

DORIS NETWORK STATUS

30 YEARS AFTER THE START OF THE NETWORK DEPLOYMENT

JEROME SAUNIER, IGN - FRANCE



■ 1986-1992: SETTING-UP

- First station installed at Tristan da Cunha in June 1986
- 32 stations for the launch of Spot-2 = start of the system
- 47 stations at the end of 1992

■ 1993-1999: DENSIFICATION

- Coverage improvement (several stations moved)
- Start of the Starec antenna (93); second generation beacon (95)
- 54 stations at the end of 1999

■ 2000-2009: RENOVATION

- Objective: improvement of the stability and the environment of the antenna
- Antenna support changes and often, relocating

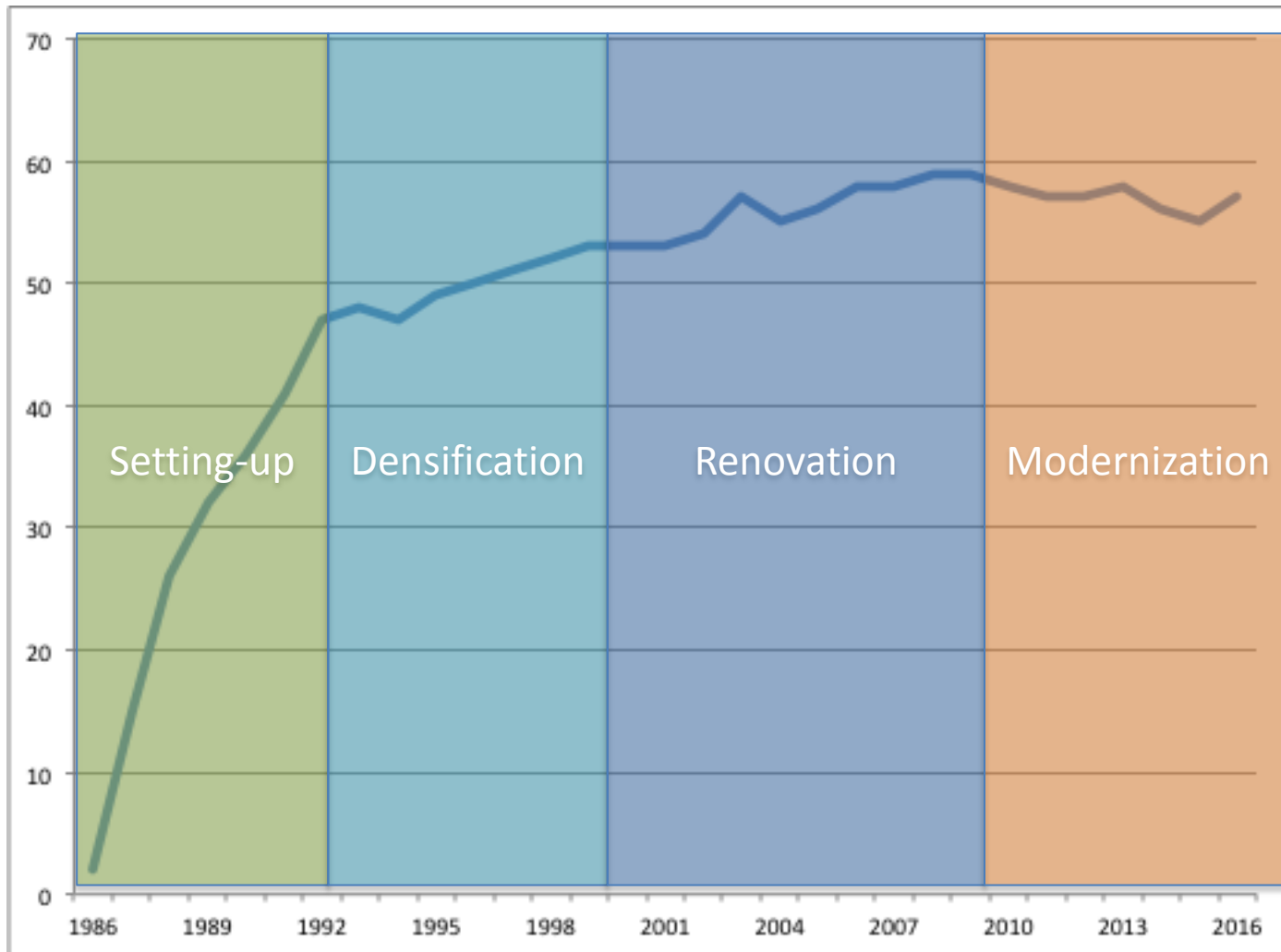
■ 2010-TODAY: MODERNIZATION

- Permanent monitoring: “DORIS integrity workshop” (2010)
- Standardization: “sites standard configuration” (2013)
- Performance assessment: “assessment of the DORIS network monumentation” (2015)
- 4th generation beacon under preparation (2019: initial deployment)

NETWORK EVOLUTION

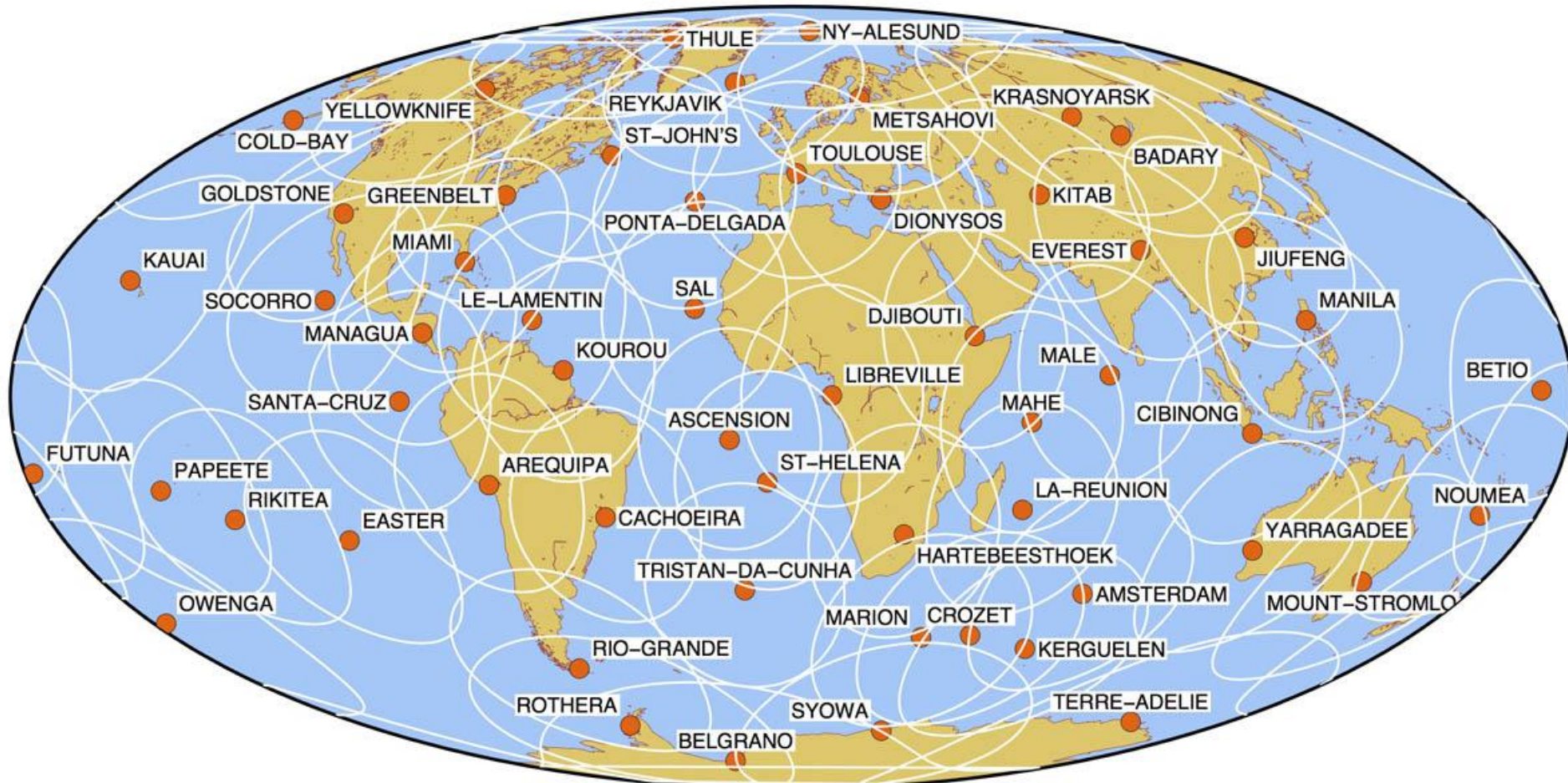


■ NUMBER OF STATIONS OF THE PERMANENT NETWORK



NETWORK DISTRIBUTION

- VERY HOMOGENEOUS GEOGRAPHICAL DISTRIBUTION
 - Coverage gap in Pacific due the decommissioning of Sakhalinsk and Port-Moresby



Sentinel-3 coverage (cut-off angle: 12°)

NETWORK MONUMENTATION

■ 3 STANDARD MONUMENTS



Type I (16%): short antenna support on load-bearing wall of a small building



Type II (24%): custom-made tripod on concrete pillar

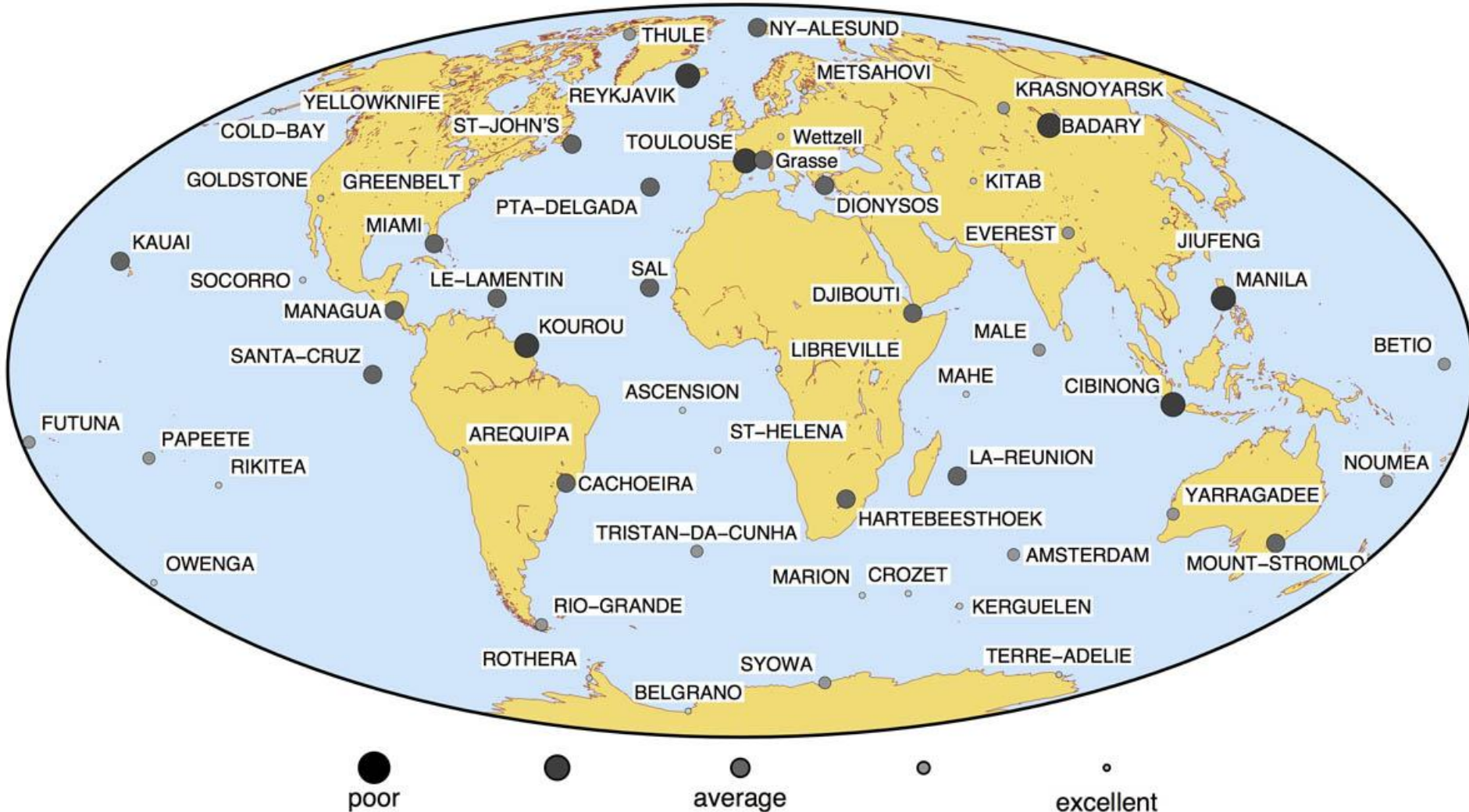


Type III (22%): very rigid steel tower on concrete block

- Elastic deformations < 1 mm when undergoing extreme climatic conditions
- 50 verticality checks in the last 15 y. : 80% of the monuments are stable (within a mm)
- 2/3 of the network monuments are compliant with standards
- *Further details: “Assessment of the DORIS network monumentation”: [10.1016/j.asr.2016.02.026](https://doi.org/10.1016/j.asr.2016.02.026)*

STABILITY ASSESSEMENT

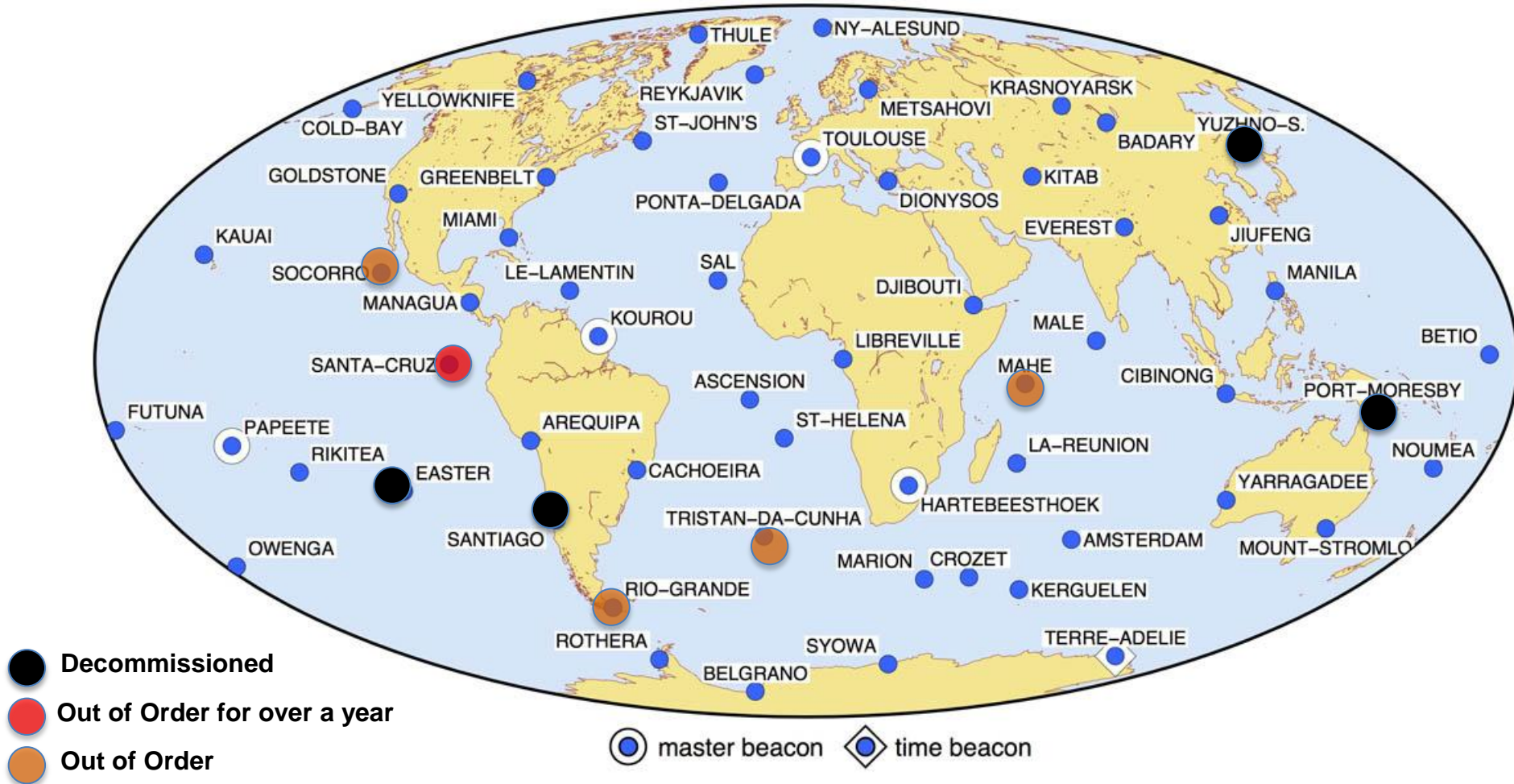
■ QUALITATIVE ANALYSIS OF THE NETWORK MONUMENTATION



OPERATIONNAL STATUS



59 stations of which: 9 beacons are out of order (4 decommissioned)



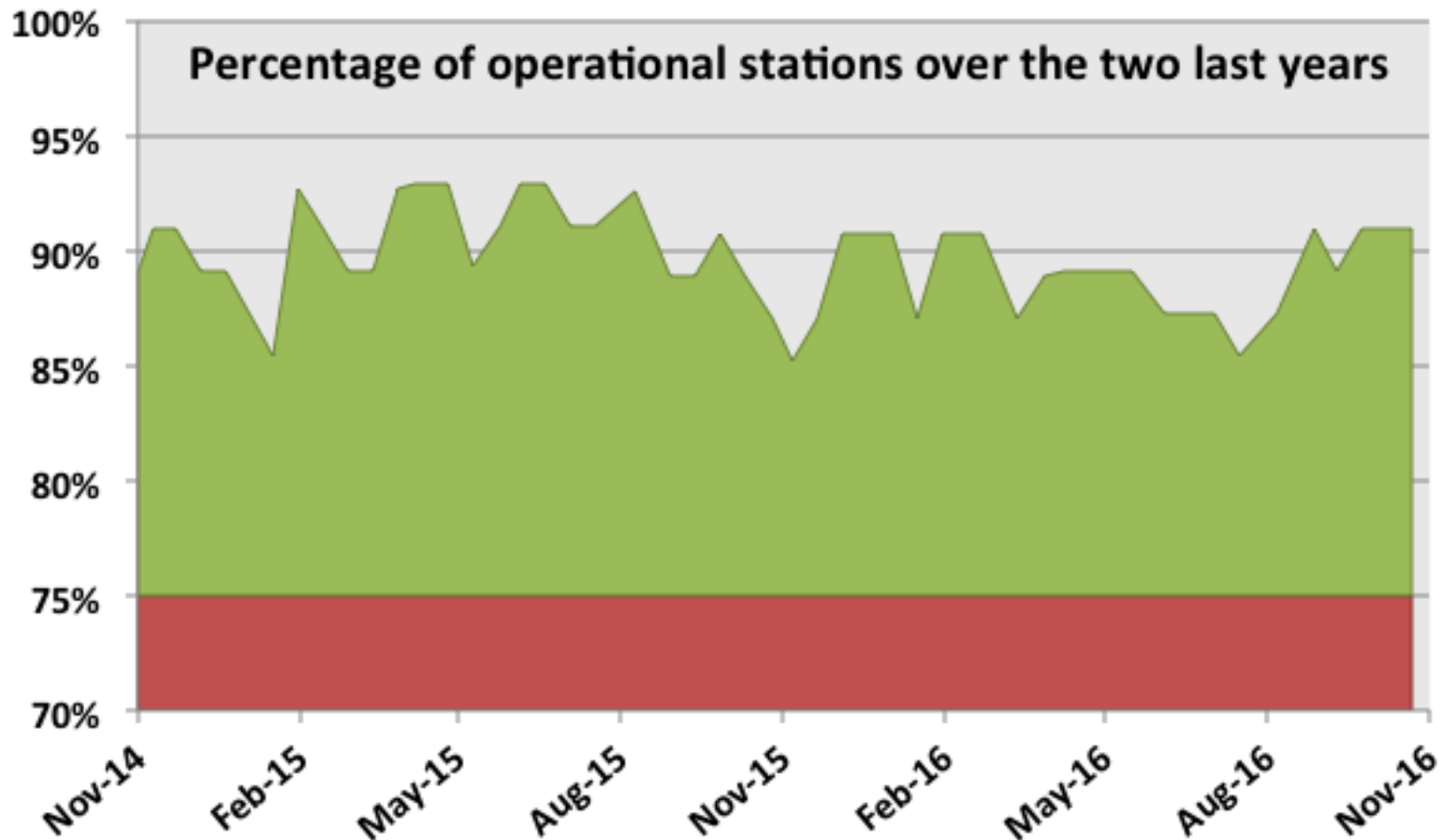
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Yuzhno-Sakhalinsk (11/2005), Santa Cruz (06/2009), Santiago (05/2013), Port-Moresby (06/2013)

NETWORK AVAILABILITY



- 5 MAINTENANCE OPERATIONS SINCE THE BEGINNING OF 2016
- MAINTAINED OVER 85% OF OPERATING STATIONS SINCE 2012

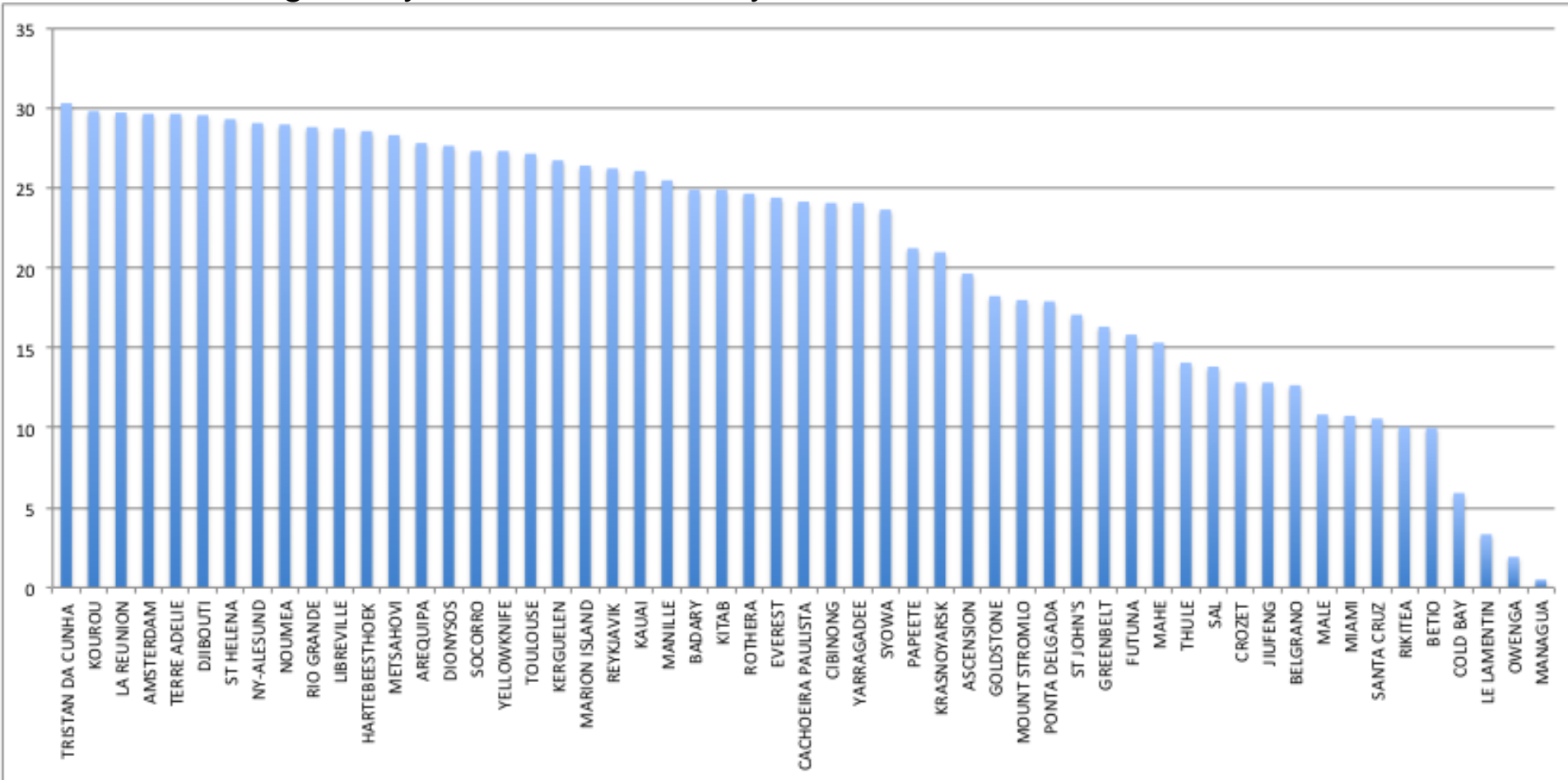


From CNES/SALP data

NETWORK RELIABILITY

■ OPERATING TIME OF THE CURRENT STATIONS

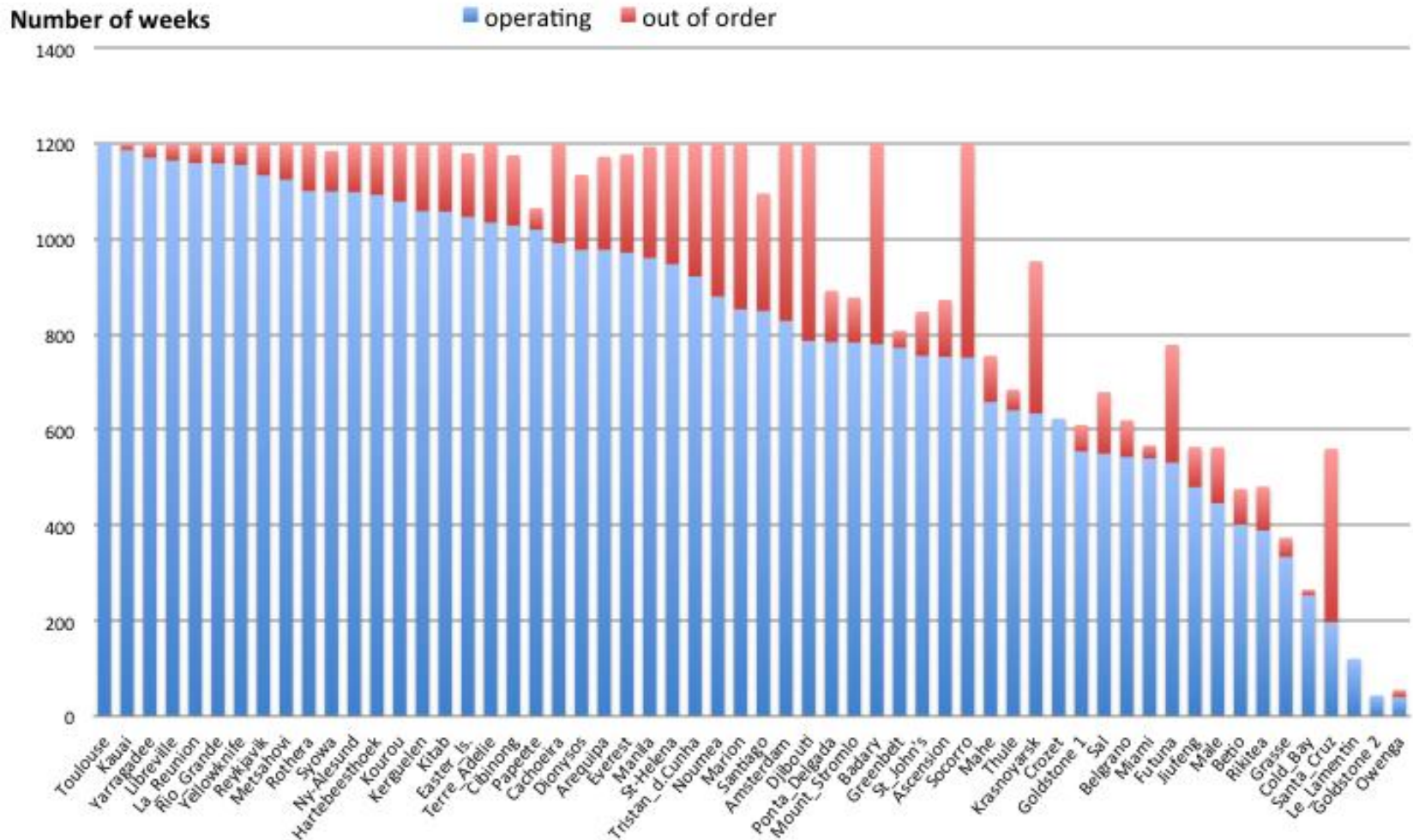
- Average: 21 years / Median: 24 years



NETWORK PERFORMANCE



DORIS network activity from January 1993



From IDS CC Data (ids12: 1993003 => 2015354)

NETWORK EVENTS (1/3)



2014			
November	COBB	<i>Cold Bay</i>	<i>Beacon replacement</i>
	OWEC	Owenga	New site in place of Chatham
December		Wettzell	Reconnaissance with a view to install a new station
2015			
January	ROW C	<i>Rothera</i>	<i>Antenna replacement</i>
	KEUC	<i>Kerguelen</i>	<i>Antenna replacement</i>
	CIDB	<i>Cibinong</i>	<i>Beacon replacement</i>
March	ADHC	<i>Terre Adélie</i>	<i>Antenna replacement</i>
	GONC	Goldstone	New site in place of Monument Peak
April	TLSB	<i>Toulouse</i>	<i>Beacon & Tracking oscillator replacement</i>
	ADHC	<i>Terre Adélie</i>	<i>Time beacon back to operation</i>
May	KRWB	<i>Kourou</i>	<i>Tracking oscillator replacement</i>

In italics: operational maintenance (equipment replacement) carried out by CNES with the participation of Host Agencies

In normal font: on-site operations carried out by IGN

In bold: main events

NETWORK EVENTS (2/3)



2015

June	-	Japan	Abandoned after failed negotiation on frequency clearance
July	- KRWB	N. Australia <i>Kourou</i>	Reconnaissance with a view to installing a new station <i>Tracking oscillator replacement</i>
August	EASB	<i>Easter Island</i>	<i>Station removed</i>
	HBMB	<i>Hartebeesthoek</i>	<i>Beacon replacement</i>
	SPJB	Ny-Ålesund	Reconnaissance with a view to relocating the station
October	JIUB	<i>Jiufeng</i>	<i>Antenna replacement</i>
	SAPC	Sal	Antenna re-location (shift of 5 m)
November	CADB	<i>Cachoiera</i>	<i>Beacon replacement</i>
	OWE C	<i>Owenga</i>	<i>Beacon replacement</i>
December	PDOC	<i>Ponta Delgada</i>	Equipment replacement (antenna + beacon)
	AMW B	<i>Amsterdam</i>	<i>Beacon replacement</i>
	KRBB	<i>Krasnoyarsk</i>	<i>Beacon replacement</i>

NETWORK EVENTS (3/3)



2016			
January	CIDB	<i>Cibinong</i>	<i>Beacon replacement</i>
February	MIAB	<i>Miami</i>	<i>Beacon replacement</i>
March	HBMB	<i>Hartebeesthoek</i>	<i>Tracking oscillator replacement</i>
	OWFC	Owenga	Station re-location (80m North-West)
April	MNAC	Managua	New site
May	TRJB	<i>Tristan da Cunha</i>	<i>Beacon replacement</i>
	-	Mariana Islands	Reconnaissance with a view to installing new station
June	KIVC	Kitab	Station re-location (200m South)
July	ASEB	<i>Ascension</i>	<i>Beacon replacement</i>
	STKB	<i>St-John's</i>	<i>Beacon replacement</i>
August	CACB	<i>Cachoeira Paulista</i>	<i>Beacon replacement</i>
September	HBMB	<i>Hartebeesthoek</i>	<i>Tracking oscillator replacement</i>
	WEUC	Wetzell	New site (IDS station)

■ PLANNED NEXT YEAR

- Santiago, CHL: station re-location in Argentina, San Juan (SLR+GNSS)
- Easter Island, CHL: station re-location following site closure in 2015
- Guam, Mariana Islands, USA: new site (co-location GNSS + tide gauge)

■ UNDER PLANNING

- Port-Moresby, PNG: station re-location in Australia, Katherine (GNSS+VLBI)
- Ny-Ålesund, NOR: station re-location 3 km away (co-location GNSS+SLR+VLBI)

■ UNDER CONSIDERATION

- Northern Asia: new site in place of Yuzhno in Manchuria (CHN)
- Reykjavik, ISL: station re-location to get better performance
- Tahiti, French Polynesia: new 4 techniques site project

FUTURE DEVELOPMENTS

■ 4TH GENERATION BEACON

- New electronic components; new architecture
- Antenna cables allowing to install it up to 50m from the beacon
- Initial deployment could start in 2019

■ MONUMENT STABILITY MONITORING

- Grasse: experimental site
- Equipping sites with control points and targets to carry out stability monitoring surveys
- Installing devices such as tiltmeter or Geocube (small GPS receiver)

■ DORIS / VLBI RF COMPATIBILITY

- Investigation for RF blockers or absorbers