A new SLR station in Tahiti at the Galileo site

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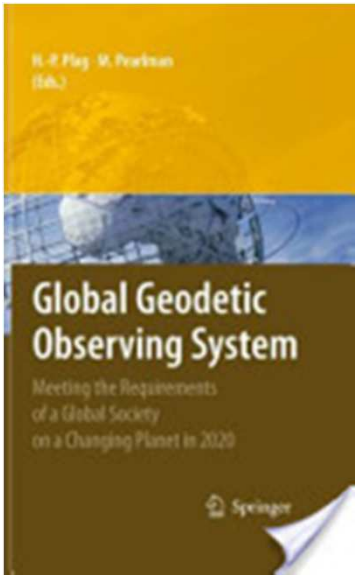
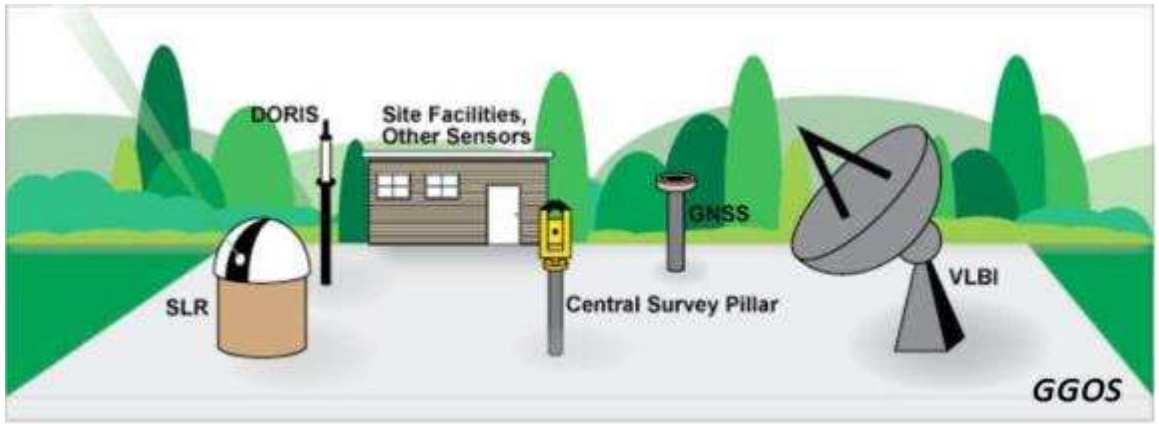
The GGOS framework

The **Global Geodetic Observing System** (GGOS) of the **International Association of Geodesy** (IAG) is the new framework for an operational core system be built up and maintained with the necessary infrastructure for **an operational geodetic Earth system service** providing quantitative information on changes in ice sheets, sea level, water cycle, and climate, as well as for hazards, disasters, and resource management application…



A fundamental core of the terrestrial global GGOS network should be a **set of at least 30-40 fundamental, globally well-distributed stations.**

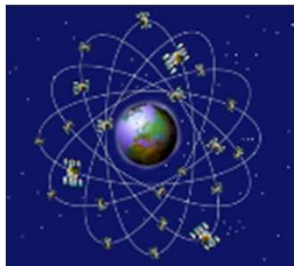
A network of such **fundamental geodetic observatory** is mandatory to monitor the global reference frame at an accuracy of **1 mm or below for decades with a recurrent stability of .1 mm/yr.**



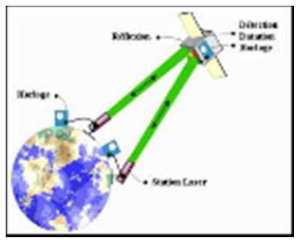
A fundamental geodetic observatory in Tahiti

A **Fundamental Geodetic Observatory**, or core station, is planned in Tahiti at the Tahiti Nui Telecom site. I should includes the following space systems:

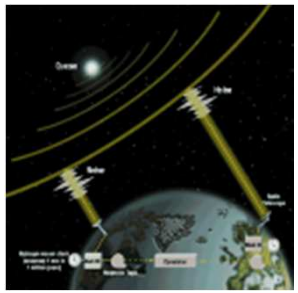
Doppler Orbitography and Positioning Integrated by Satellite (DORIS)



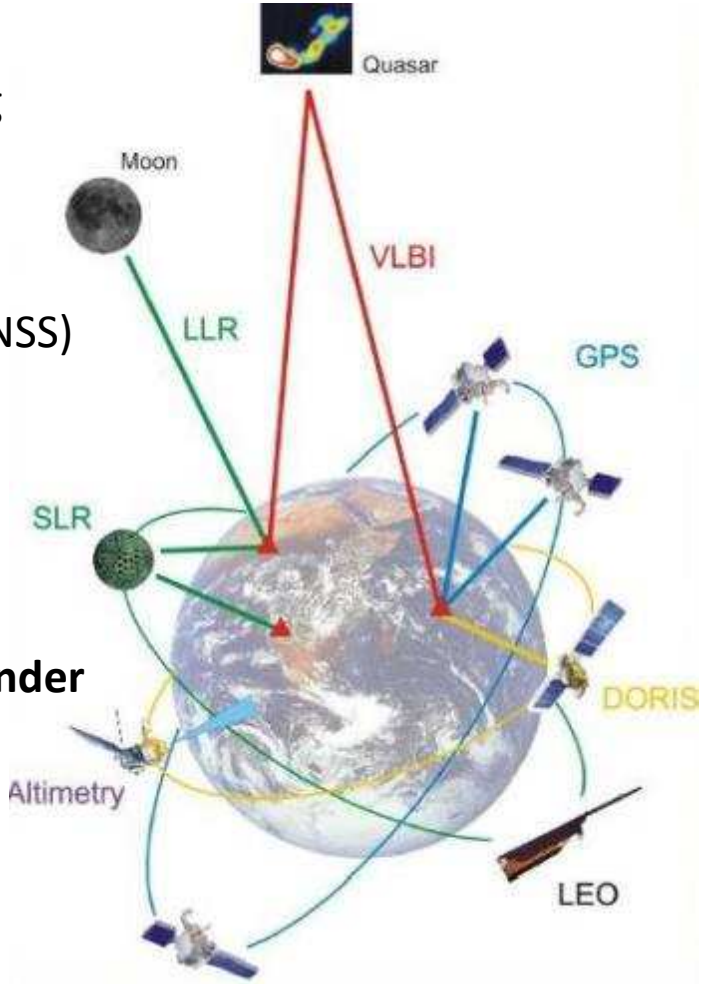
Global Navigation Satellite System (GNSS)
CNES Regina receiver



Satellite Laser Ranging (SLR)
OCA-CNES New Generation station under study



Very Long Basis Interferometry (VLBI)
NASA/VGOS system

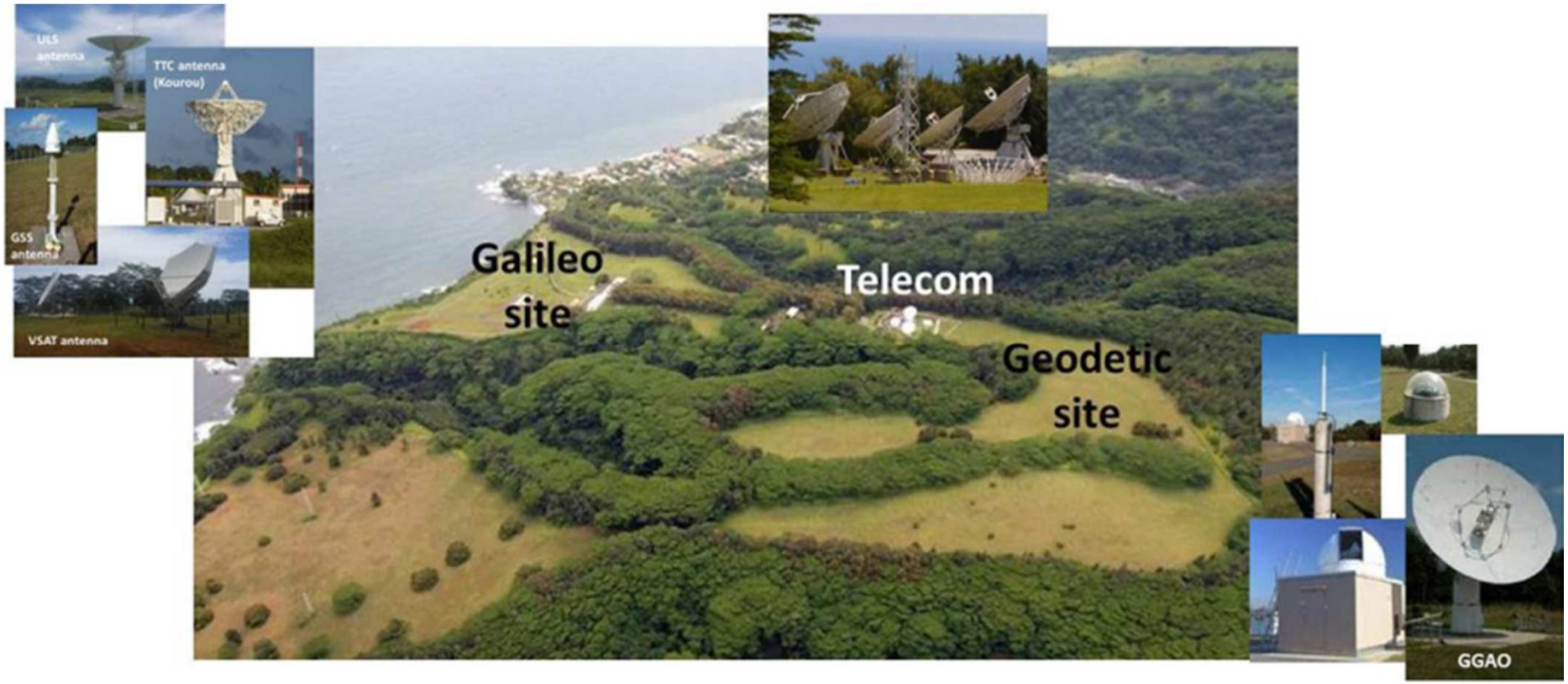


Diapositive 3

ES1 Etienne Samain; 08/11/2017

The Tahiti Nui Telecom site

- Tahiti Nui Telecom (TNT) expressed its agreement in principle for hosting instruments of space geodesy at the south side of its ground in Papenoo for a 30 year period.



- The site of Papenoo hosts already a Galileo TTC/ULS/GSS ground station located at the north side, about 500 m away from the south clearing where the geodetic is proposed.

First OCA proposal in January 2017 :

Prototype of a « ***low cost*** » automated SLR station dedicated to Galileo survey in near infrared

Budget: 1.6 M€

However, ESA consortium annoncement in April 2017

"Laser Ranging Station for Cooperative Targets" - ESA/IPC(2017) 1,add.26
Total price of deployed laser ranging station: **1,6 M€** from **3rd quarter 2017** over **2 years.**

The ESA Laser ranging capability will allow to:

- Support future Space Traffic Management applications
- Assume ESA's role in advancing critical optical sensor technology developments
- Facilitate the move towards ranging to non-cooperative targets during both day and night as well as to fully automated operation
- Contribute into the space object tracking cataloguing and the ILRS community
- The LRS would be designed to accommodate optical communication receivers thereby aiming to demonstrate synergies between laser ranging, optical communication, and quantum key distribution on a single station.

The project is an Austrian-German cooperation
Prime: DiGOS Potsdam GmbH (DE)
Sub-contractors:

- ASA Astrosysteme GmbH (AT) (amateur AstroES2y)
- ÖAW-IWF Graz (AT)
- Eventech Ltd. (incl. University of Riga as consultant - LV)

Future steps after successful implementation:

- Fully automated operation
- Laser ranging to known non-cooperative (space debris) objects during both day and night
- Hand-over from passive survey observations of un-known non-cooperative targets of < 1m for follow-on laser tracking
- Development of associated technical and operational standards

Diapositive 5

ES2 ASA : Amateur astronomy

Etienne Samain; 08/11/2017

And top of the line :

Industrial solution (US) :

2.8 M€ for the 500 mm telescope and the tracking mount **only**

Current OCA proposal (november 2017) :

Automated SLR station in near infrared

Innovation:

- SLR station dedicated to Galileo survey
- Hermetic dome for tropical environment.
- Infrared operation to garantee day/night data acquisition (OCA expertise)
- Automated operation
- SLR station designed for Time Transfer by laser link (OCA expertise) and for the demonstration of optical telecommunication (OCA expertise)
- Consortium Academic & Industry with start-up creation
- High reliability
- Distribution of the light of the telescope on two optical bench thanks to a coudé for multi-purpose operations

Total cost : 4 M€ with delivery at T0 + 36 months

In the framework of Innovation law:
Creation of a Startup hosted by OCA-CNRS capable to design and build a laser station in 36 months

Sub-systems	Costs	Subcontractor
Shelter	300 k€	To define
Dome	850 k€	Monoptec (US)
Telescope	200 k€	(OCA + RCOS)
Tracking mount	400 k€	Multiplast (France)
Optical coudé	200 k€	Newport (US) + SAFRAN (France)
laser	500 k€	Onefive (Switzerland) or Ekspla (Lithuania)
clock	30 k€	Quartzlock (UK)
Event timer	40 k€	OCA-startup
Camera	60 k€	Andor (UK)
Detection	60 k€	OCA-startup + micron photon device (Italy)
Meteorological station	26 k€	Vaisala (Finland)
Computer and software	80 k€	Dell-CNRS
Security	40 k€	ADS-B radar + Basler camera + Dell
TOTAL SUB-SYSTEMS	**2.786 M€**	

RH	Costs
OCA : 3 ETP sur 3ans	450 k€
Startup : 7 ETP sur 3 ans	1 M€

+ Transport costs and missions for local integration : 200 k€

TOTAL COST = 3.987 M€ (without OCA-RH)

A Satellite Laser Ranging station of new generation

The site should be equipped with a new generation SLR station.

Picosecond pulsed laser @ 1064 nm

Dome

High-speed IR single-photon avalanche diode

Carbon Tracking mount

Sub-picoseconde event-timer

Tube optique **Design OCA**