TRANSMIT
from an Industrial Partner's Perspective

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Fugro-Intersite BV

11th European Space Weather Week

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Prof. Dr. Ir. Kees de Jong

12 Januari 1962 – 31 October 2014 (52 year)

1980 Technische Hogeschool Delft, NL
1984 First GPS measurements in NL
1986 GPS baseline Post-Process software
1988 Japan Sokkia, GPS manufacturer
1993 Researcher at Technical University Delft
1995 Philips, CARIN, Car navigation
1997 Phd Technical University of Budapest
1998 Assistent Profesor TU Delft
2003 Fugro Senior Geodesist
- Moving baseline RTK Protrack
- Inertial Navigation System Finetrack
- 10 cm worldwide PPP
- centimeter level worldwide PPP-RTK

2013 Visiting Profesor Newcastle
130 Publications 2 Patents,
1 Reference book “Hydrography”

Fugro Mission

Fugro's mission is to be the **world's leading service provider** in the collection and interpretation of data relating to the Earth's surface and sub-surface, and in the support of infrastructure developments on land, at the coast and on the seabed.

Fugro Resources

12,165 Employees

50 Vessels

75 CPT Trucks

27 Laboratories

29 Jack-up Platforms

27 Aircraft

261 Land-based Drill Rigs
17 Offshore Drill Rigs

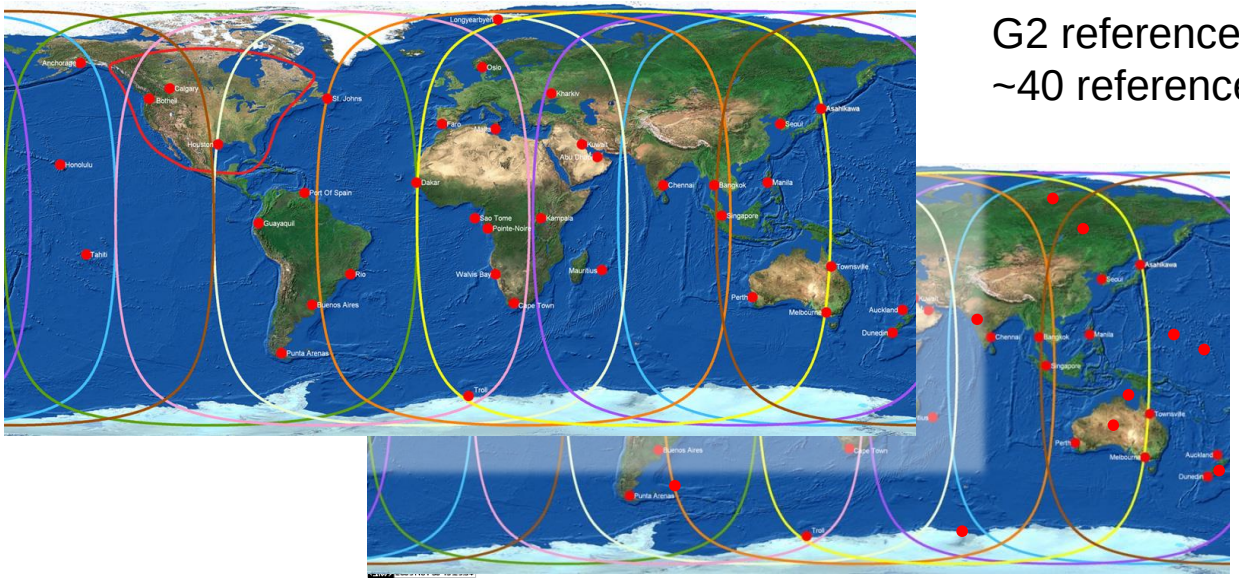
150 ROVs

9 AUVs

> 250 Offices

Fugro's **people, vessels, equipment** and **facilities** are continually growing in capability and expertise in order to meet the demand for continuous high quality services in ever-more challenging regions of the globe.

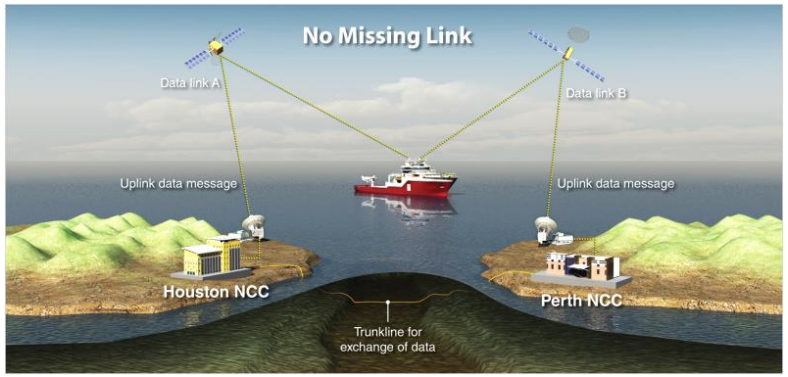
GNSS Infrastructures



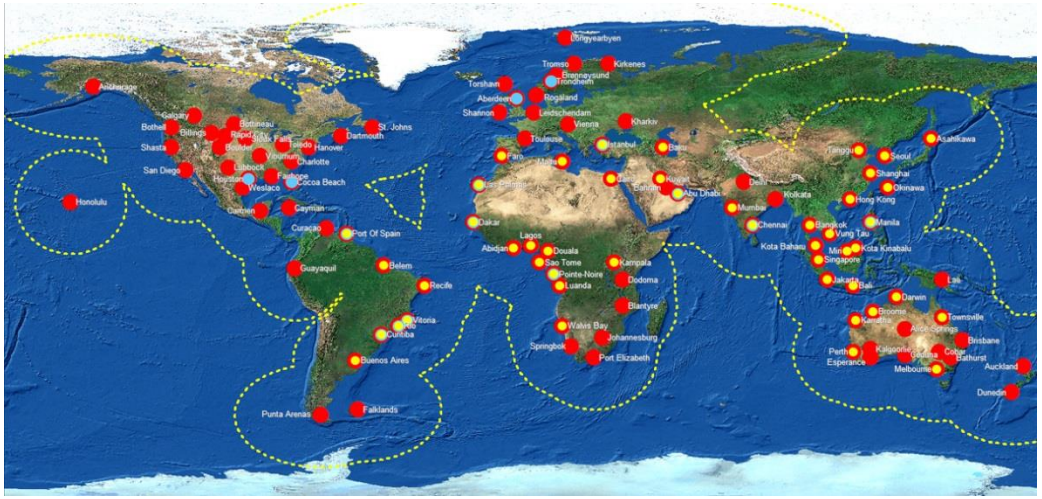
G2 reference network
~40 reference station GPS+Glonass

XP independent
orbit and clock network
~60 reference stations GPS

L1 and HP reference network
~100 reference stations

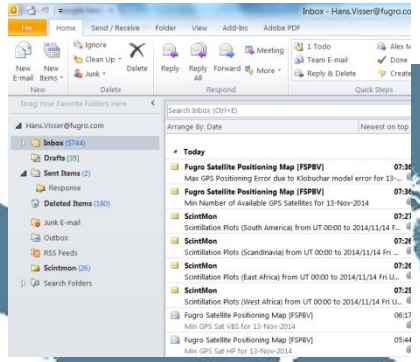


Two Network Control Center (NCC)



8 broadcasting satellites

FUGRO Offices around the world



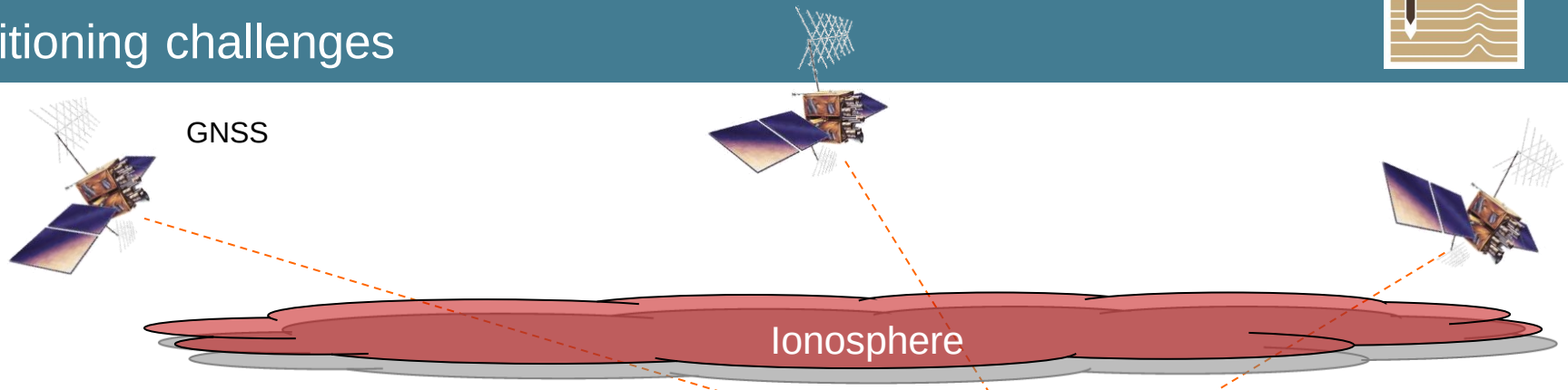
FUGRO Offices around the world

FUGRO GNSS relations to Universities

Relations by:

- *Apprenticeships*
- *Invited Lectures*
- *Sponsor Students*
- *Data Exchange*
- *Workshops*
- *Publications*

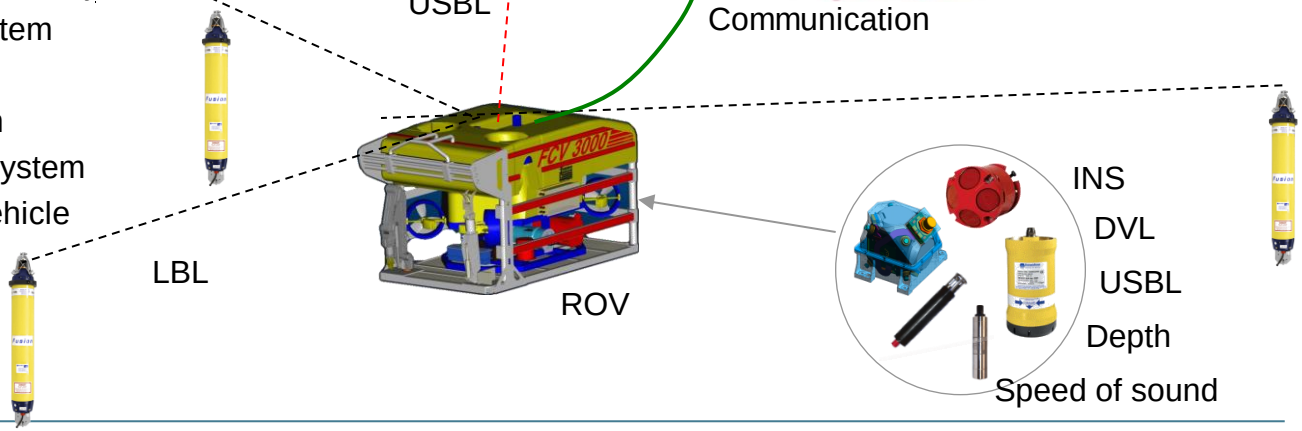
Positioning challenges



Orbit and Clock Error
GNNS Antenna phase Centre
Ionospheric delay
Ionospheric Scintillation
Troposphere
Multipath
Interference
Blockage and birds

GNSS – Global Navigation Satellite System
INS – Inertial Navigation System
DVL – Doppler Velocity Log
LBL – Long BaseLine system
USBL – Ultra Short BaseLine system
ROV – Remotely Operated Vehicle

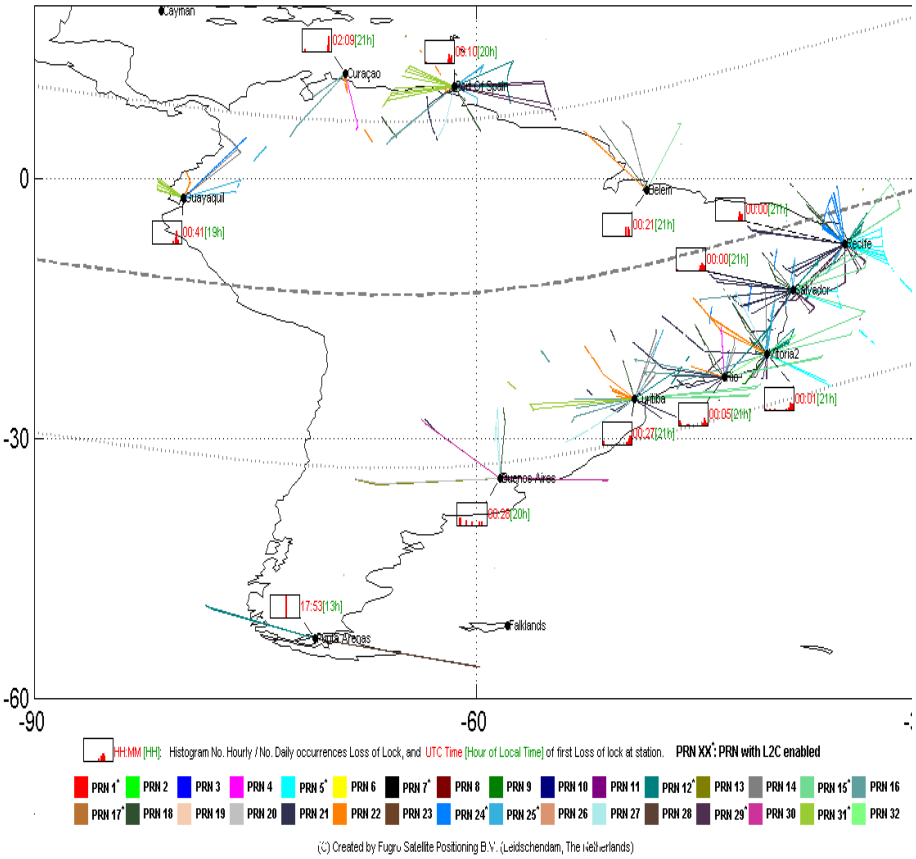
USBL
Communication



Loss of Lock Indicator graph

Thu 13 Nov 2014: L1/L2 Loss of Lock in Fugro GPS Network over 24 Hours
Area: South-America

Ionospheric Pierce Points for all satellites at the ionospheric height of 350 km (Mask=20°)

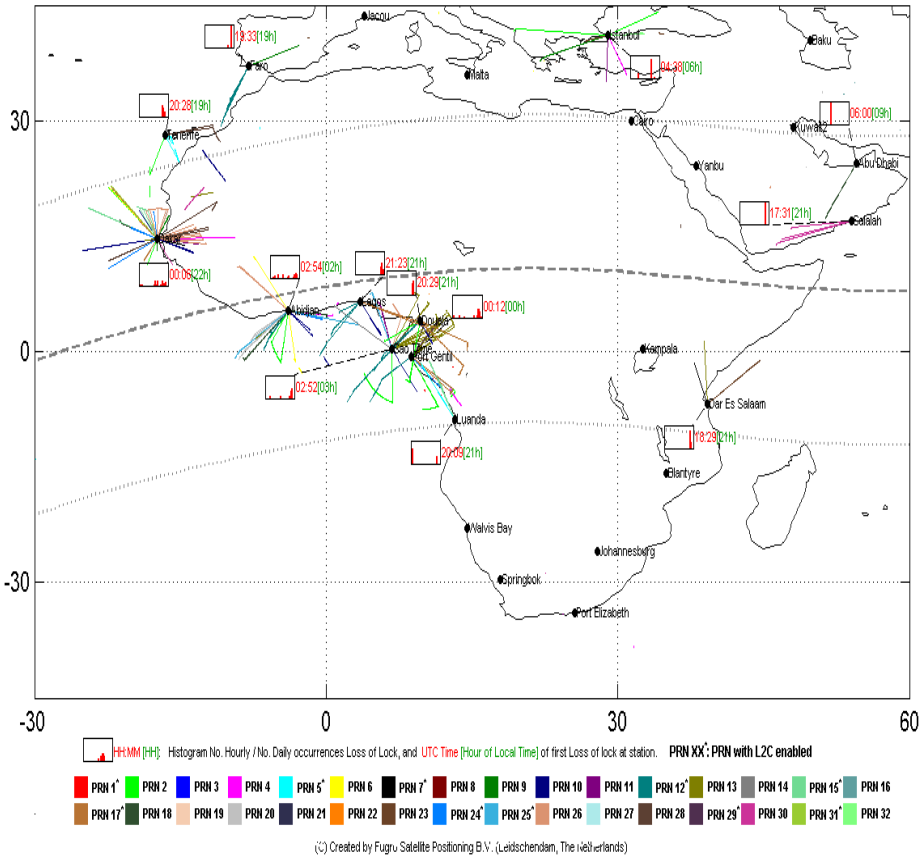


HH:MM [HH]: Histogram No. Hourly / No. Daily occurrences Loss of Lock, and UTC Time [Hour of Local Time] of first Loss of lock at station. PRN XX*: PRN with L2C enabled

PRN 1* PRN 2 PRN 3 PRN 4 PRN 5* PRN 6 PRN 7* PRN 8 PRN 9 PRN 10 PRN 11 PRN 12* PRN 13 PRN 14 PRN 15* PRN 16
PRN 17* PRN 18 PRN 19 PRN 20 PRN 21 PRN 22 PRN 23 PRN 24* PRN 25* PRN 26 PRN 27 PRN 28 PRN 29* PRN 30 PRN 31* PRN 32

Thu 13 Nov 2014: L1/L2 Loss of Lock in Fugro GPS Network over 24 Hours
Area: Africa

Ionospheric Pierce Points for all satellites at the ionospheric height of 350 km (Mask=20°)



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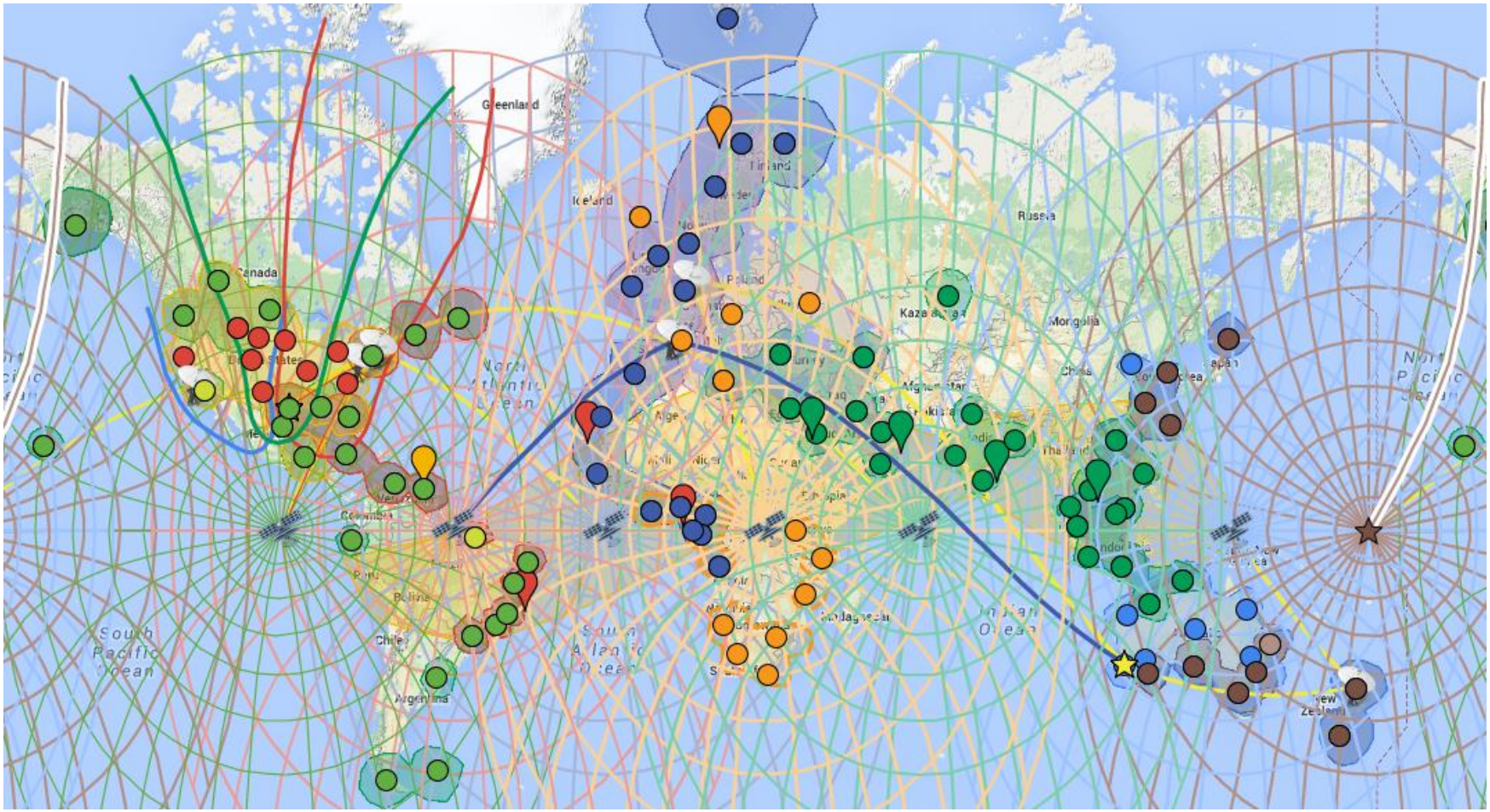
PRN 17* PRN 18 PRN 19 PRN 20 PRN 21 PRN 22 PRN 23 PRN 24* PRN 25* PRN 26 PRN 27 PRN 28 PRN 29* PRN 30 PRN 31* PRN 32

Data distribution



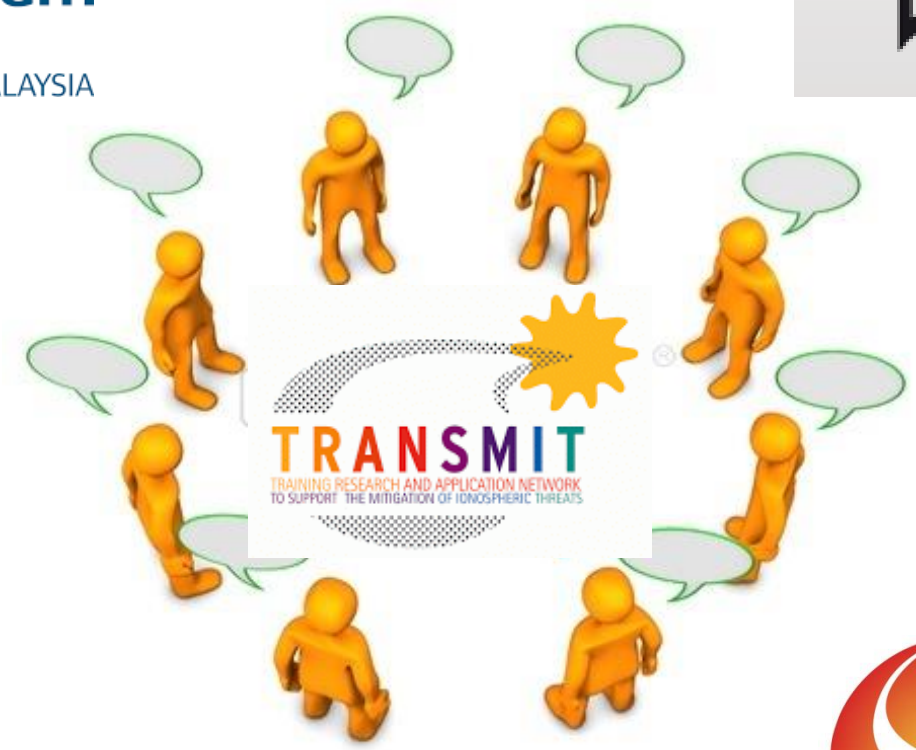
Transmit motivated Fugro to make all data real-time available through NTRIP and RTCM.

Transmit Workshops

The University of Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

DLR



UNIVERSITY OF BATH

INGV

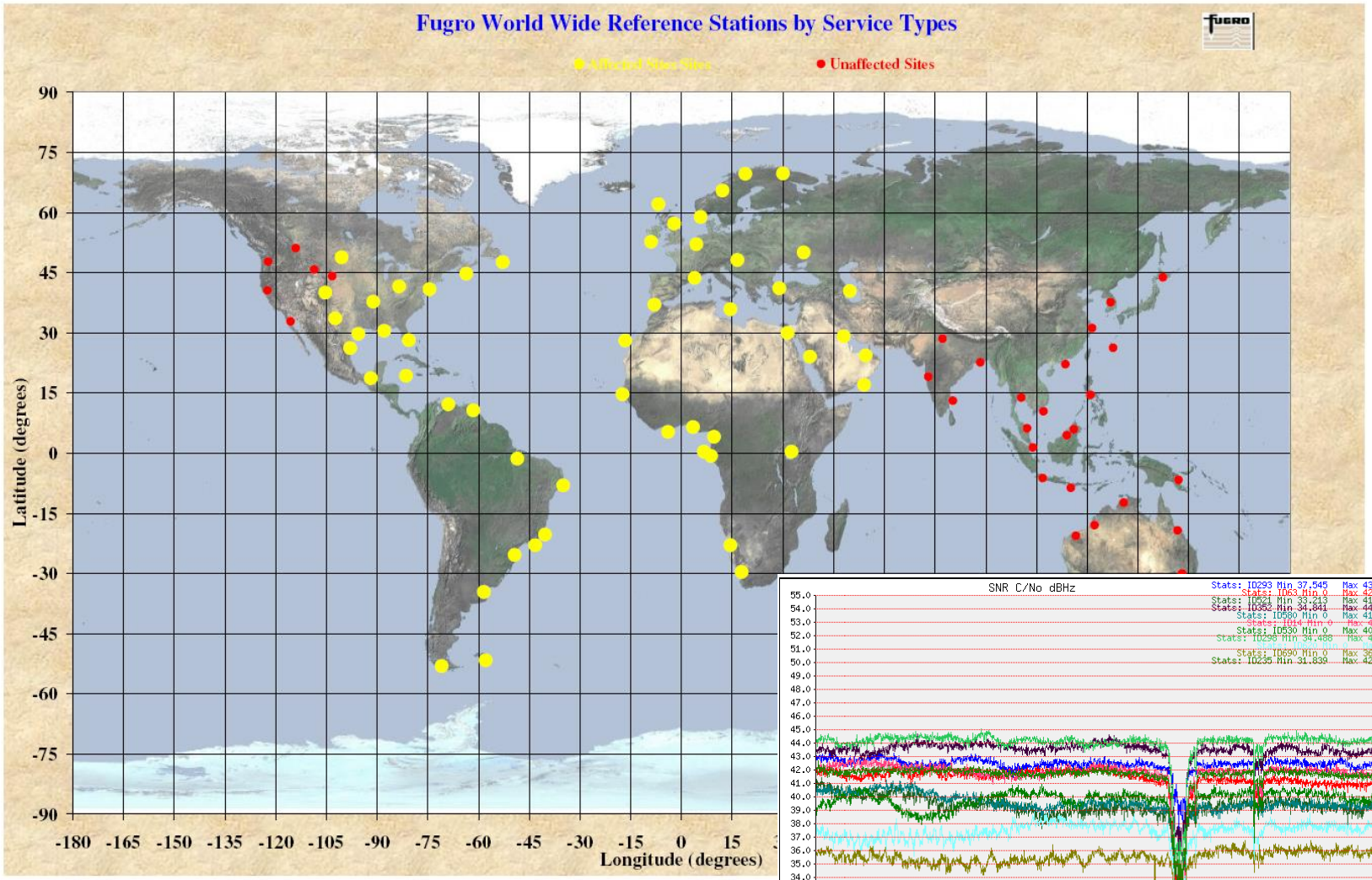
ENC-GNSS 2014

Technology – Innovation – Business

EUGIN

eswww

26-Sep-2011 X-ray Solar Burst



Summary

TRANSMIT has been advantageous for Fugro

- A better understanding of scintillations
- Work with highly motivated researchers and other partners in Workshops
- Involvement in state of the art research, based on our own data.
- Access to data from scintillation monitors,
- Also good for high phase noise and satellite clock anomalies.
- Software, developed by TRANSMIT fellows, are used in network monitoring.
- The need of a data archiving system for our network data,

The overall conclusion is that TRANSMIT indeed has proved to be a very beneficial experience for Fugro. We hope we will be able to continue and extend our cooperation with project partners in the future

Thanks for your attention

For questions:

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Fugro Intersite BV