloupe and Martinique (IGS colocation) Antenna replacement (position unchanged)
April	Futuna <i>Terre Adélie</i>	Major renovation + local tie survey (new GNSS station 'FTNA') <i>Equipment upgrade (3.1) + Maser and antenna replacement</i>
May	Greenbelt <i>Everest</i>	Renovation (antenna raising and equipment replacement) <i>Remote control system installation</i>
June	Tristan Da Cunha Metsähovi	Major renovation + local tie survey Renovation + local tie survey (new REGINA station)
August	Port Moresby	Renovation (antenna raising and equipment replacement)
September	<i>Djibouti</i>	<i>Beacon replacement + remote control system</i>
October	Jiufeng Hokkaido	Renovation + local tie survey (new REGINA station) Reconnaissance (GNSS + VLBI co-location)

2. NETWORK AVAILABILTY

Current status of the 57 stations

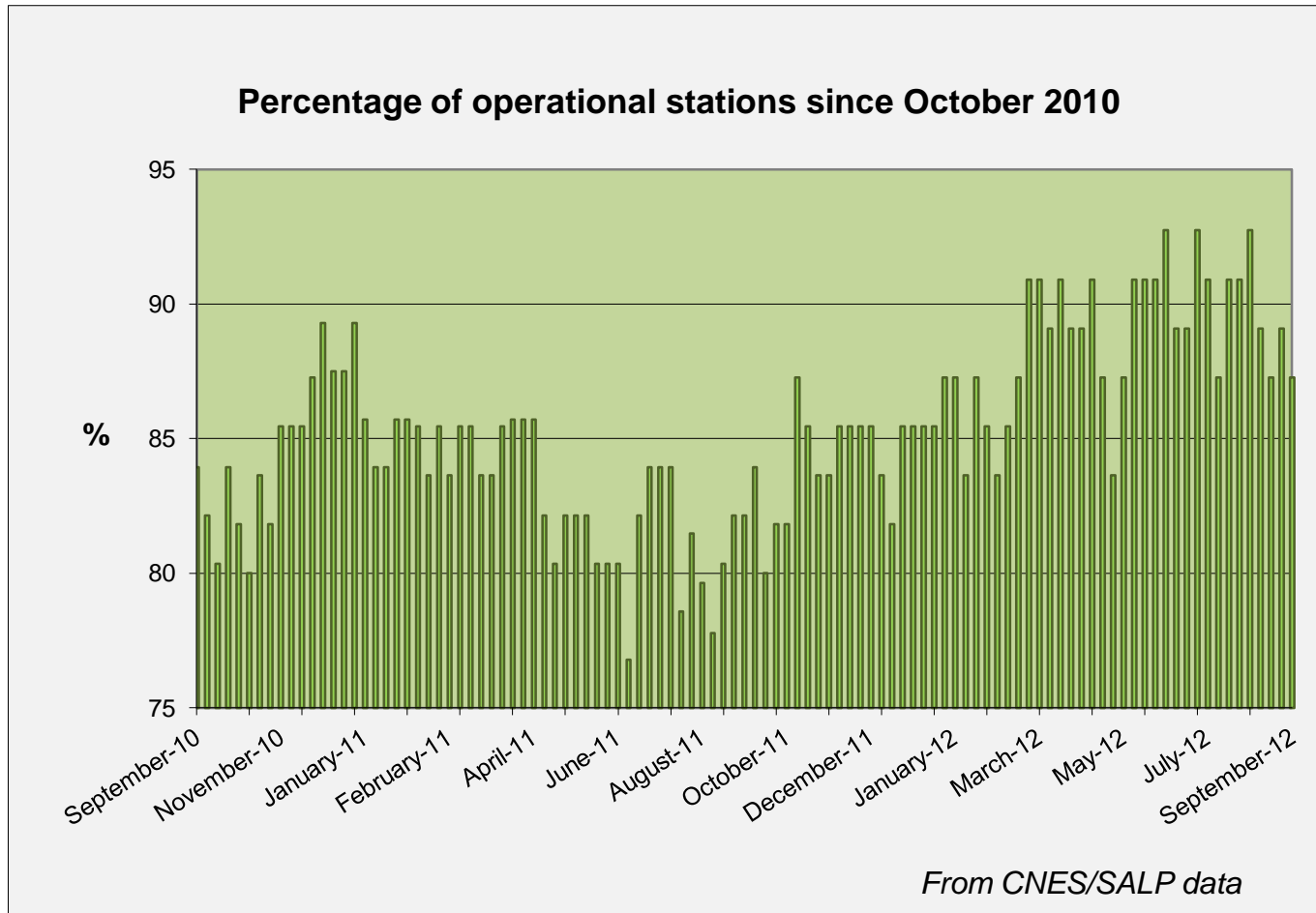


Out of Order for over a year:

Yuzhno-Sakhalinsk (11/2005), Santa Cruz (06/2009), Socorro (10/2009), Monument Peak (02/2010)

2. NETWORK AVAILABILITY

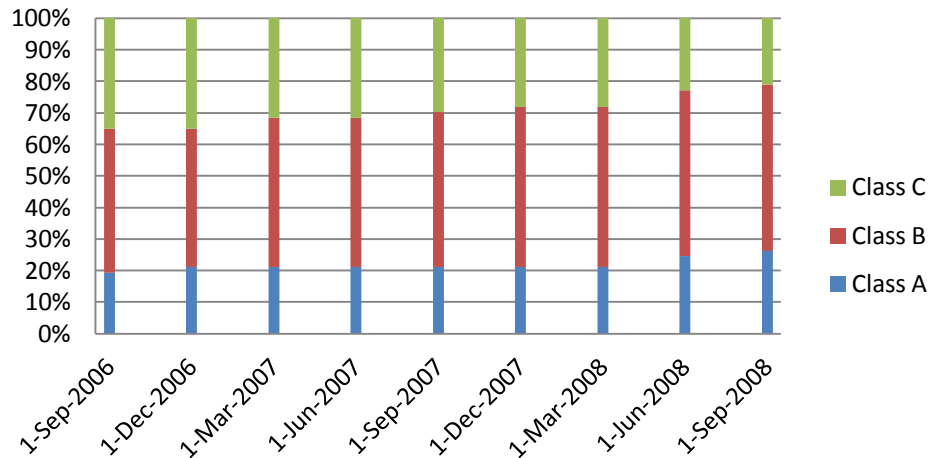
- RESULT OF THE JOINT EFFORT OF CNES AND IGN
- 28 BEACONS OUT OF 56 REPLACED IN 3 YEARS



2. QUALITY INDICATORS

- BASED ON DORIS SYSTEM REQUIREMENTS (DSR)
- 3 STATION CLASSES:
 - Class A : at least 90% of DSR satisfied
 - Class B : 80 to 90% of DSR satisfied
 - Class C : less than 80% of DSR satisfied

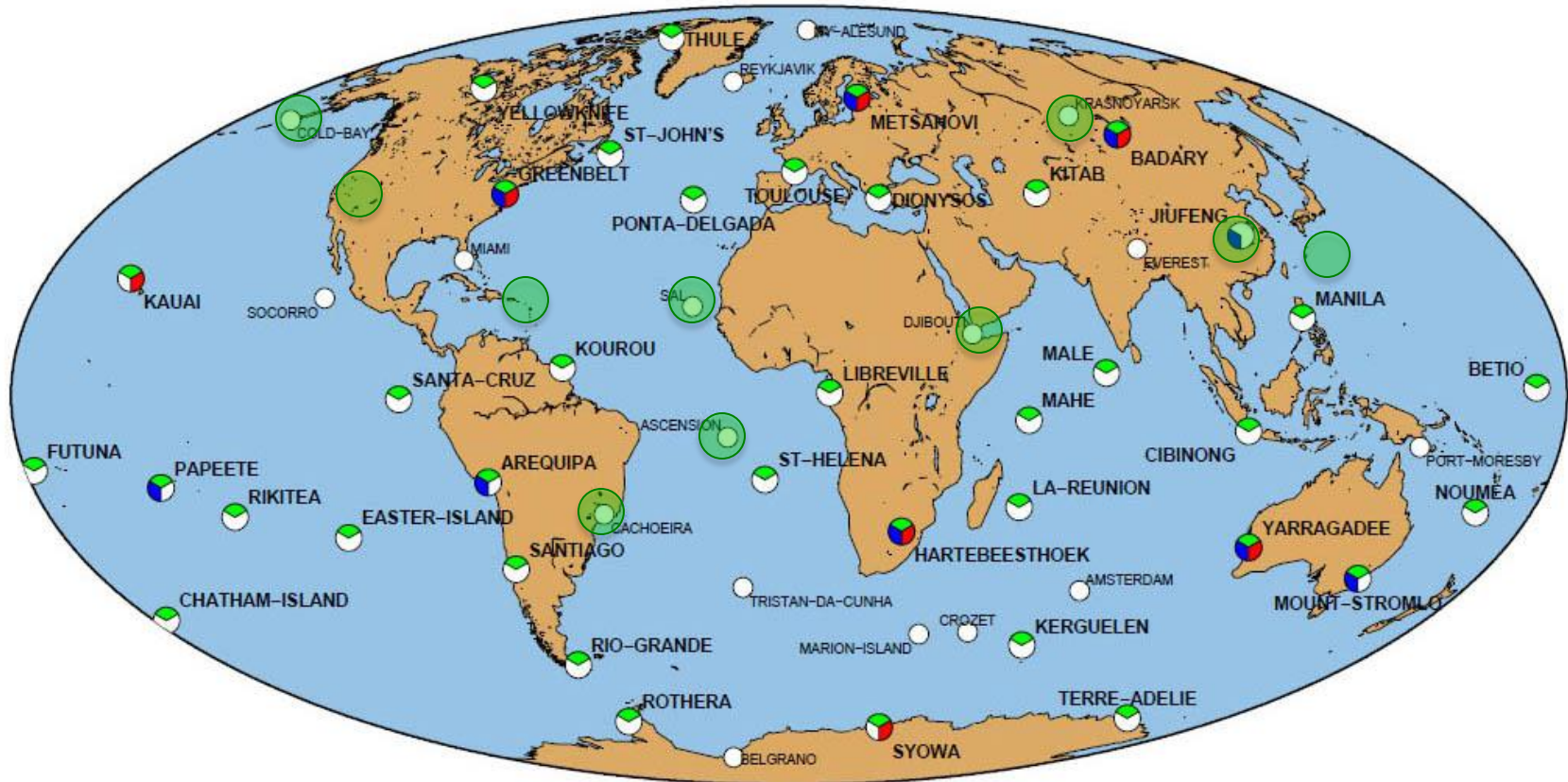
Two years follow-up



09/2012	Class A	Class B	Class C
Score	26%	53%	21%
Stations	15	30	12
Target	40%	50%	10%

2. CO-LOCATIONS

■ DORIS STATIONS CO-LOCATED WITH OTHER IERS TECHNIQUES



GNSS (IGS)

SLR

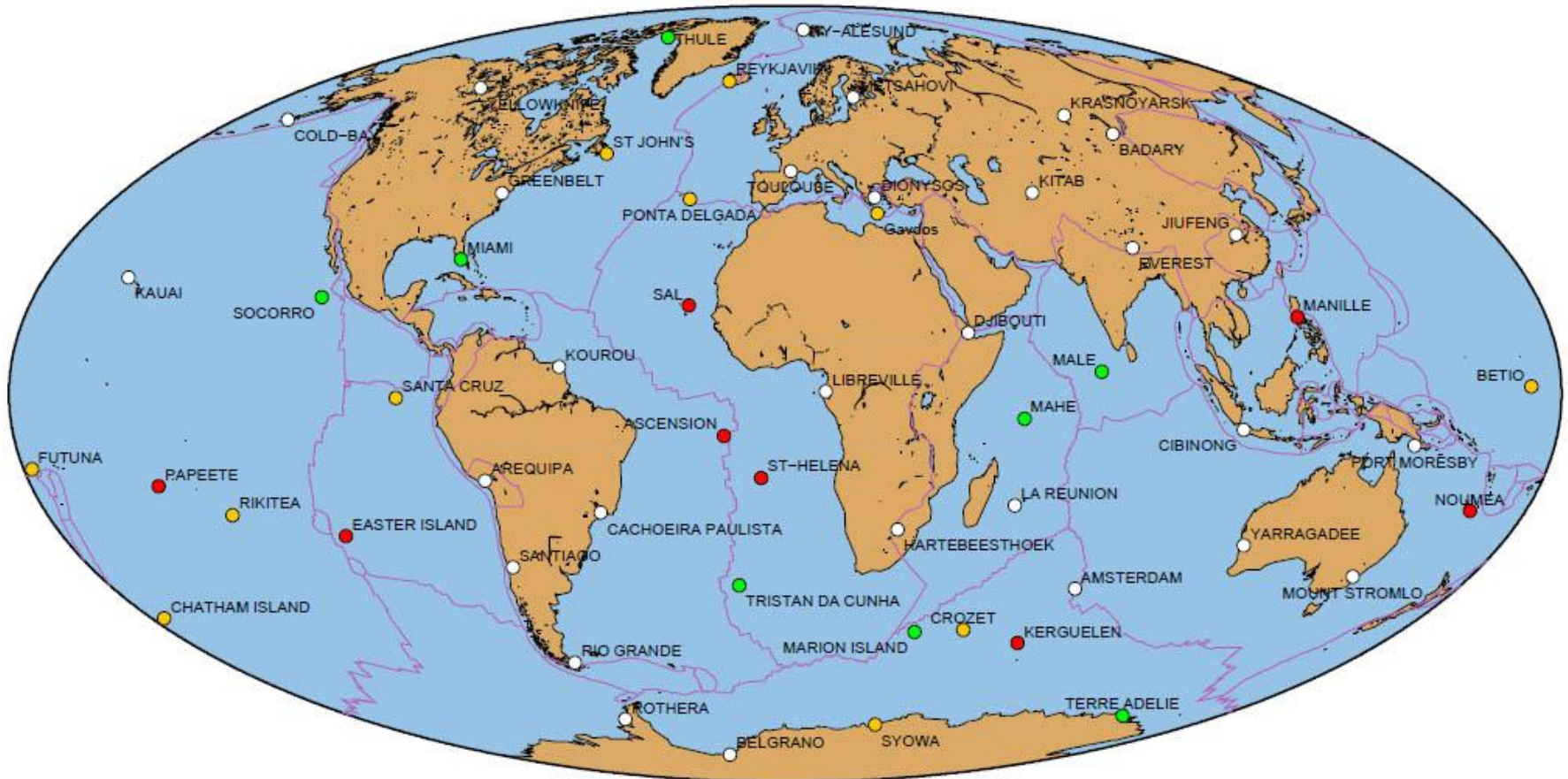
VLBI

No active co-location < 1 km

REGINA co-location to-be

2. CO-LOCATIONS

■ DORIS STATIONS CO-LOCATED WITH TIDE GAUGE



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

2. NETWORK EVOLUTION

■ SHORT RUN (NEXT 6 MONTHS)

- Jiufeng: renovation, local tie survey (new GNSS station)
- Syowa: antenna replacement
- Mahé: antenna moving, local tie survey (new GNSS station)

■ LATER

- Goldstone: new station in place of Monument Peak
- Socorro: major renovation (equipment, antenna moving...)
- Miami: definitive shutdown (interferences with TV-mobile)
- Chatham: host agency moving
- Hokkaido: new station in place of Sakhalinsk, co-location GNSS+VLBI
- Kitab: major renovation
- Easter: major renovation

2. NETWORK DENSIFICATION

■ NEW STATIONS

- Chichijima: installation planned in 2013
- Fr. West Indies : installation planned in 2013
- Nicaragua: under negotiation, co-location GNSS
- Korea: under negotiation with KASI, co-location GNSS+SLR+VLBI
- Wake island (Marshall): under consideration
- Tamanrasset: lying dormant
- Riyadh: abandoned (frequency clearance default)

