



The international DORIS Service (IDS)

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Presentation prepared by IDS Central Bureau (Laurent Soudarin)

IAG Service Assessment Meeting
Technical University of Vienna
Vienna, Austria
April 25, 2014



HISTORIC DEVELOPMENT

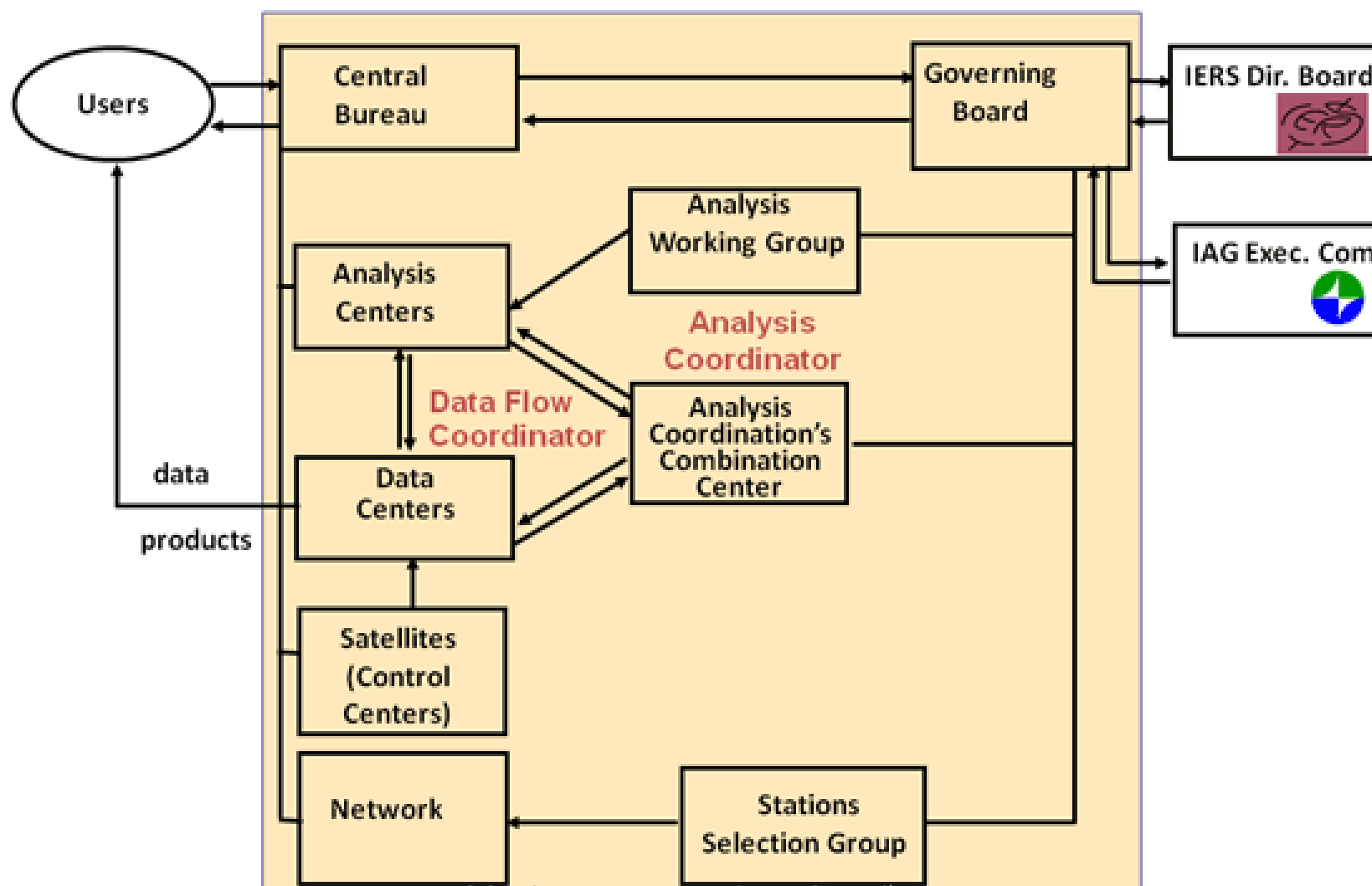


IDS history



- 80's: DORIS system designed and developed by CNES, IGN and GRGS for POD of altimeter missions and consequently also for geodetic ground station positioning.
- 1990: first DORIS instrument on board SPOT2 (initially 6-month trial experiment, DORIS has been functioning more than 19 years until the satellite was decommissioned in 2009)
- 1994: first contribution to ITRF (IGN and LEGOS/CLS)
- **1999: DORIS pilot experiment** to assess the need and feasibility of an International DORIS Service. Set-up: Steering Committee, Data Centers, Analysis Centers, Bureau Central, web site, mailing lists
- **2003: Official start of IDS** as an IAG service on July, 1st. Objective: to foster the scientific cooperation between Analysis Centers and to generate and distribute scientific products to a broad range of users.
- 2005: Contribution to ITRF2005 (IGN/JPL, INASAN, LEGOS/CLS + GSFC)
- **2009: Combination Center start**, contribution to ITRF2008 (weekly sinex series of 7 ACs)
- **2011: ToR revised**
- **2013: Network Member of ICSU WDS**
- 2014: Contribution to ITRF2013 in preparation (participation of 6 ACs)

Organization





Organization



Satellites (Control Centers): space agencies

Network: developments and operations by CNES, installation and maintenance by IGN
/ funding CNES

2 Data Centers: CDDIS (USA) and IGN (France) */ funding NASA/CDDIS, IGN*

6 Analysis Centers: ESA/ESOC (Germany), GOP (Czech Rep.), IGN/JPL (France), INASAN (Russia), CNES/CLS* (France), NASA/GSFC (USA) (using 5 different software packages) [and previously Geosciences Australia] */ funding: respective institutions, (*) CNES*

Analysis Coordination

- 1 Combination Center (CLS, France) */ funding CNES*
- Analysis Working Group = Analysis Centers + persons involved in DORIS data analysis and/or POD (CNES, GFZ, TU Delft), in TRF and EOP (IGN, Paris Obs.), modeling (IGN, EOST, UCL, GRGS) *+TU Munich / funding: respective institutions*
- Analysis Coordinator */ funding: corresponding institution*



Organization



Central Bureau at CNES+CLS+IGN (France) / *funding CNES (+IGN)*

Web site, ftp site, mailing lists, analysis forum

Governing Board: 11 members

- Elected by IDS Associates (persons representing organizations that participate in any of the IDS components), 4-year term, partial renewal every two-years:
 - 1 Analysis Centers' representative
 - 1 Data centers' representative
 - 1 Analysis Coordinator
 - 2 Members at large
- Appointed members:
 - 1 Director of the Central Bureau
 - 1 IERS representative to IDS
 - 1 IAG representative to IDS
 - 1 Combination Center representative
 - 1 DORIS System representative (CNES)
 - 1 Network representative (IGN)



Information and data center organization



The **Central Bureau** (CB) produces/stores/maintains basic information on the DORIS system, including various standard models (satellites, receivers, signal, reference frames, etc). Data available at www.ids-doris.org and [ftp.ids-doris.org/pub/ids](ftp://ftp.ids-doris.org/pub/ids)

The **Data Centers** (DC) store observational data and products, formats and analysis descriptions.

CDDIS: [web](#) and [ftp](#) sites

IGN: [ftp site](#)

The **Analysis Coordinator** (AC) provides information and discussion areas about the analysis strategies and models, and analyses of the products of the Analysis Centers, referring to CB and DC information on the data and modelling. Web pages on IDS website, maintained by the Analysis Coordinator with the support of the Central Bureau

Mailing lists:

DORIS-mails : general information

DORIS-reports: data (CNES) and product (Analysis Centers) delivery reports

DORIS-stations: information about station events (data gap, beacon change)

IDS Analysis forum: discussion about analysis topics



Main tasks



- DORIS data are routinely supplied to Data Centers by CNES POD team, mission by mission, about 4 weeks after acquisition
- ACs are requested to submit routinely every 3 months, within 3 months, 3 months of products, mainly weekly multi-satellite SINEXs of stations coordinates and EOP (X_p , Y_p , eventually LOD)
- CC assesses AC solutions individually, send feedbacks, performs weekly combination with SINEXs of at least 3 ACs



IDS Products



Product	format	Frequency delivery	from Analysis Center	from Combination Center
station coordinates	SINEX	weekly	√	√
Earth Orientation Parameters	IDS	weekly	√	√
geocenter motion	IDS	weekly	√	√
orbits	sp3	daily	√	
reference frame	SINEX	yearly	√	



GOVERNANCE



Governing Board, IDS reps., reporting



Governing Board

- although no formula is prescribed, efforts is made to keep the GB membership properly balanced with regard to supporting organizations and geographic representation.
- at least one GB meeting per year
- reports online at <http://ids-doris.org/report/governing-board.html#minutes>

Link with other services

IDS representative to the IAG: Pascal WILLIS

IDS representatives to the IERS:

Analysis Coordinator: Frank G. LEMOINE

Network representative: Jérôme SAUNIER

IDS delegate for the GGOS Steering Committee: Pascal WILLIS (substitute: Frank G. LEMOINE)

IDS representatives to GGOS consortium: Pascal WILLIS, Laurent SOUDARIN

Reporting

IDS Annual activity report

Annual reports for IERS, reports for IAG (now prepared simultaneously with the IDS annual activity report

Reports online at <http://ids-doris.org/report/governing-board.html#activity>

GGOS Steering Committee, 25 Nov 2014

2014



Terms of Reference



Online at <http://ids-doris.org/organization/tor.html>

Accepted by IAG EC, 2003

Revised by IDS in June 2011

Issues addressed:

Election process for GB members (partial renewal every two years)

Distribution: Elected members (5) / Appointed members (6)

Addition of a DORIS System representative and a Combination center representative (total 11 members, instead of 9 previously)

Some rewording for clarification

Note: the revised version was not submitted to IAG approval; potentially not fully compliant with IAG By-Laws?



IDS-IAG links



IDS ToR: say

- “The IDS is an IAG Service and operates in close cooperation with the International Earth rotation and Reference frames Service (IERS)”
- “Members of the GB become IAG Fellows with the appropriate rights and privileges, as described on the IAG website, after an initial two-year period.”
- **Pascale Ferrage and Michiel Otten should be IAG Fellow as they are both GB members since 2009. CB will contact IAG Cassini Committee to give the IDS candidates to IAG fellowship.**
- “The IAG and IERS representatives to the IDS Governing Board are appointed respectively by the IAG Executive Committee and by the IERS Directing Board for a maximum of two four-year terms.” → *M. Otten is IAG representative to the IDS GB (since 2009; 2nd four-year term)*
- “The IDS Governing Board will select the IDS representative to the IAG Executive Committee.” → *P. Willis is the IDS representative to the IAG EC (since 2009; 2nd four-year term)*
- **Ambiguous since there is no IDS representative but 3 elected representatives for the services. CB will contact IAG Cassini Committee to clarify this issue.**
- “IDS Associates are persons representing organizations that participate in any of the IDS components. [...] IDS Associates are considered IAG Affiliates. “ → *really?*”



QUALITY CONTROL AND RISK ASSESSMENT



Quality control



Routine AC SINEX solutions controlled by Combination Center

Orbits: no operational control, but feedbacks from users, and comparisons with orbits computed independently or jointly with other techniques.

Station performances controlled by MOE and POE statistics

Station Coordinates Time Series (STCD): quality control by users

<http://ids-doris.org/plot-tools.html>

Local ties regularly updated by IGN

Monumentation survey by IGN and CNES

History of events: system, stations, impacting data, Earthquake close to DORIS site

At least one Analysis Working Group (AWG) meeting a year.

IDS workshop every 2 years in conjunction with OSTST meeting (POD sessions)



Risk assessment



Analysis Centers:

Risk: best effort participation; participation linked to funding: limited (INASAN), stopped (Geoscience Australia)

Risk: not to find groups to get involved in DORIS data analysis

Governing Board:

Risk: not to find a new Analysis Coordinator at the end of term



FUTURE PLANS AND PERSPECTIVES



Next IDS activities



Improve access to time series (Web service, set up of a data base)

Continue collaboration with IGS TRF CC to get coordinate time series of GNSS colocated stations with DORIS sites (IDS plottool)

Discussion with ITRF Center at IGN

Use RINEX/DORIS data (not available for SPOT-5): All missions starting with Jason-3, Sentinel-3A (2015) will supply only RINEX/DORIS data.

Improve satellite modeling

CC: single-satellite solution comparison



Perspectives



New satellites planned until 2020+

New products:

Ionosphere (VTEC)?

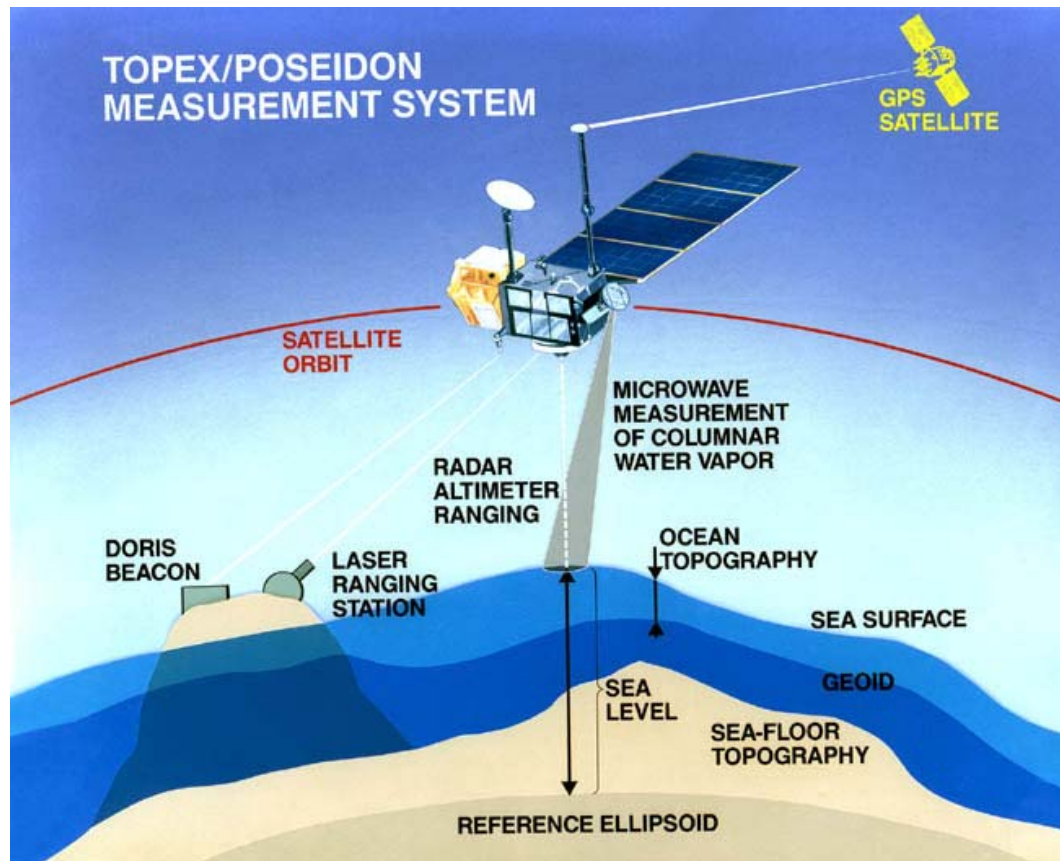
Troposphere (ZTD)?

New Analysis Centers:

Develop contacts with Chinese groups



BACK-UP SLIDES

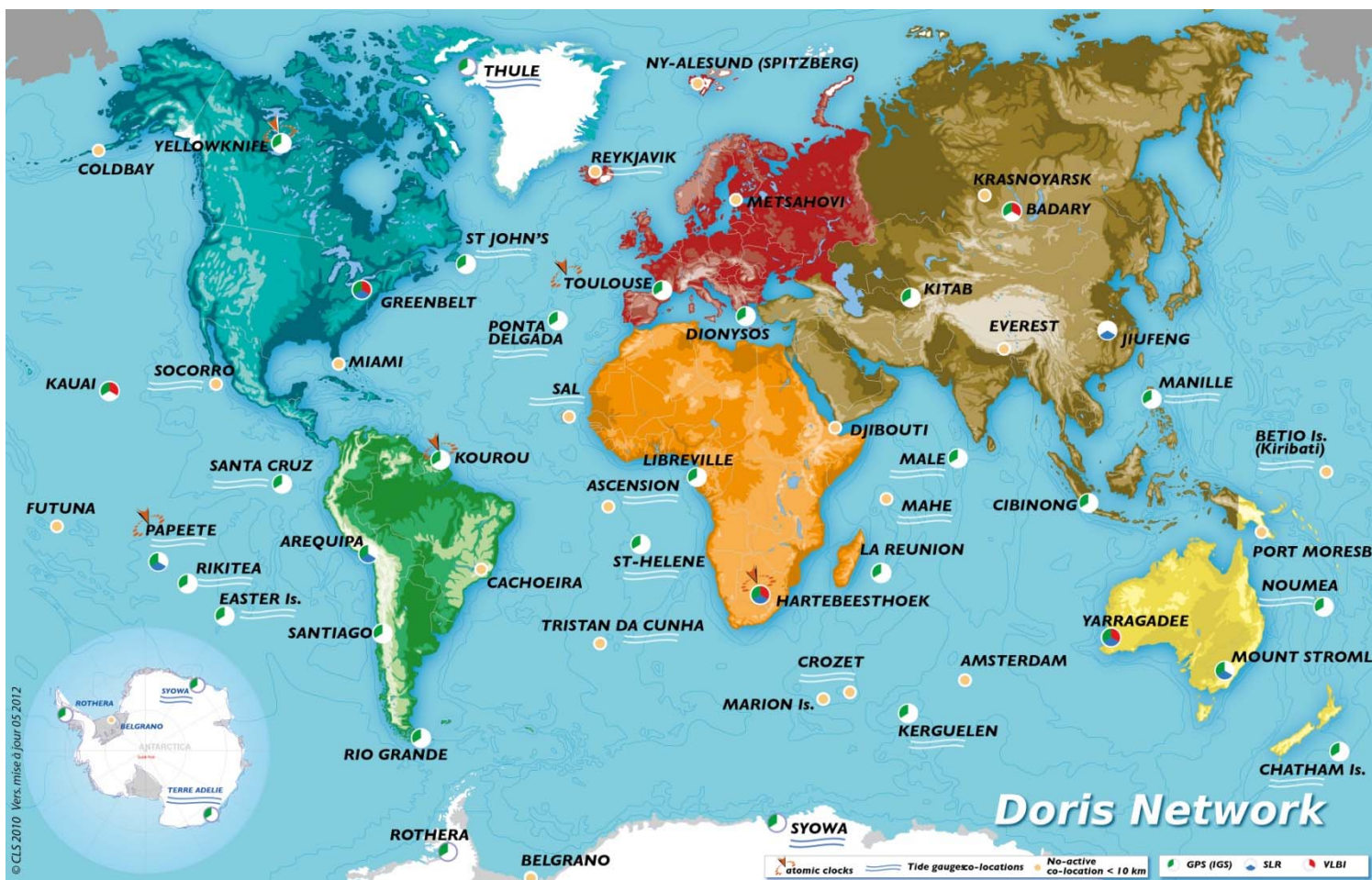


- Developed by CNES (French Space Agency)
 - for T/P for Precise Orbit Determination (1992)
 - First demonstration with SPOT-2 (1990)
 - **Uplink system**
 - 2 GHz, 400 MHz
- Other applications :
 - Geodesy / Geophysics (station coordinates and velocities, Earth Orientation, Geocenter Motion)
 - Atmospheric Sciences (Zenith Total Delays)

See also [Willis et al., Adv. Space Res., 2010](#)



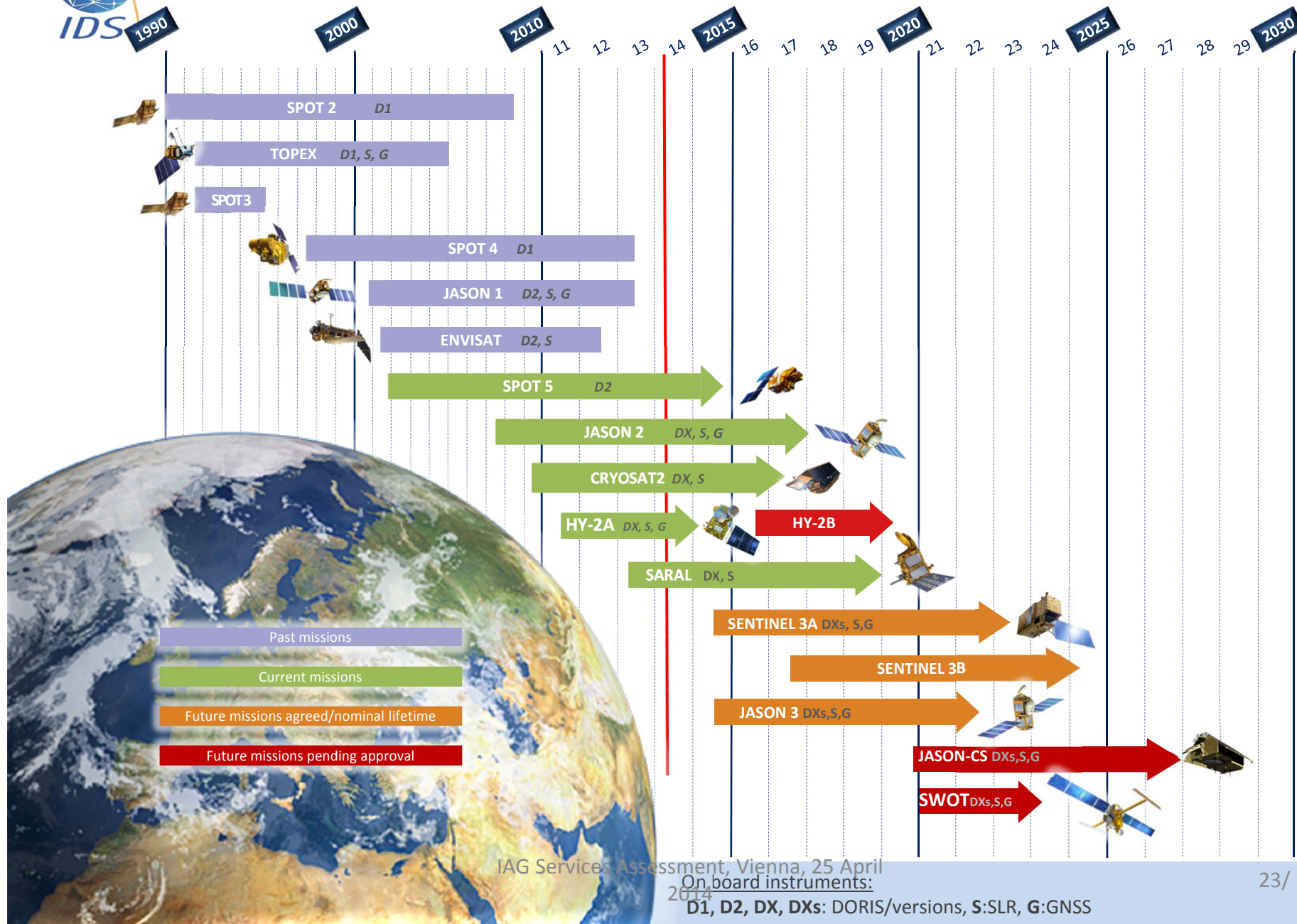
DORIS tracking network (2013)



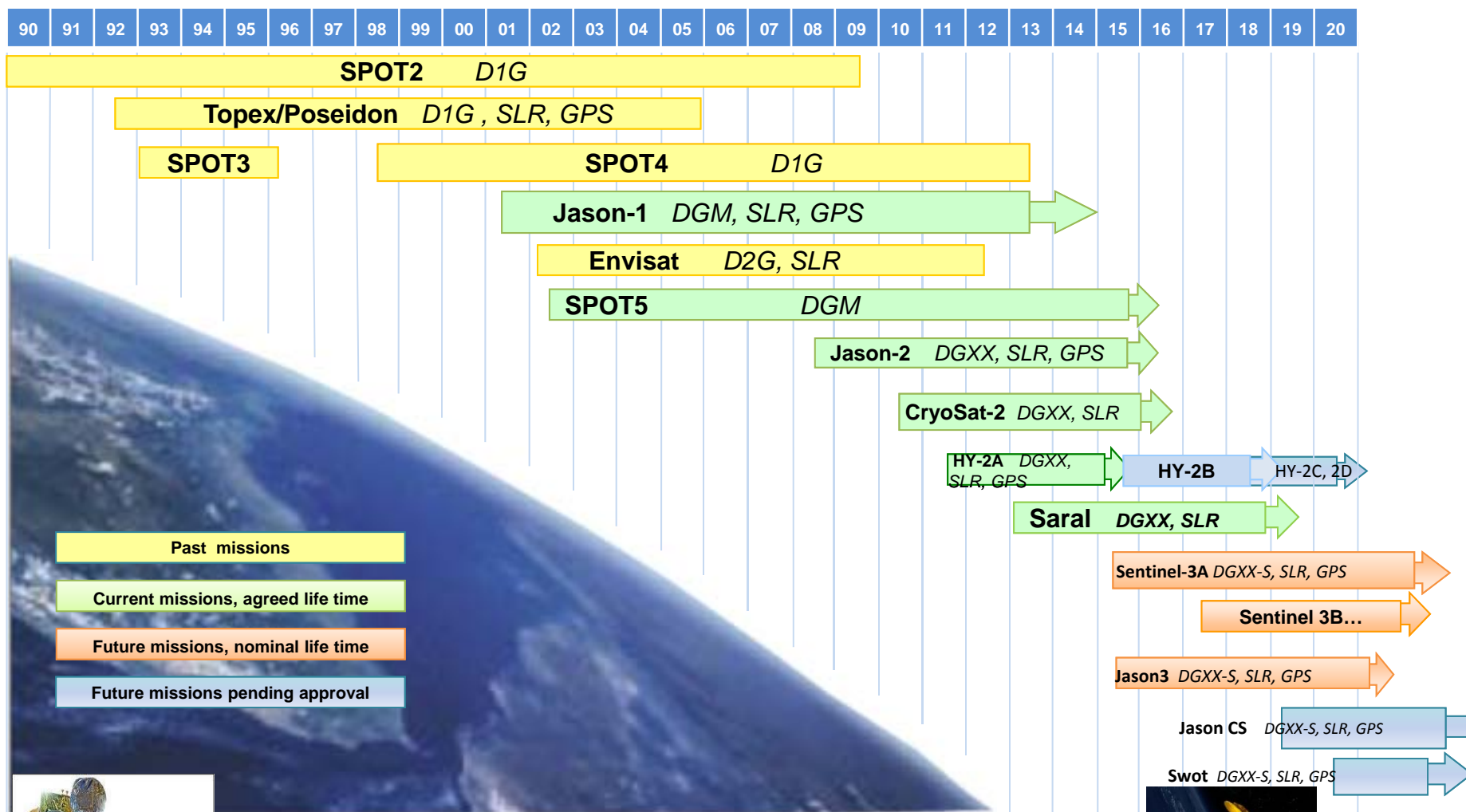
NB: Also explore network through **GoogleEarth** :
<http://ids-doris.org/network/googleearth.html>



DORIS instruments



DORIS satellites



- Past missions
- Current missions, agreed life time
- Future missions, nominal life time
- Future missions pending approval



HY-2A (China)

IAG Services Assessment, Vienna, 25 April 2014

Saral (India)





Analysis Centers



Analysis Center	Acronym	Country	Software package	Current status
ESA/ESOC	ESA	Germany	NAPEOS	active
Geosciences Australia	GAU	Australia	GEODYN	past
GeoForschungsZentrum	GFZ	Germany	EPOS	proposed
NASA/GSFC	GSC	USA	GEODYN	active
Geodetic Observatory of Pecny	GOP	Czech Rep.	Bernese	active
IGN	IGN	France	GIPSY-OASIS	active
INASAN	INA	Russia	GIPSY-OASIS	active
CNES/CLS	LCA	France	GINS/DYNAMO	active



Network:

- *Utility of Service: 3 beacons are made available to IDS; IDS defines list of priority sites according to its own criteria (co-locations with other space geodetic techniques, with a view to GGOS, co-locations with tide gauges and not supported by other techniques, geophysical interest,...). IDS sites can become permanent sites if compliant with DORIS project objectives (cover, ...).*