

DORIS

DAYS
2021

November 16, 17 and 18

Overview of Ground Network

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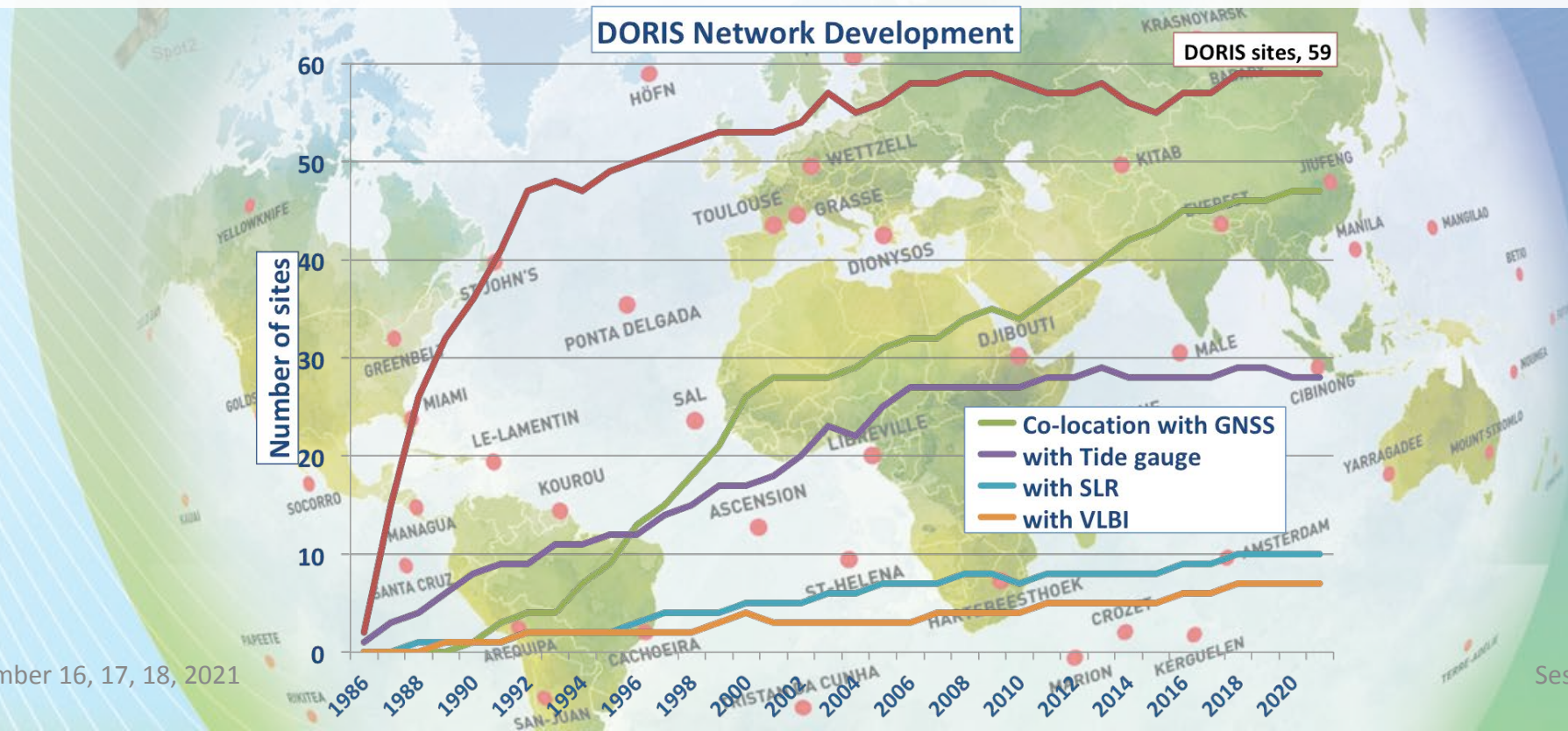
November 16
Session 1 – Presentation 5

Network goals

- **Serving the space altimetry missions**
 - Good coverage of ground stations for precise orbit determination
 - Good data availability
- **Contributing to geodesy and geophysics**
 - Precise positioning of ground stations
 - Co-location with other space geodetic techniques
 - Long time series

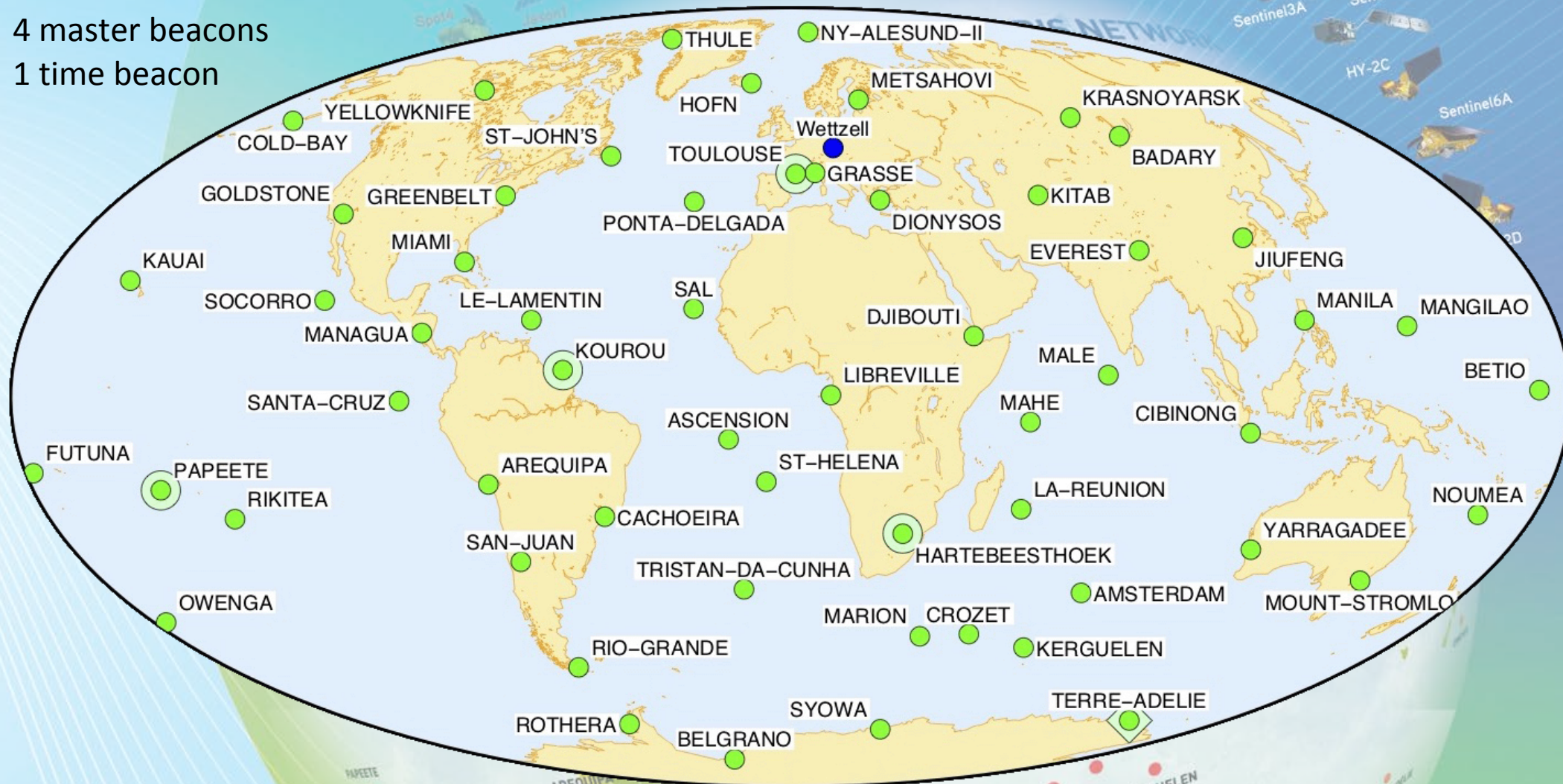
Network setting-up and development

- Between 55-60 stations over the past 20 years
 - This number of stations allows to maintain the required level of service for POD
- Continuing effort to co-locate DORIS with other techniques
 - To improve the geodetic reference systems

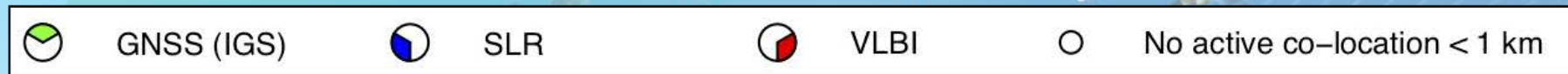


GM2

1 time beacon



Co-location with other space geodetic techniques



Inter-technique combination of solutions
Inter-comparisons of local events



Co-location with tide gauges

● Distance < 1000 m ● 1 km < Dist. < 3 km ● 3 km < Dist. < 10 km ○ No co-location

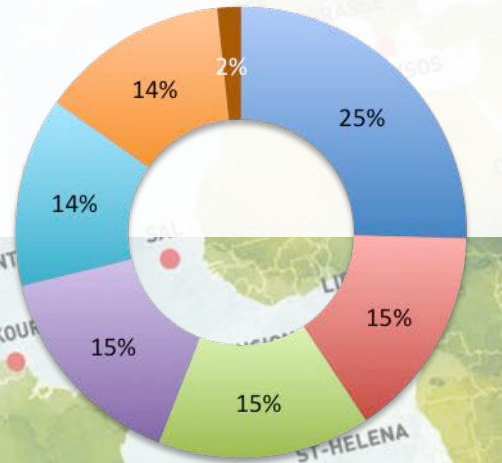
Absolute reference for tide gauge measurements

Vertical Land Movement monitoring



Network reliability

- Long-term life and stability of the stations
 - Several time series extremely long and most of them longer than 25 years
 - Very few relocations or changes of sites
- Continuous service of the permanent tracking stations
 - At least 80% of active sites every week over the last 15 years
 - Close monitoring and maintenance of CNES and IGN teams
- Key role of the host agencies
 - Partners in 35 countries
 - Scientific interest in DORIS



Network main key developments over time

- **Monument stability improvement (since 2000)**
 - First estimate of the stability of the stations monuments (*Fagard, J. Geodesy, 2006*)
 - Action plan to renovate the network monumentation
- **Standardizing installations (since 2007)**
 - System requirements for a DORIS station to ensure smooth operation and good performance => see *DORIS Days Session #3*
- **Integrity monitoring system (since 2010)**
 - Immediate detection of a faulty beacon; checking of the signal quality and reliability for each station
- **Equipment upgrade (since 2014)**
 - Starec C type Antenna (as for 2014) => see *DORIS Days Session #3*
 - 4th generation Beacon (as for 2019) => see *DORIS Days Session #3*

Network ongoing developments

- Gradual replacement of the equipment with new generation
 - 4th generation beacon deployment (indoor equipment)
 - Starec C type antenna deployment (outdoor equipment)
- Densification (10 additional stations)
 - Make the network more robust by adding stations in critical areas
 - Enhance the network contribution to various applications
 - New sites under way: Gavdos (Crete, Greece), Katherine (Australia), Hanga Roa (Easter Island, Chile), Changchun (China)
- Site renovation
 - Better meet the system requirements => see *DORIS Days Session #3*
- Connection between DORIS beacons and GNSS receivers
 - Clocks stability inter-comparison
 - About 30 sites concerned

Further information

- **IDS Website** **ids-doris.org**

- DORIS SYSTEM > Tracking Network:
 - Station information sheets: Sitelogs; Position Time Series; Maps...
- ANALYSIS COORDINATION > Documents:
 - Ground Segment: RF Characteristics; Antennas types ; System Requirements...
 - Stations: Local tie surveys; Station Events...

- **Publications**

- Fagard, H., 2006. *Twenty years of evolution for the DORIS permanent network: from its initial deployment to its renovation*. J. Geod. 80 (8–11), 429–456.
<http://dx.doi.org/10.1007/s00190-006-0084-2>
- Saunier, J., 2016. *Assessment of the DORIS network monumentation*. Adv. Space Res. 58 , 2725–2741. <http://dx.doi.org/10.1016/j.asr.2016.02.026>
- Tourain, C., Moreaux, G., Auriol, A., Saunier, J., 2016. *DORIS Starec ground antenna characterization and impact on localization*, Adv.Space Res. 58 (12), 2707–2716.
- Saunier, J., Auriol, A., Tourain, C., 2016. *Initiating an error budget of the DORIS ground antenna – Genesis of the Starec antenna type C*. Adv. Space Res. 58 (12), 2717–2724.
<http://dx.doi.org/10.1016/j.asr.2016.02.013>

Network key features

- **Dedicated to satellite altimetry for more than 30 years**
 - Good coverage for precise orbit determination
 - About sixty stations so as to maintain a sufficient level of service
- **Very homogeneous geographical distribution**
 - Distinctive feature providing an important contribution to geodesy
- **Co-location with other techniques**
 - 49 co-locations out of 59 DORIS sites (83%) with other geodetic techniques
 - Half of the network stations co-located with tide-gauge
- **Long-term life span of the stations**
 - Very long time series of position => good estimate of the velocities
- **Reliability**
 - Close monitoring and maintenance ensuring a large amount of data