ESA/ESOC IGS Network Operations. Present and Future.

ESOC IGS team
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Outline

- Introduction.
- ESOC GNSS network evolution.
- ESA/ESOC GNSS network description.
- IGS data and metadata contribution. Support to different projects and WGs : ultra, rapid, final, iono, real time.
- Impact of IGS recommendations (monumentation, etc)
- Giove (experimental Galileo satellite) network deployment.
- Plans for the future.

Introduction

- **ESA/ESOC role in IGS:**
  - Data contribution from a small (12 receivers) but growing data network with nearly global coverage
  - Analysis Centre contributing to almost all the IGS products: need for all kind of data and metadata (configuration, calibration, etc) distributed through IGS

- **Permanent need to update the stations network with enhancements that fulfil the new requirements from all the IGS groups:**
  - Data retrieval and availability in real-time, 1 Hz, 15 min NRT, hourly, daily, etc
  - New places like Tahiti, needed to improve the coverage of the RT and the GLONASS networks
  - Permanent GPS only and GPS/GLONASS receivers acquisition to provide local back-up receivers and improve GLONASS network coverage
  - Connection to Hydrogen masers (New Norcia, Cebreros, Kourou planned) or Cesium oscillators (rest of the stations)

ESOC GNSS Network evolution

- **Complete overhaul in the last two years**
  - **Creation of the Navigation Facility at ESOC**
  - **At the stations: racks overhaul following integration standards and with remote back-up equipment**
  - **Communications integration in operational network. Shared with main ESA projects**
- **Connection to Hydrogen masers from ESA deep space network:**
  - **Since 2002: New Norcia (Australia)**
  - **New station in 2005: Cebreros (Spain)**
  - **Planned: Kourou**
- **Acquisition in 2005 of 2 new GPS/GLONASS receivers planned for:**
  - **Tahiti. Installation planned for July 2006**
  - **Malindi. Installation planned for September 2006**
- **Improve support to IGS Real Time Network:**
  - **Complete GNSS network available in RT**
  - **Installation of a receiver at Tahiti**
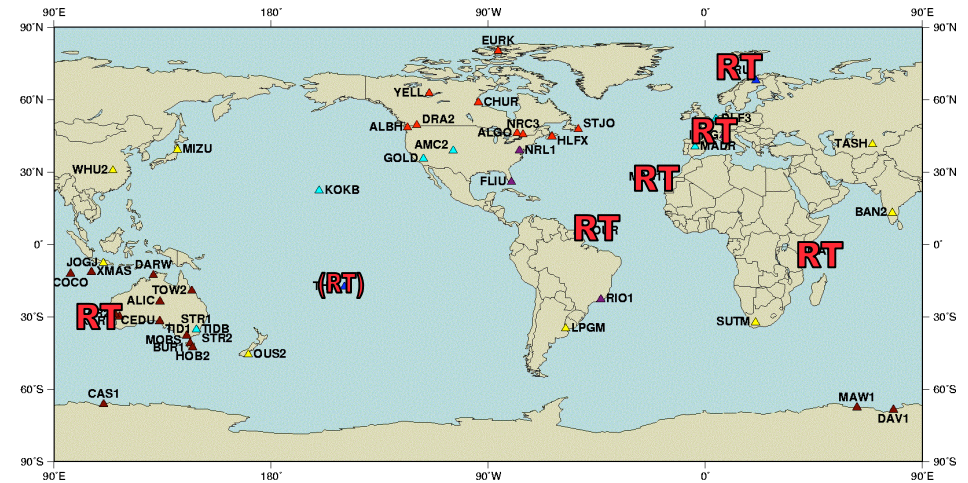- **EGNOS receiver installed at ESOC in 2005. Part of EGNOS system monitoring network.**

ESA/ESOC GNSS network
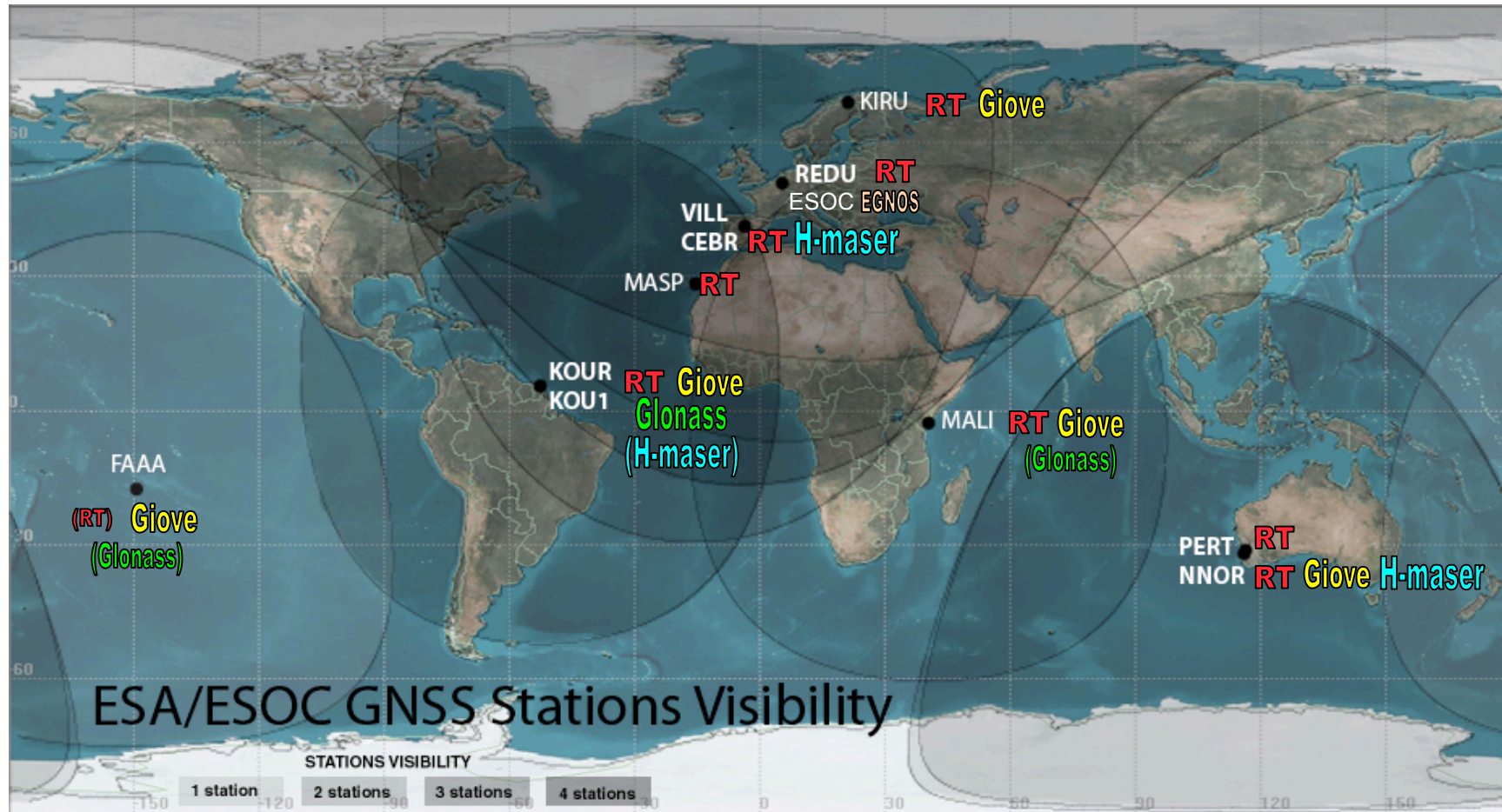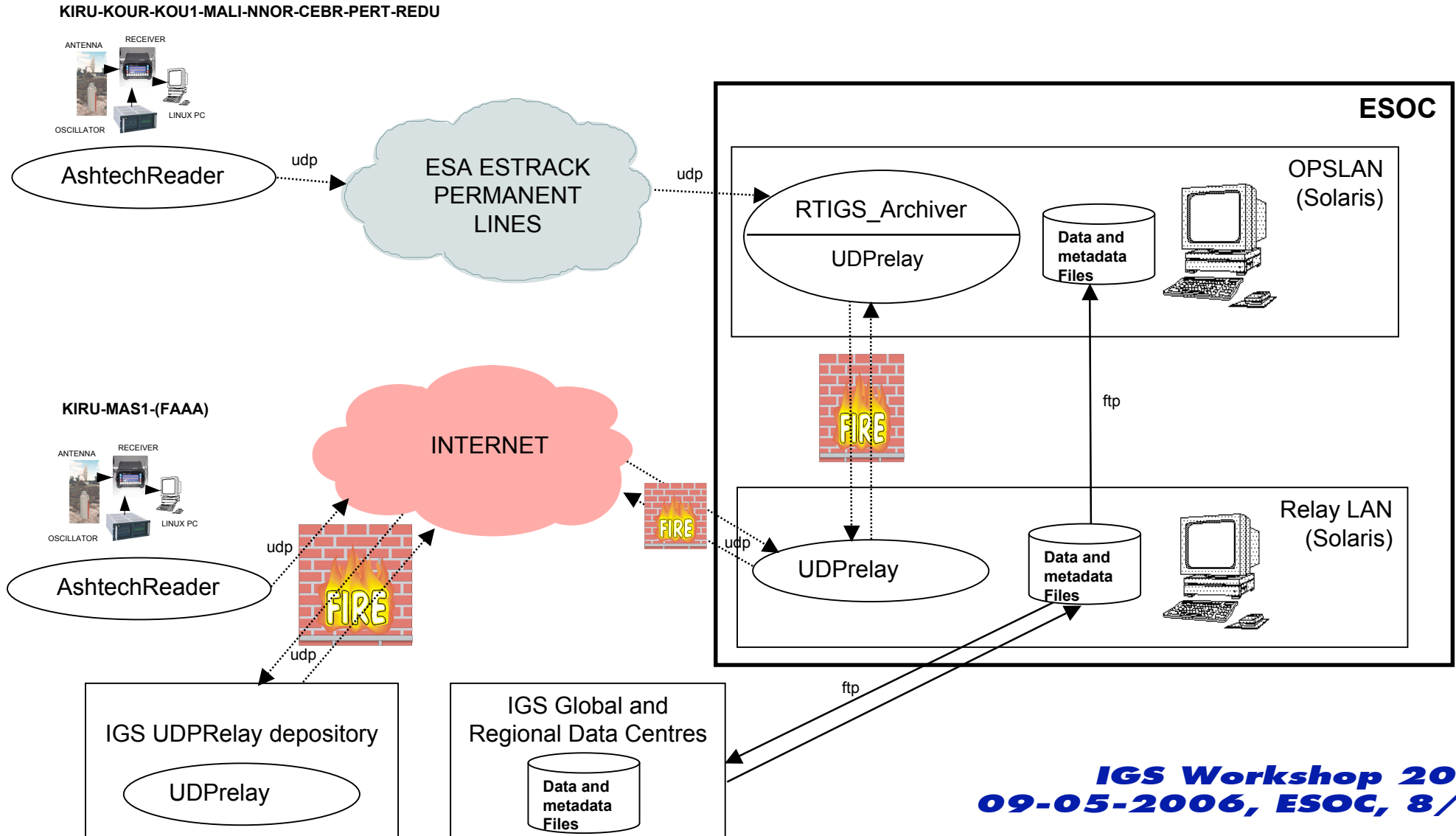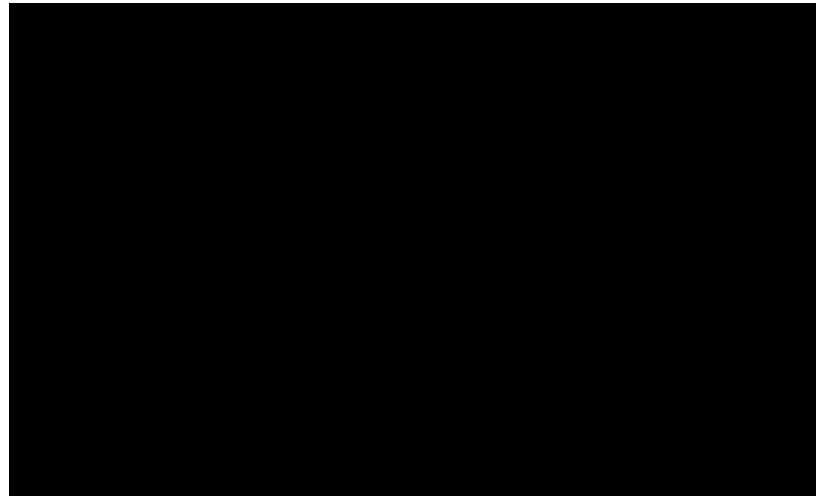
IGS GLONASS and Real Time Networks

ESA/ESOC GNSS data Network

- Current real time streams resulting from migration from ESOC development (own protocol and format) to RTIGS protocol to improve compatibility and data sharing.

- NRT missions support: full 15 min 1 Hz file downloaded if missing data (to be improved to minimize bandwidth requirements)

- Hourly and daily files for IGS data centres generated from 15 minutes 1 Hz data.
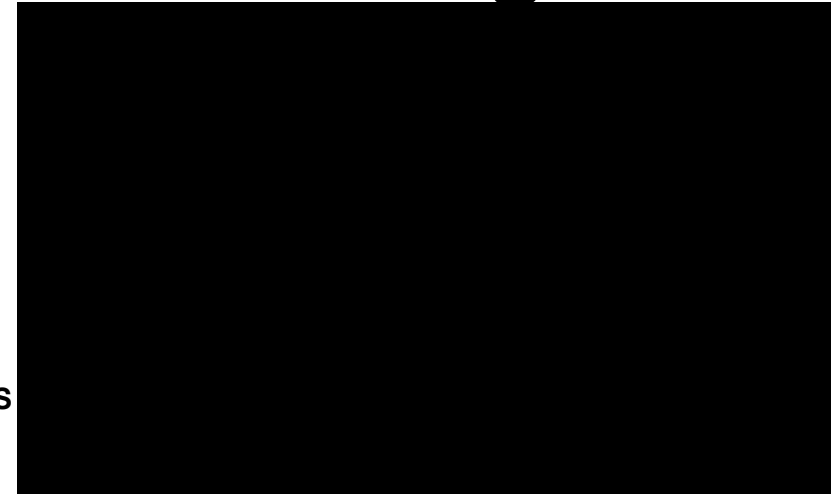
- Native binary data is not downloaded to ESOC.

ESOC data flow

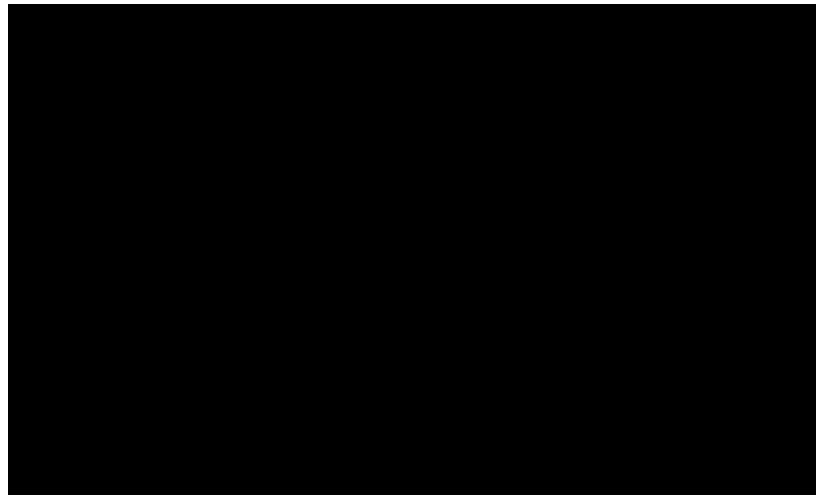**KIRU-KOUR-KOU1-MALI-NNOR-CEBR-PERT-REDU**
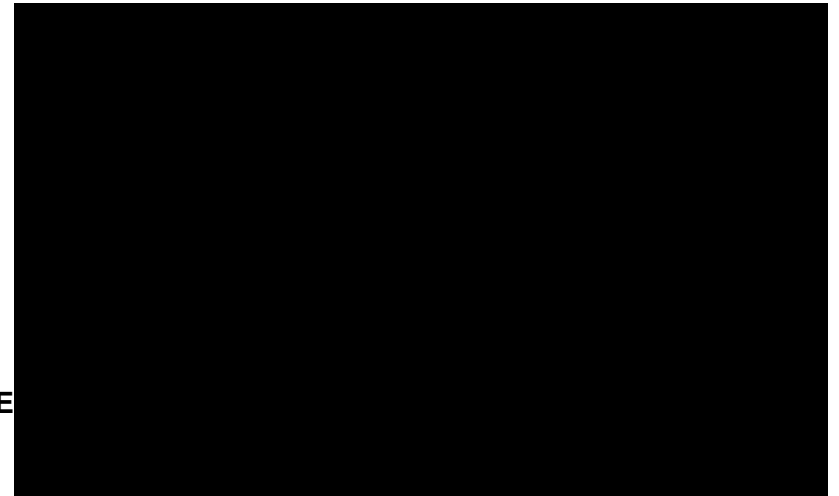
ANTENNA   RECEIVER

OSCILLATOR   LINUX PC

AshtechReader

udp

ESA ESTRACK PERMANENT LINES

udp

ESOC

RTIGS_Archiver

UDPrelay

OPSLAN (Solaris)

Data and metadata Files

FIRE

ftp

KIRU-MAS1-(FAAA)

ANTENNA   RECEIVER

OSCILLATOR   LINUX PC

AshtechReader

udp

INTERNET

FIRE

FIRE

FIRE

udp

UDPrelay

Data and metadata Files

Relay LAN (Solaris)

udp

IGS UDPRelay depository

UDPrelay

IGS Global and Regional Data Centres

Data and metadata Files

ftp

IGS data and metadata usage

FINAL-ULTRA
(62 stations)

GLONASS
(33 sta)

IONO
(174 sta)

REAL TIME
(25 sta)

Impact of IGS recommendations (1)

- **Kiruna radome**

    "Avoid using radomes unless required operationally"

Discontinuity during snow covering and melting still there.
Giove monument:
  - deeper
  - centred in the plateau

- **Antenna replacement at Kourou**

    "Moving to another monument must be avoided"

Procedure to follow:
  - Replace kour antenna.
  - Run the "modified" kour and the "original" kou1 in parallel.
  - Estimate the kour - kou1 baseline before and after the equipment change
  - Replace kou1 with the Galileo equipment.

Impact of IGS recommendations (2)

- **Receivers set to track all in view**
  - **Problems with bug in some receivers tracking manoeuvring satellites**

- **Add enhancements to try to have "IGS product sites"**

  IGS Sites classification is:
    - » **IGS Proposed Sites.**
    - » **IGS Provisional Sites.**
    - » **IGS Project Sites.**
    - » **IGS Product Sites.**
    - » **IGS Inoperational.**

- **Archive of native binary data**
  - **Not possible due to bandwidth limitations since data files are derived from real time streams**

Giove (experimental Galileo) System
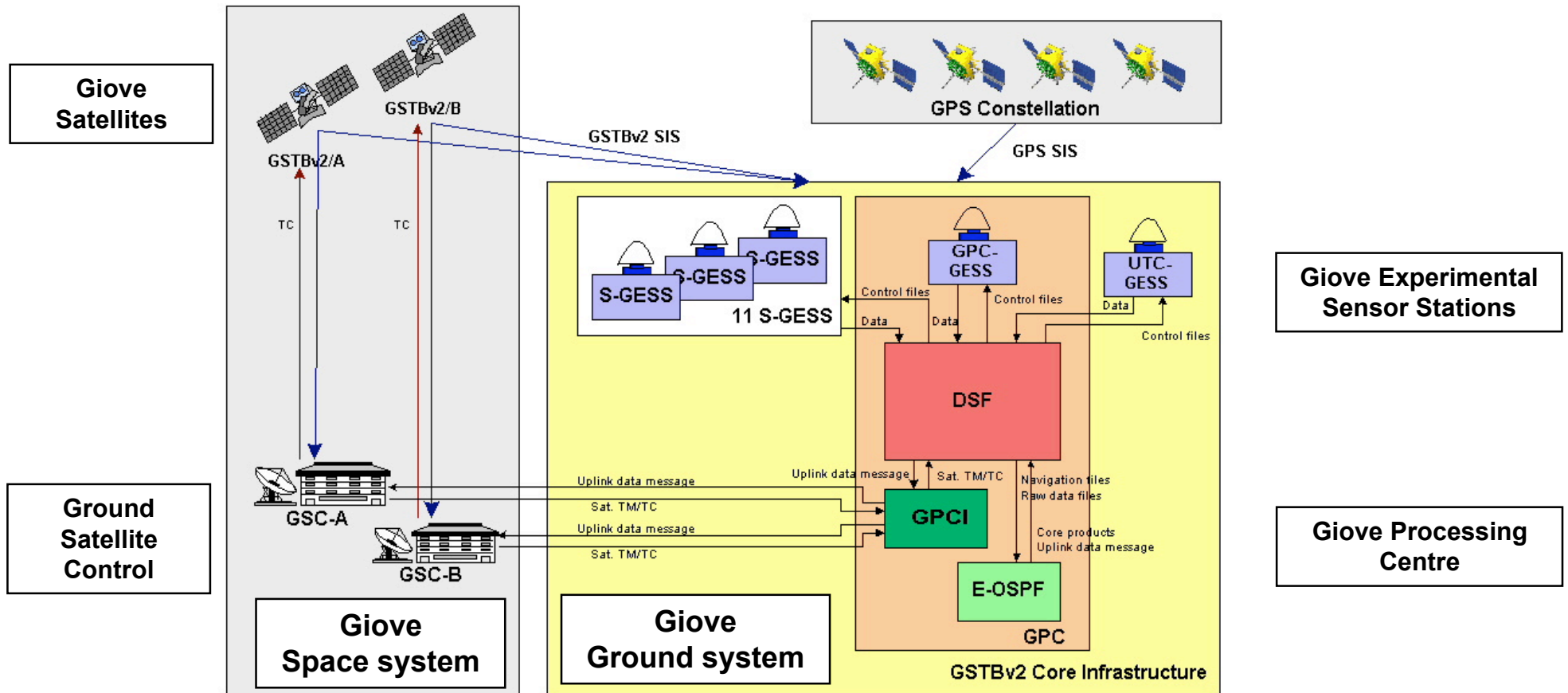
GPC: GSTBv2 Processing Centre
S-GESS: Standard GSTBv2 Experimental Sensor Station
GPC-GESS: GSTBv2 Experimental Sensor Station at GPC
UTC-GESS: GSTBv2 Experimental Sensor Station at UTC site
DSF: Data Server Facility
GPCI:GSTBv Payload Control Interface
E-OSPF:Experimental Ornit Synchronisation Processing Facility
GSC: Ground Satellite Control

Giove Experimental Sensor Stations
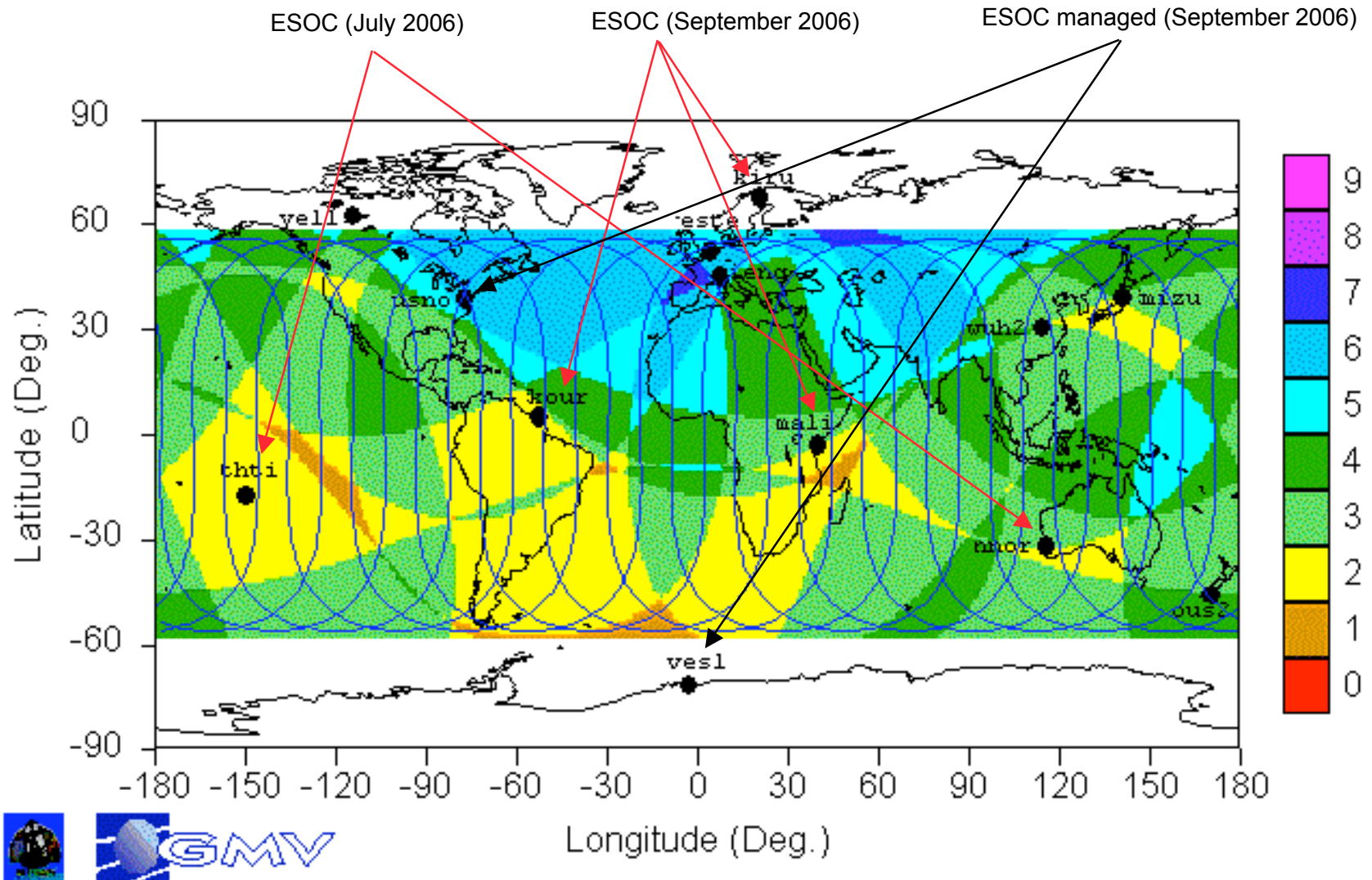
Giove Stations Equipment
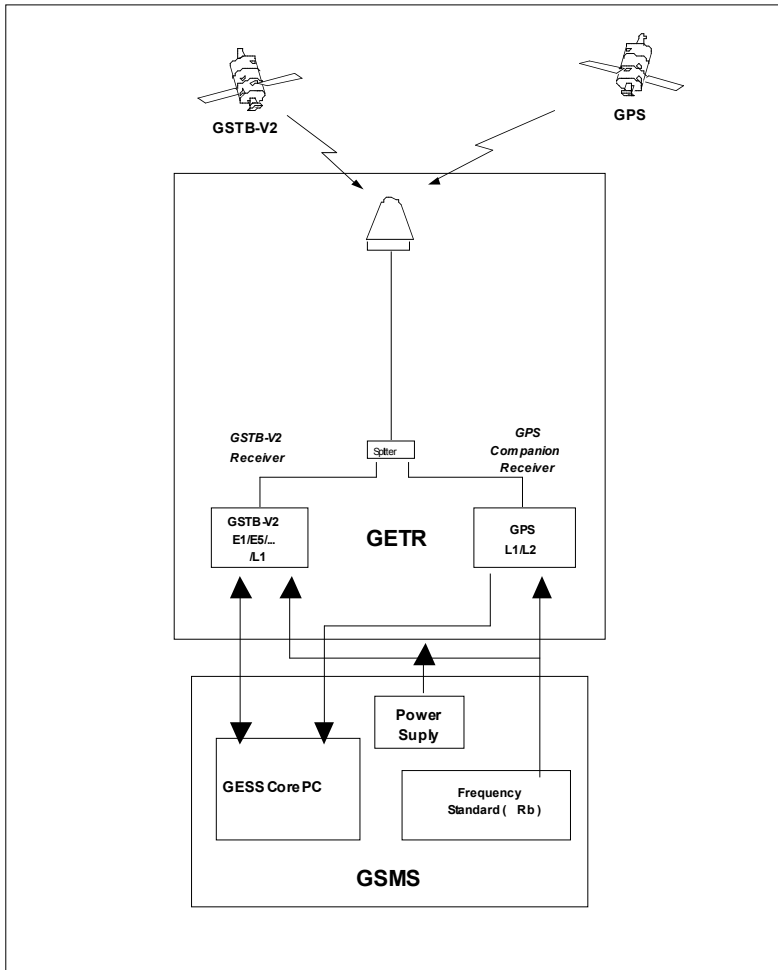
Typical GESS installation

Plans for the future

- **Deployment of Giove ground support network**
- **Deployment of GPS+GLONASS stations (Tahiti, Malindi)**
- **Deployment of RT stations (Tahiti)**
- **Kourou H-Maser**
- **Continued support to IGS**
- **Increase number of stations for all contributed products**
- **Involvement in IGS Real time WG pilot project**