GNSS PPP WORKSHOP
AN INDUSTRY APPROACH TO PRECISE POINT POSITIONING

JUNE 13TH , 2013 - GNSS PPP WORKSHOP, OTTAWA, CANADA

SESSION 4: USER SOLUTIONS

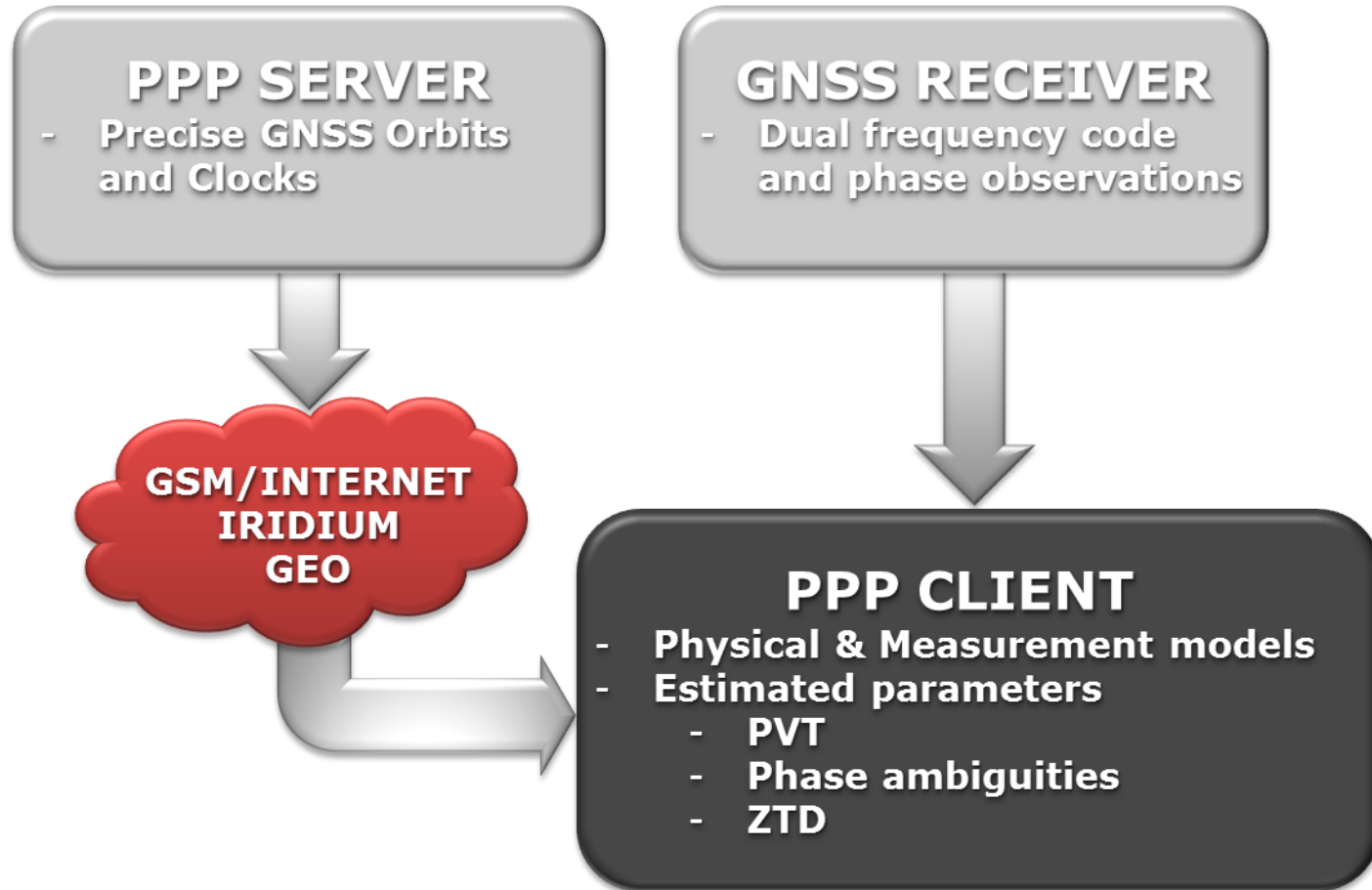D. Calle
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OUTLINE

■ Introduction

■ PPP Infrastructure
  – Server
  – Client

■ Testing on the field – highlights and lessons learned

■ Regional PPP

■ Galileo PPP

■ PPP protection levels

■ Conclusions

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INTRODUCTION

PPP: PRECISE POINT POSITIONING

PPP SERVER
- **Precise GNSS Orbits and Clocks**

GNSS RECEIVER
- **Dual frequency code and phase observations**

GSM/INTERNET IRIDIUM GEO

PPP CLIENT
- **Physical & Measurement models**
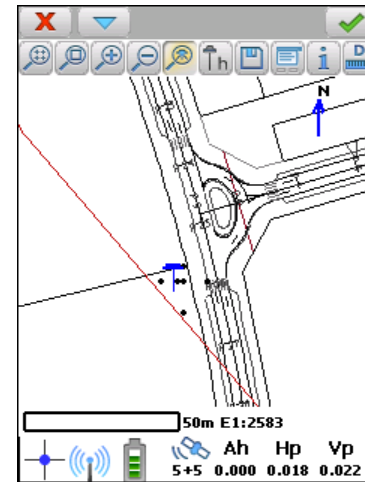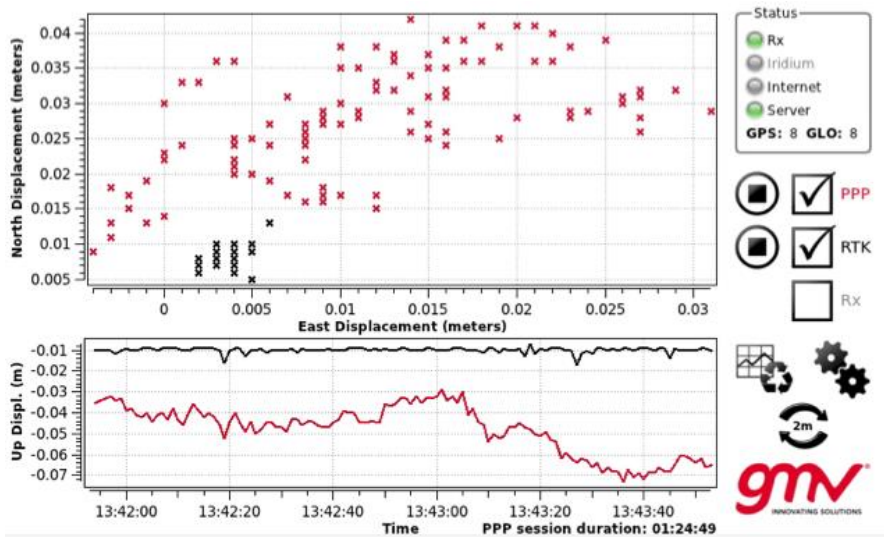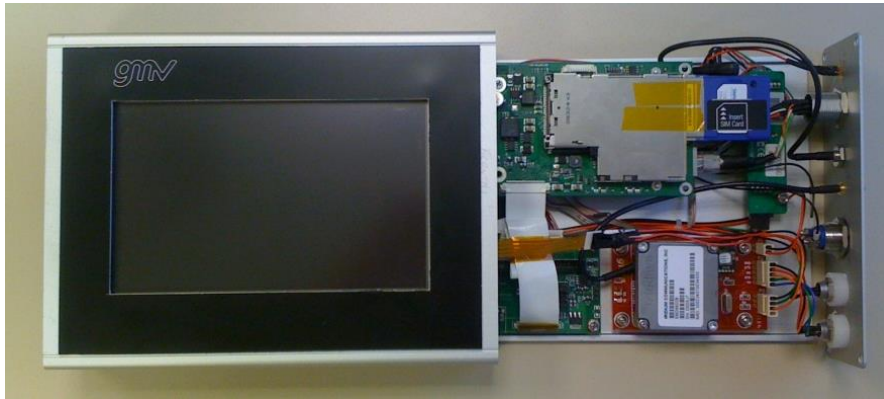- **Estimated parameters**
  - **PVT**
  - **Phase ambiguities**
  - **ZTD**

- Absolute positioning technique
- Precise orbits & clocks + observations + detailed models
- Sparse network of reference stations

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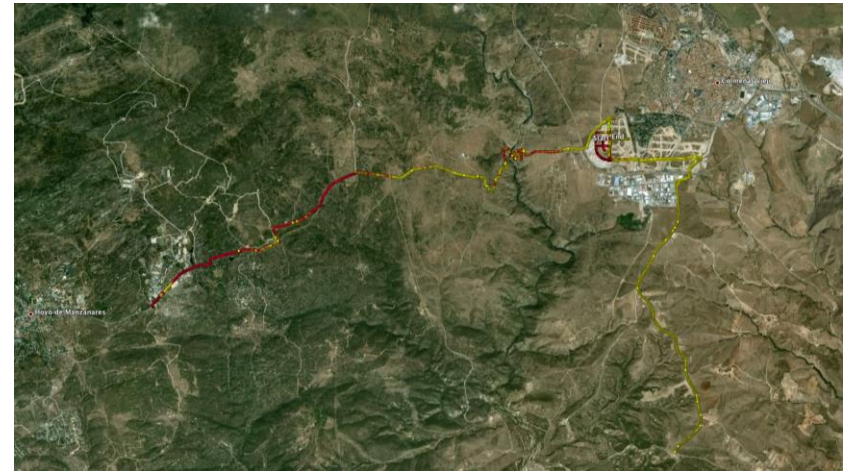
PPP INFRASTRUCTURE
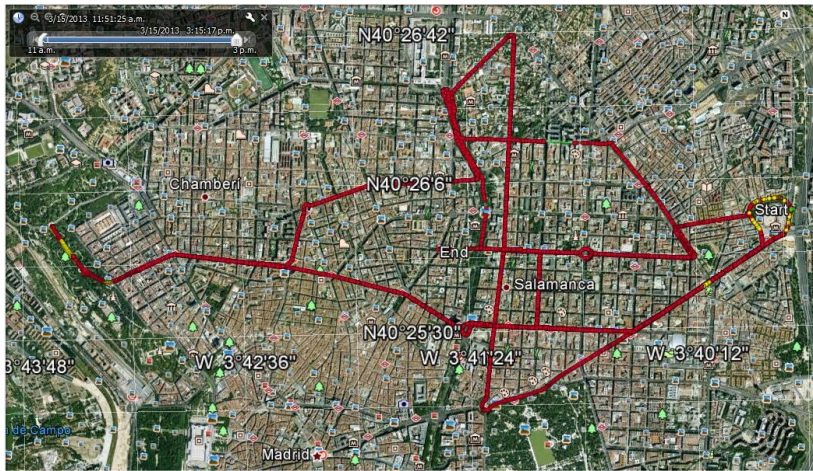
PPP DEMONSTRATOR SERVER
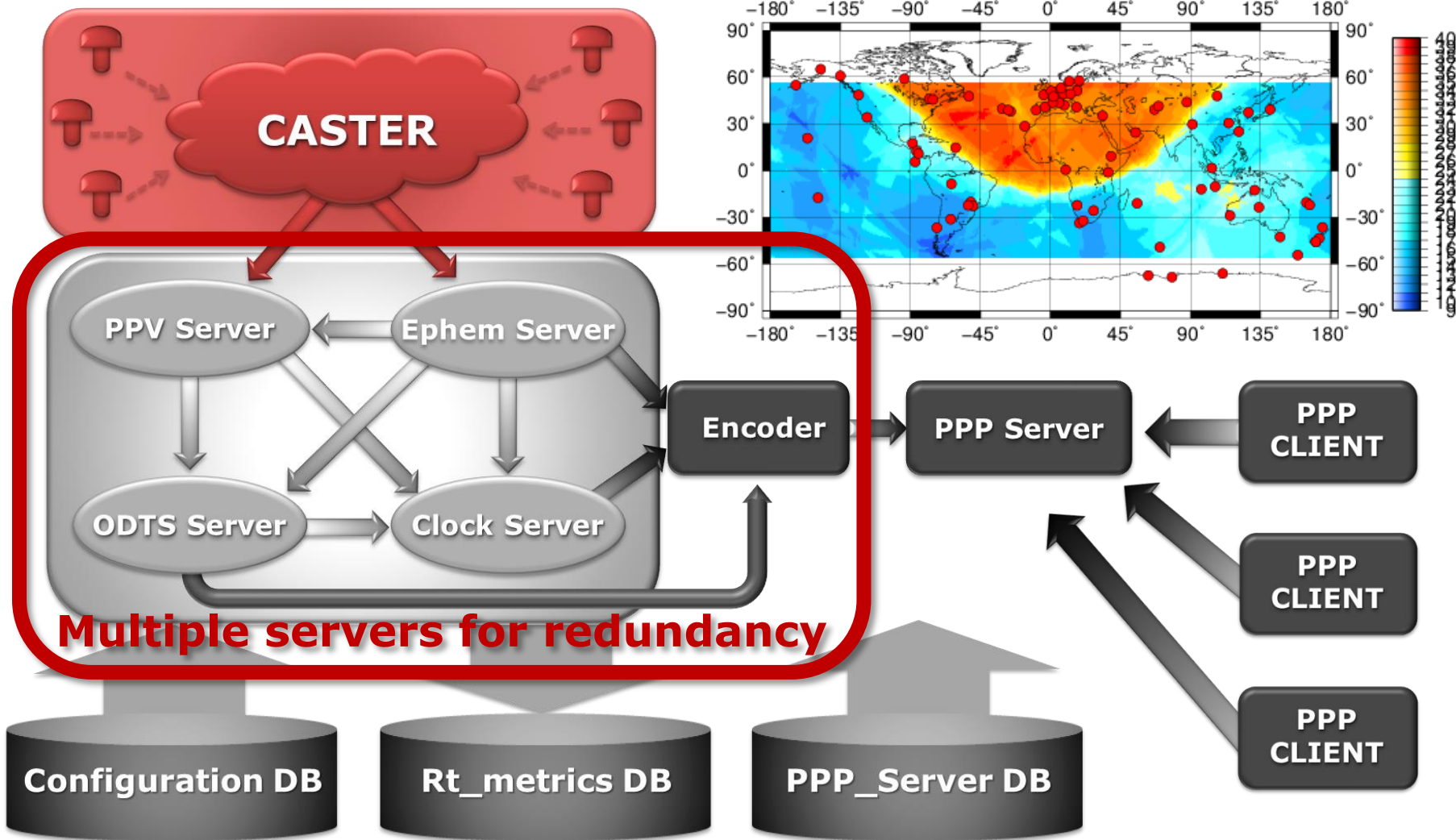
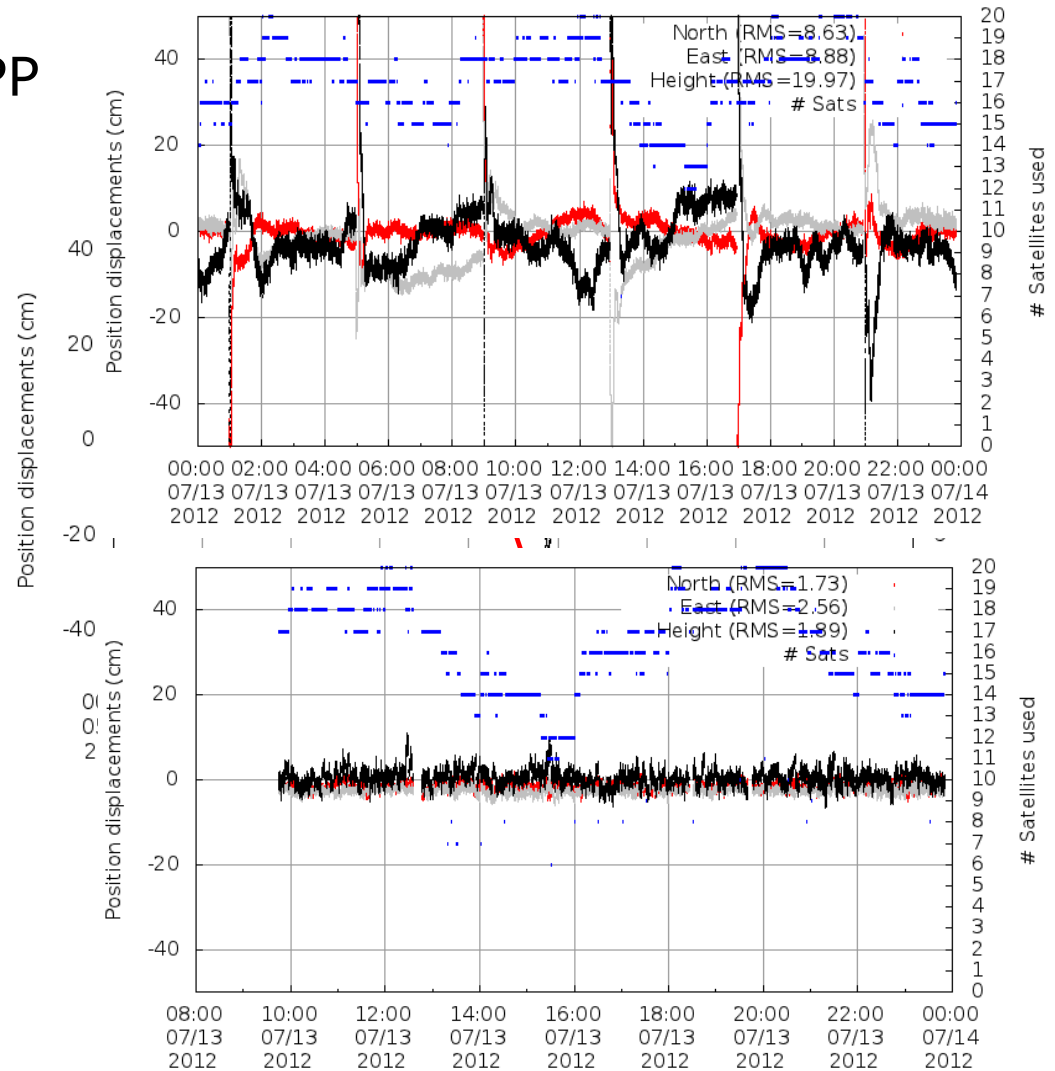# RT PPP DEMONSTRATOR CLIENT

PPP TESTING IN THE FIELD

KINEMATIC FIELD TESTS

LEARNED EXPERIENCE

- Correction outages -> PPP products extrapolation.

- Loss of lines of sights

- Latency and Data rate performance impact

- Quickstart for certain applications

REGIONAL PPP

# RREGIONAL PPP

- Global network not always affordable-> Demonstrator server allows to easily set up a **regional network.**

- Real time PPP comparison
  - Global products
  - Regional products


- Slight degradation performances
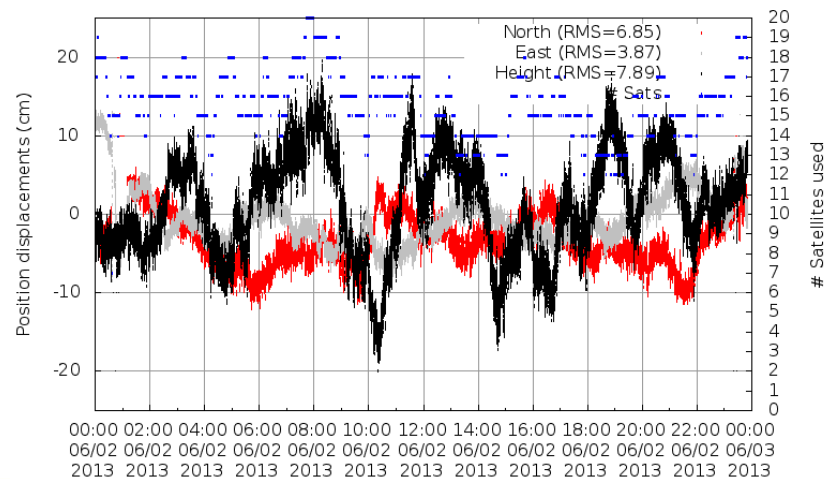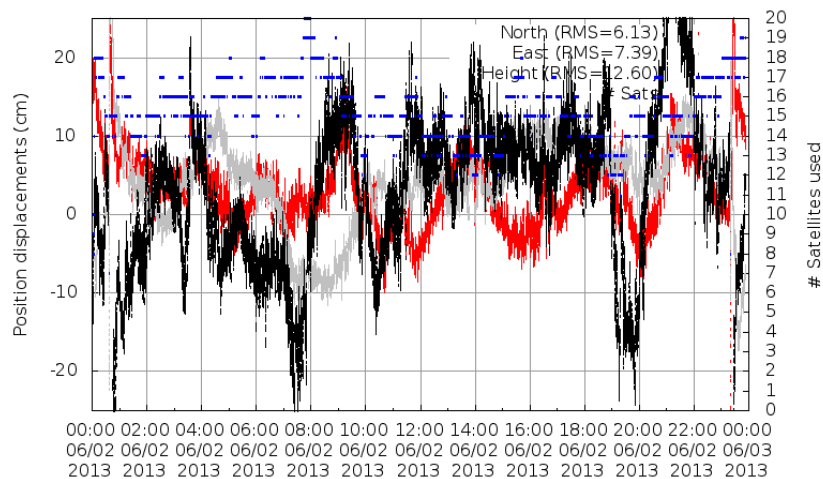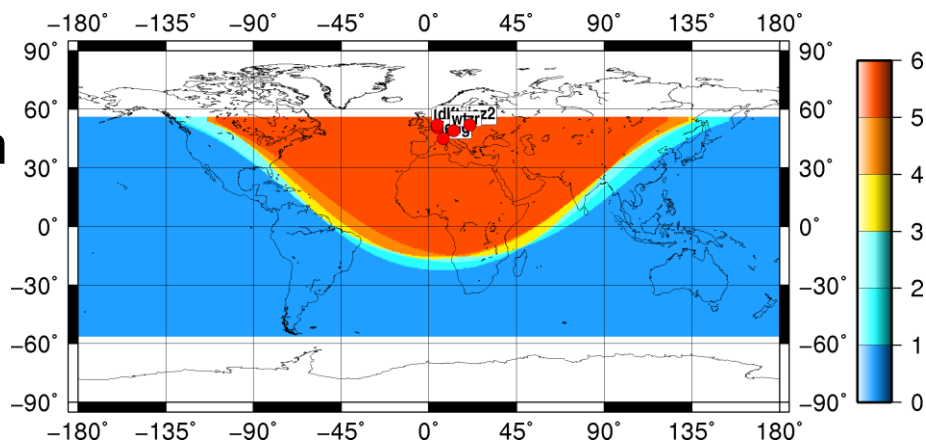
GALILEO PPP

GALILEO PPP (1)

- 4 operational Galileo satellites (E11, E12, E19 and E20) since late 2012.

- Large number of contributors to **MGEX** project (http://igs.org/mgex/) providing RINEX 3.0X and RTCM observations.

- IOVs disposition provides up to 3 hours of common view over Europe -> feasibility for PPP solutions.
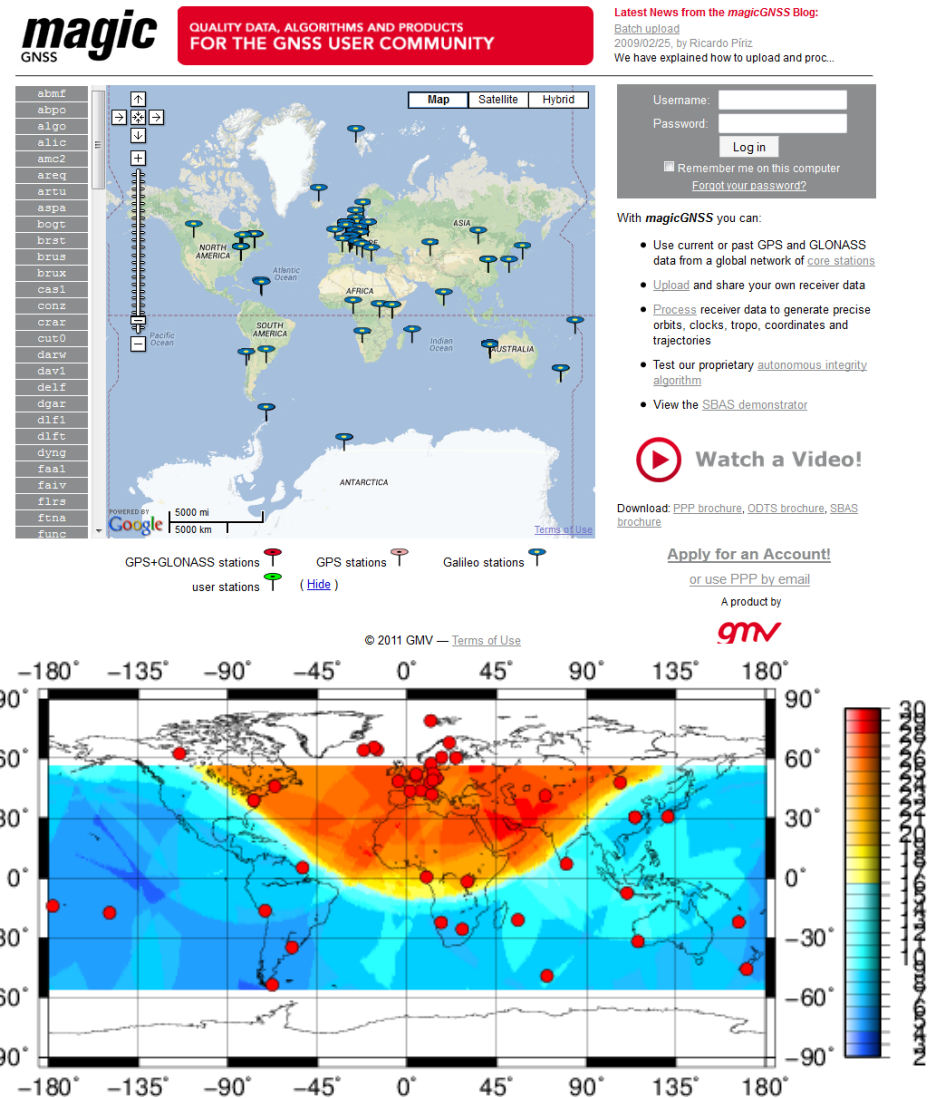
GALILEO PPP (2)

- TRIMBLE R10 receiver at GMVs premises.

- May 31st. 150 minute window with 4 IOV satellites over Tres Cantos.

- Postprocessing of the recorded RINEX data.
  - Static PPP based on IGS products for precise coordinate determination.
  - Galileo only static PPP based on GPS+Galileo products.

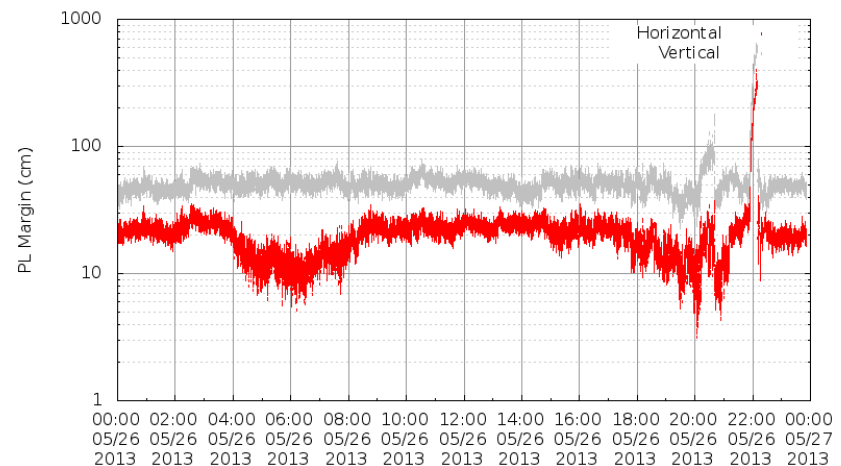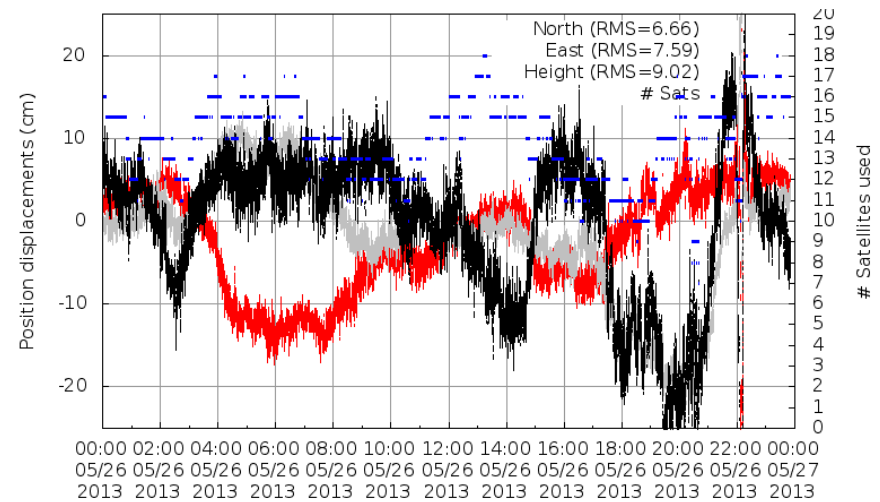- Position error below 5 cm.

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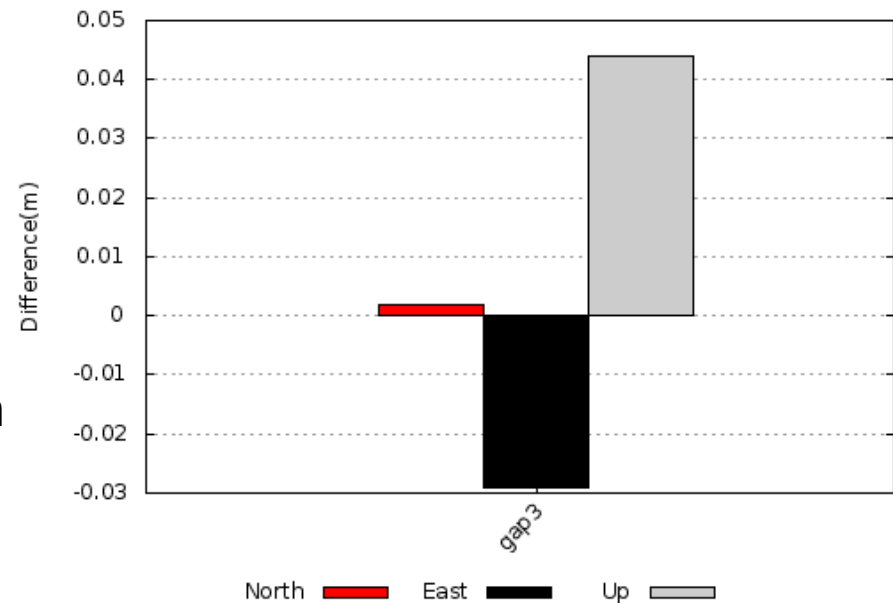
PPP PROTECTION LEVELS

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- Based on process indicators and experimentation we generate a PL.

- Conservative approach for the definition of the PLs.

- Computed PLs bound the position error in nominal condition and under challenging environments.

- Intensive experimentation is foreseen.

CONCLUSIONS

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- Full end user demonstration capability
  - Focused on robustness and operability
  - Enables to analyse different performance drivers
  - Extensive real-time field tests
  - Promising solutions for some of the main challenges

- Regional PPP: Feasible, promising results in real-time

- Galileo: Still proof of concept, but upcoming reality

- PL: Potential enabler for PPP applications

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Thank you

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