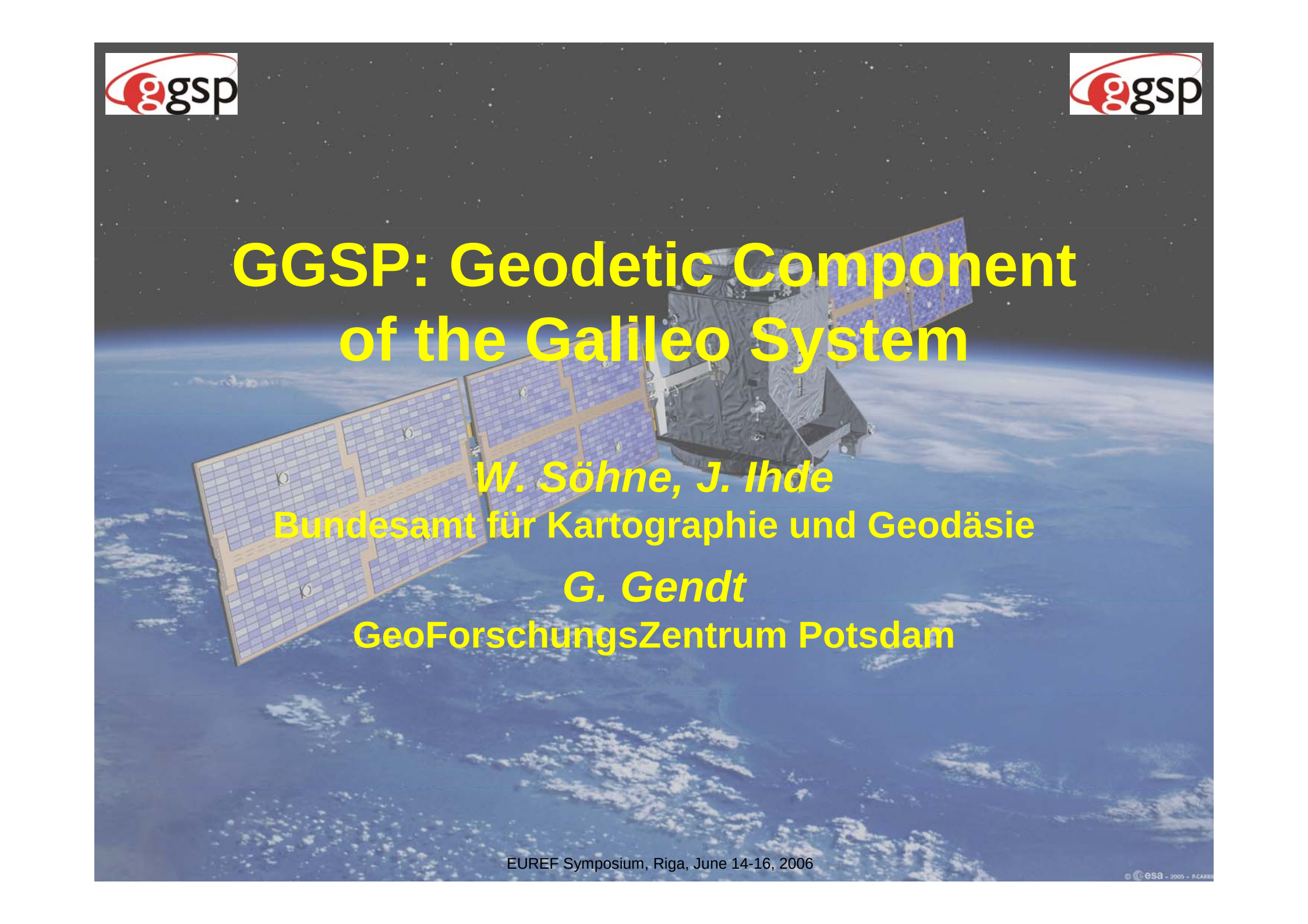

GGSP: Geodetic Component of the Galileo System

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Outline

I. Development of the Galileo Geodetic Service Provider (GGSP) Prototype

I. Project structure and external interfaces

II. Galileo Terrestrial Reference Frame (GTRF)

III. Summary and Outlook

History European GNSS

- 19/12/1994: Council Resolution on the European contribution to the development of a GNSS (GNSS1 → EGNOS, GNSS2 → Galileo)
- December 1999: Beginning of the Galileo “definition phase”
- May 2000: WRC Istanbul: Allocated frequencies MUST be used before 13/02/2006 : At least one satellite must be transmitting SIS by this date
- 26/03/2002: Galileo is officially launched
- 10/06/2003: Founding of GJU (signed by EU and ESA)
- 19/12/2004: Phase 1 Kick-Off

- **6th Framework Programme of the EC**

  “Community activities in the field of research, technological development and demonstration”

  2002-2006
- **First Galileo Call mid 2003**
- **Galileo 6FP 2nd Call**

  June 2004

  Three different areas with altogether 17 topics
- **Third Call in December 2005**

Second Call:

- **Area 1 “User segment, user community”**

  10 topics

- **Area 2 “Mission definition and implementation”**

  5 topics

  Call 2420 “Implementation of Galileo Geodetic Service Provider Prototype”

- **Area 3 “Innovations and international initiatives”**

  2 topics

Consortium

sent a tender for GGSP prototype development
to Galileo Joint Undertaking (GJU)
in September 2004, accepted in March 2005

GFZ POTSDAM

AIUB
Astronomisches Institut der Universität Bern

bkg

ESOC OPERATIONS CENTRE FOR THE EUROPEAN SPACE AGENCY

IGN INSTITUT GEOGRAPHIQUE NATIONAL

WUHAN UNIVERSITY

Natural Resources Canada | Ressources naturelles Canada

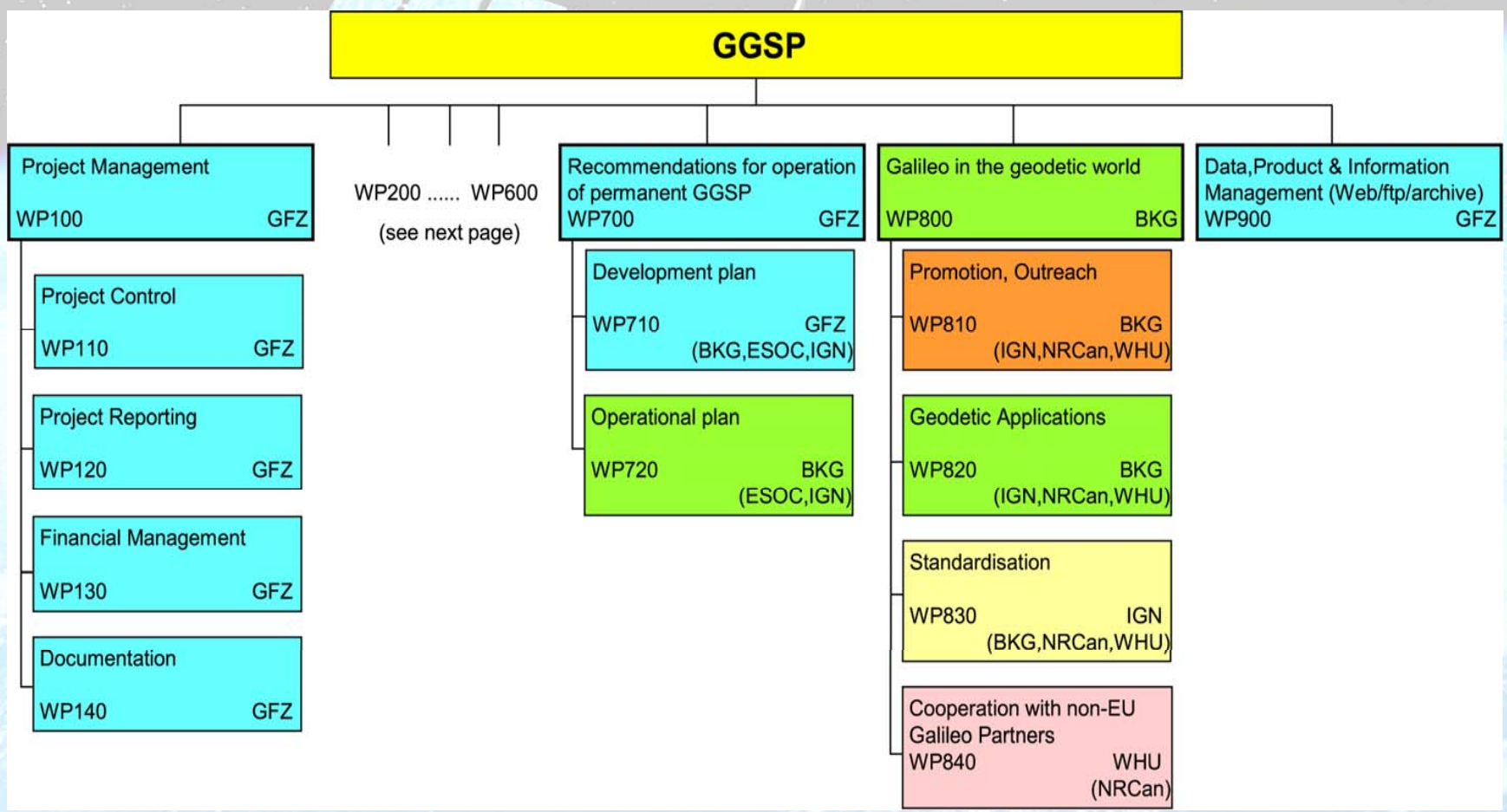
ggsp

I. Development of the Galileo Geodetic Service Provider (GGSP) Prototype

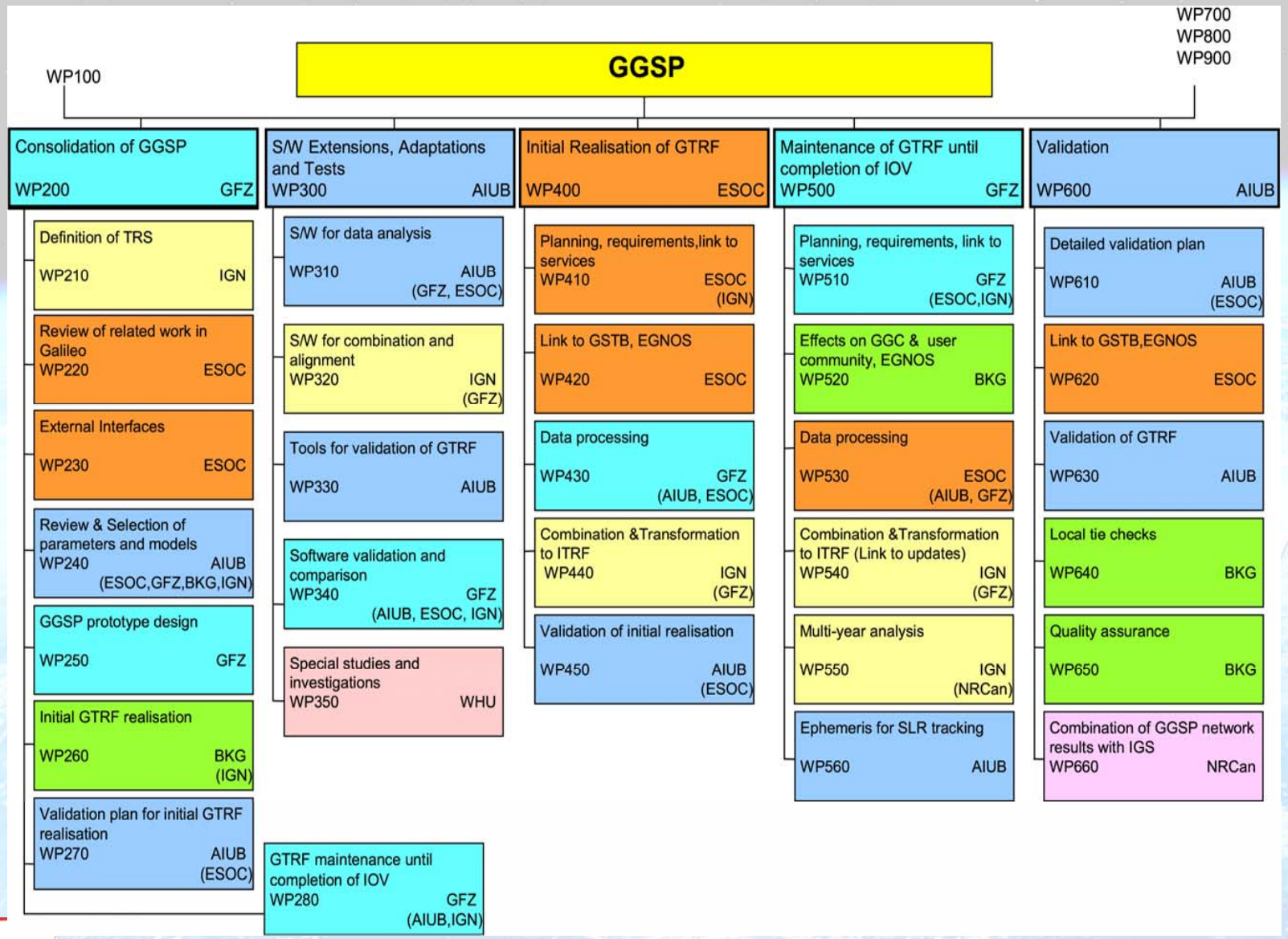
- **Main part: Development of Galileo Terrestrial Reference Frame (GTRF) and establishment of service with products and information for potential users**
- **Actions of GGSP Prototype:**
  - **GTRF Definition**
  - **GTRF Realization**
  - **GTRF Maintenance**
  - **GTRF to IERS Link**
  - **Galileo to ILRS Link**
- **Contract with Galileo Joint Undertaking**
- **Start ("Kick-Off") July 2005**

II. Project structure and external interfaces

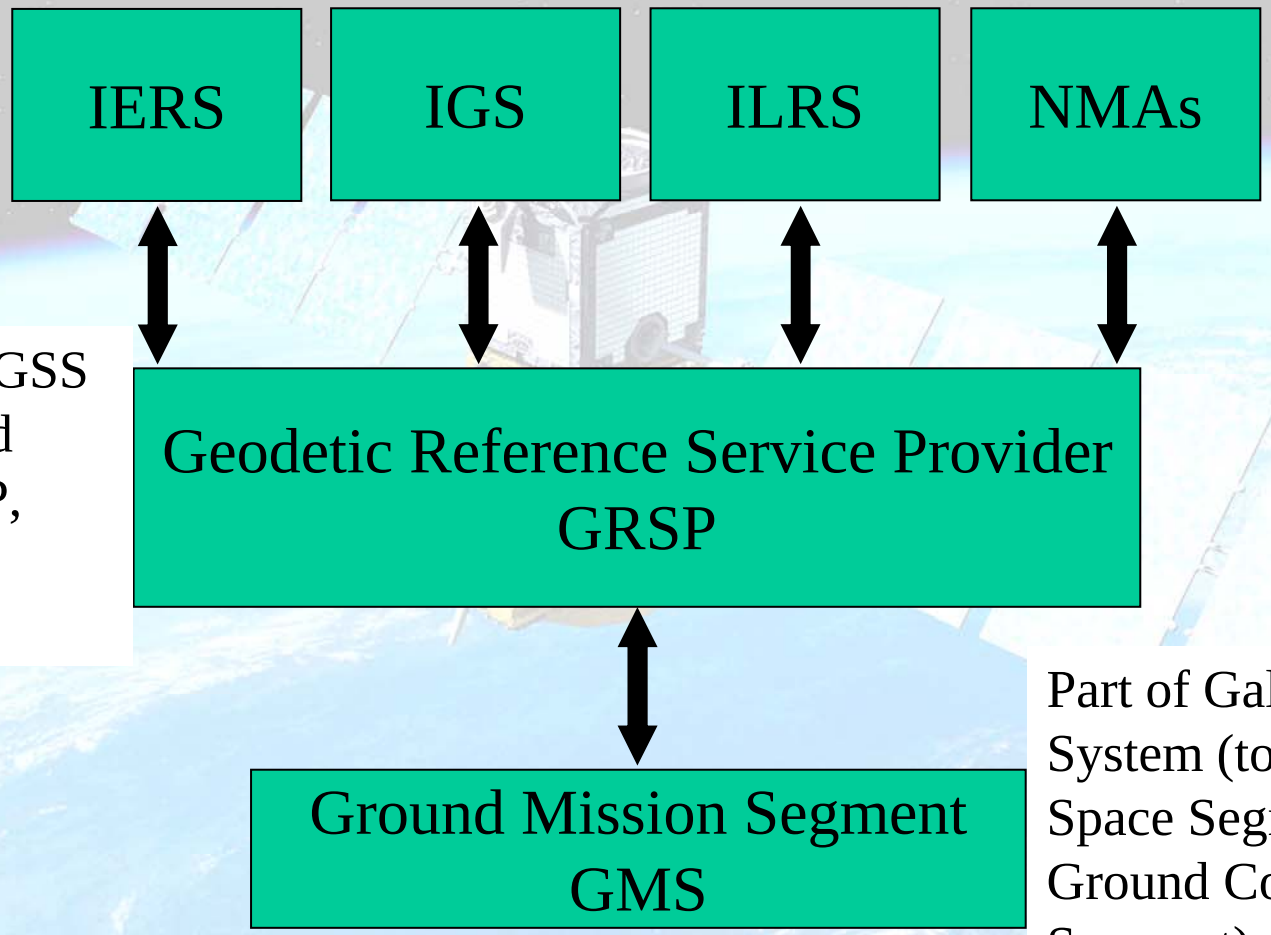
GGSP Project Structure (1/2)



GGSP Project Structure (2/2)



GGSP External Interfaces



Providing e.g. GSS coordinates and velocities, EOP, transformation matrices etc.

Part of Galileo Core System (together with Space Segment and Ground Control Segment)

Responsible for GSS

III. Galileo Terrestrial Reference Frame (GTRF)

(1) Coordinates and velocities for GTRF Stations (in FOC phase all equipped with Galileo receivers):

- **Core network: Galileo Sensor Stations (GSS)** ⟷ ***(GMS)***

  Planned number of GSS: 18 for IOV, final about 50, including 5 Galileo Uplink Stations (ULS)

- **Galileo satellite laser ranging stations*** ⟷ ***(ILRS)***
- **ITRF core stations**** ⟺ ***(IERS)***
- **additional IGS Stations to fill gaps** ⟺ ***(IGS)***

  At all stations terrestrial local ties between the observation techniques shall available. First stage of GTRF realization with GPS only

(2) Earth physical parameters and models ⟺ ***(IERS)***

**** SLR Stations which are able to observe Galileo Satellites***

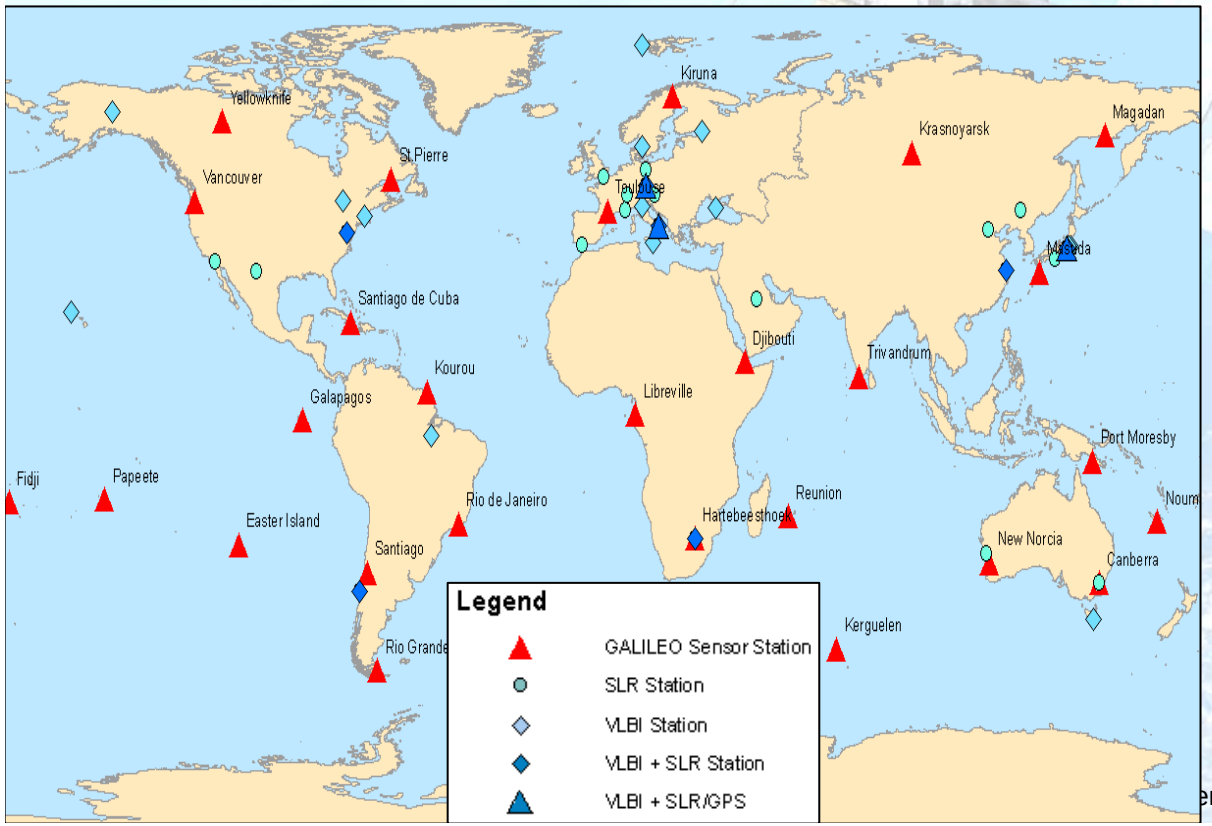
*****Co-location of a minimum of two of the three space techniques: SLR, VLBI, GNSS (mandatory Galileo and GPS, optional GLONASS and DORIS).***

Strategy for GTRF realisation and maintenance (1/2)

a) GTRF free network adjustment
b) GTRF alignment to ITRF

a) Free network adjustment

- To avoid errors in fixing ITRF reference stations
- To get the highest internal network quality (2 sigma = 3 cm)



Simultaneous determination of

- **Station positions**
- **Earth Rotation Parameters**
- **Orbits and Clocks (additional products offered to GMS and geodetic community)**

em"

Strategy for GTRF realisation and maintenance (2/2)

b) Alignment to ITRF

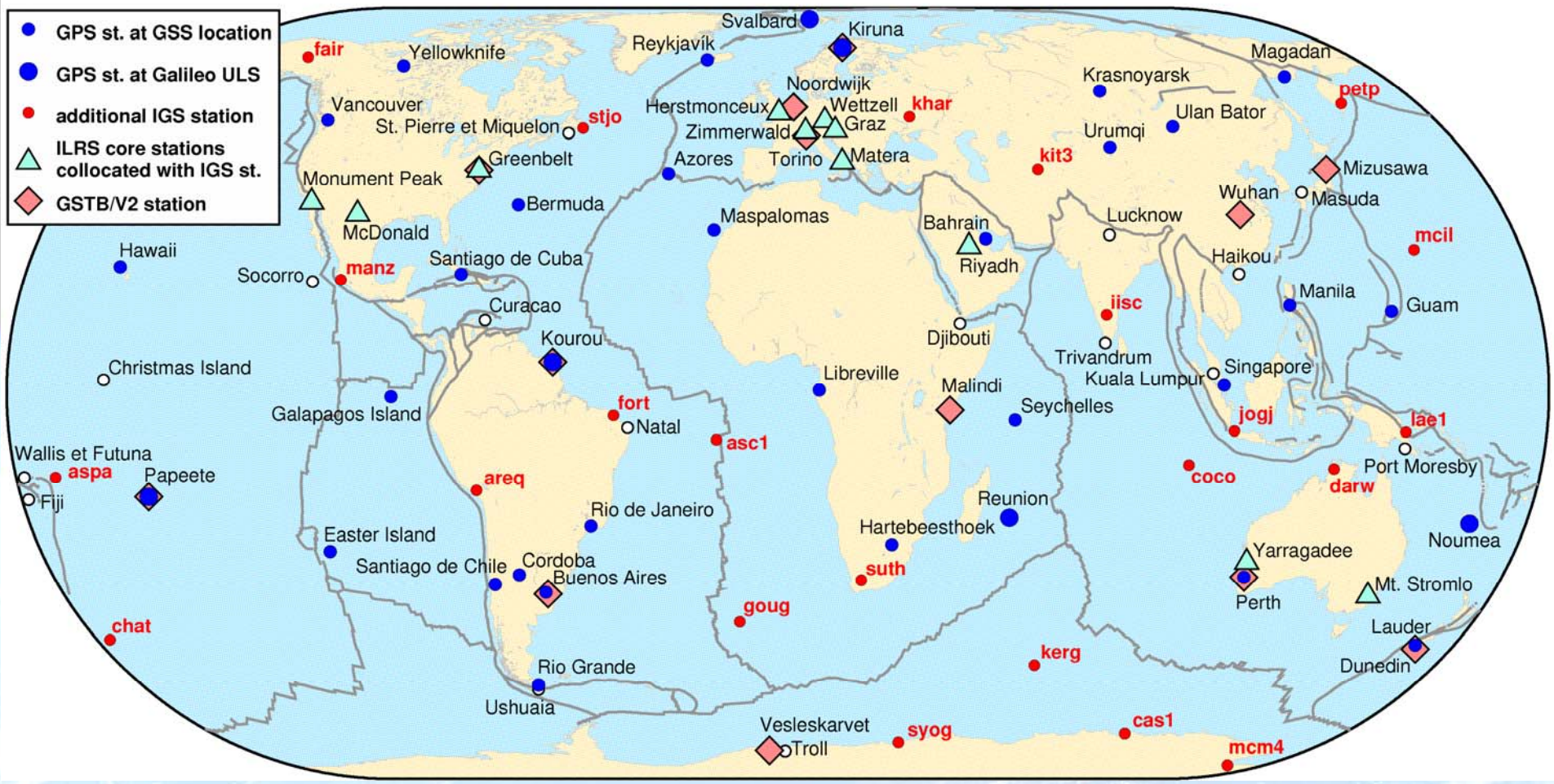
consistent within 3 cm (2 sigma)
via

- **IGS core stations expressed in ITRF**
  - co-located to GSS & non co-located stations
  (independent quality check via co-located sites)

- **SLR/VLBI stations co-located to GSS (independent quality check via co-located sites; from IGS independent connection to geocentre and scale)**
  Require accurate local ties (1 mm)

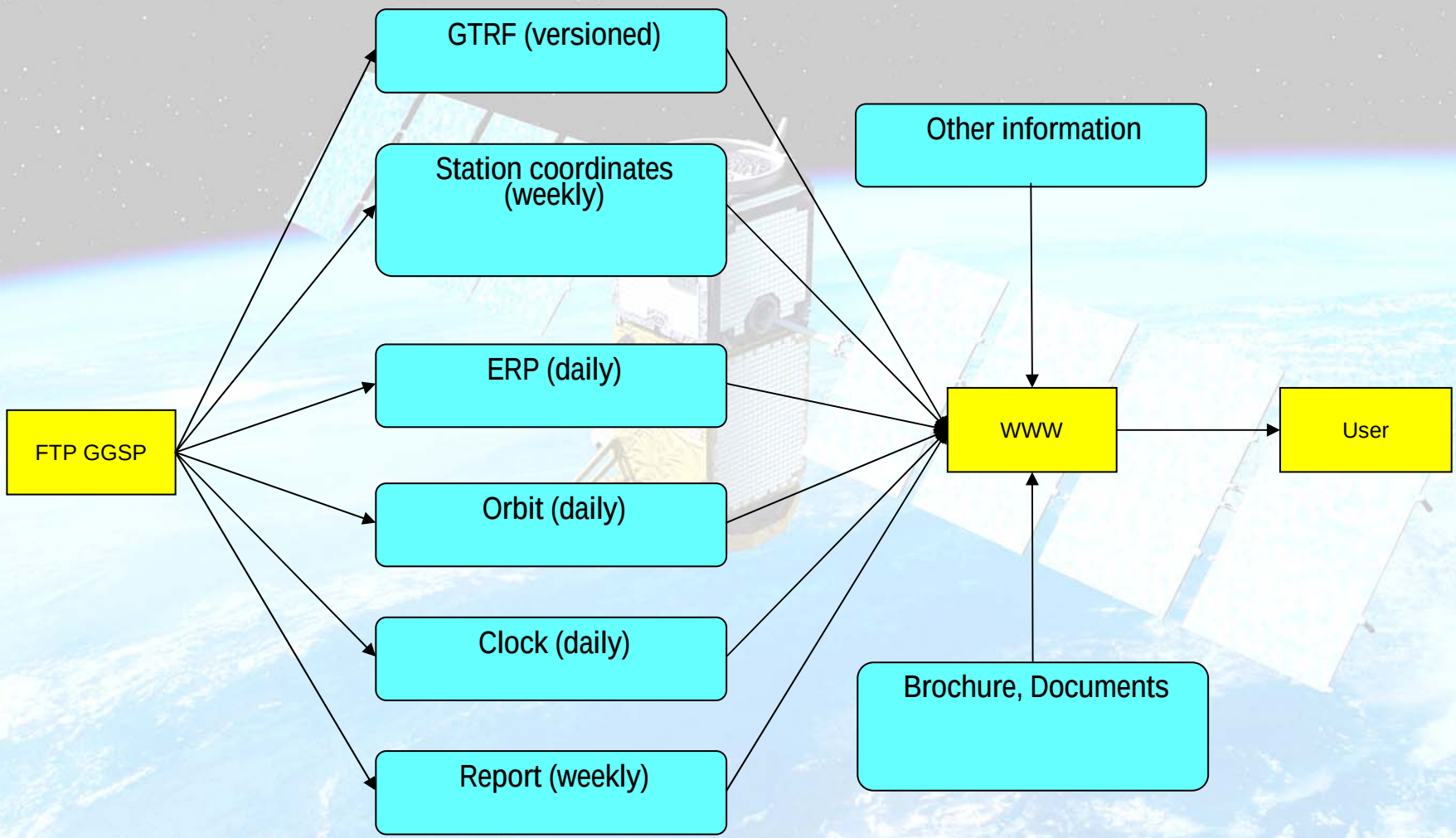
Remark: EGNOS stations may be imbedded in the same way according to a TBD schedule.

Initial GTRF Network

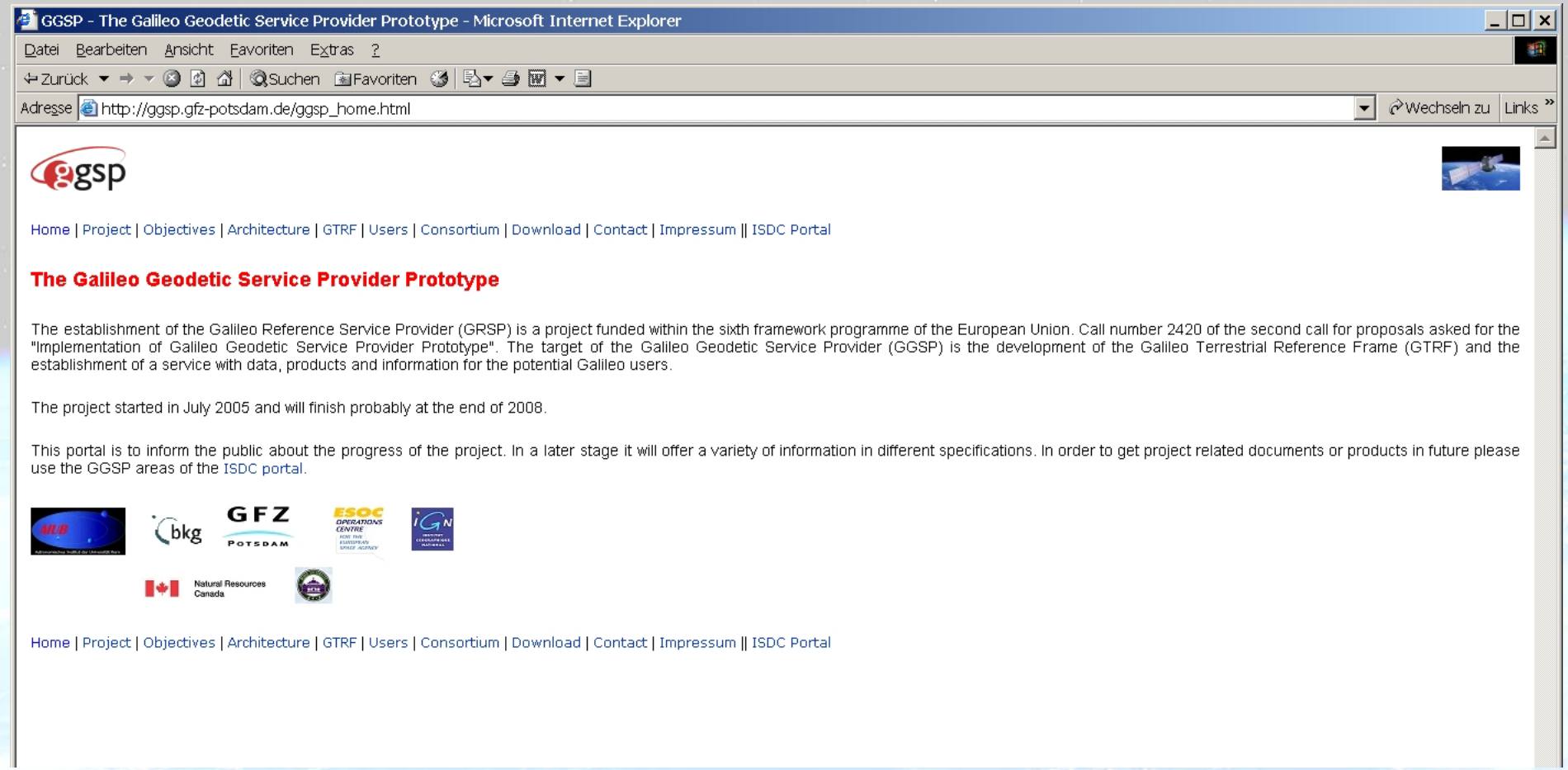


Initial GTRF network at the beginning of IOV:
>73 locations: ≥18 GSS (incl. 5 ULS), ≤50 GPS stations, 10 ILRS core stations
IGS stations and GSS are collocated at established GSS

GGSP Products



GGSP Homepage

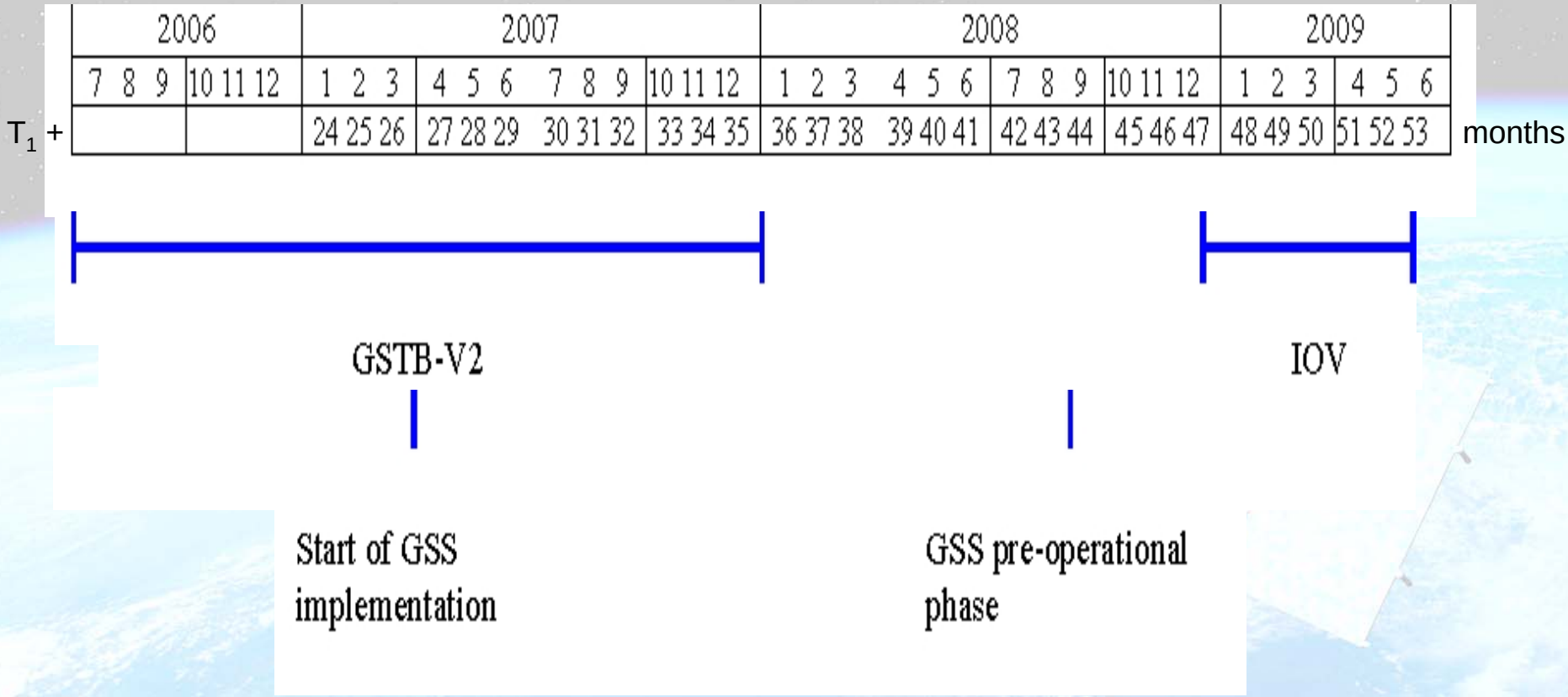


- http://ggsp.gfz-potsdam.de **(preliminary)**
- http://www.ggsp.eu **(submitted)**

IV. Summary

- The partners of GGSP Prototype consortium works since about two year close together
- GGSP will initialize and maintain the Galileo Terrestrial Reference Frame (GTRF)
- GGSP will establish a prototype of a service with products for potential users
- Use of Galileo data of GSS at an early stage not finally decided

Outlook



- **T_1: CDE phase 1 Kick-Off (December 2004)**

Geodesy is fundamental to GALILEO

GALILEO 2nd Call, Number 2420, 6FP

Implementation of Galileo Geodesy Service Provider Prototype