

## COMPARISON OF THE REGIONAL SOLUTIONS



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USING GPS AND GALILEO

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## Introduction

Our analysis cover all stations provided at least both GPS and Galileo data in 2018. During this period the number of EPN stations providing Rinex3 data with Galileo observations increased from 136 at beginning of year to 181 at end of year. We divide entire network to subnetworks, excactly the same for GPS and Galileo solutions. Then we generate daily solutions independently for each system.

Below are the results of comparing them. We focused on the ambiguities resolutions and coordinates (internal repeatabilities and cross agreement).



System	GPS	Galileo
Frequencies	L1, L2	E1, E5a
Observations	Ionosphere-free code and phase combination	
Cutoff elevations	10 deg.	
Orbits	CODE MGEX	
Transmitter PCC	igs14.atx	
Receiver PCC	individual calibration from epncb.atx data sets and igs14.atx	
Troposphere delay	VMF1, 1-hourly ZTD and 24-hourly gradients	
Clock errors	estimated	
EOP	IERS2010	
Tide displacements	IERS2010, FES2004	
Attitude model	Kouba's eclipse routine (Feb. 2017)	
Earth radiation	BERNE	

EPN stations used in this study

## Results and Discussion



Our analysis showed that today ambiguity resolution for GPS and Galileo is on the same level. In the first half of the year 2018 Galileo looked a little worse for "narrow-lane" (NL) combination, but for "wide-lane" (WL) Galileo sometimes it is even better than GPS.

> Repeatability of coordinates in 2018 for Galileo solution was only 10% worse than the one obtained from GPS. Mostly for Up component.

Over the year we do not see any systematic differences in horizontal component. Only few individual stations exhibit significant biases. The most R interesting and worrying things occur in vertical component, where we see a large (several mm) differences between GPS and Galileo.

+/- 5 mm



Helmert Transformation Parameters between GPS and Galileo solutions



![](_page_0_Figure_20.jpeg)

![](_page_0_Picture_21.jpeg)

![](_page_0_Figure_22.jpeg)

![](_page_0_Figure_23.jpeg)

250

Station: VARS00NOR

300 350

Corrections (PCCs) is the practiced approach that emerges from current capabilities. Especially where today E05 values are available only for 18 from among 138 antenna models 5 (valid for year 2018). In case of available individual calibrations provided by IGG, Univ. Bonn one can see that there are significant and systematic differences in PCCs (dPCCs) between G02 and E05.

The mean differences in Up component between Phase Centre Offsets (E05 and G02) is 6 4.9 mm and vary from -0.6 mm to 9.8 mm.

This fact should not be ignored!

![](_page_0_Figure_27.jpeg)

![](_page_0_Figure_28.jpeg)

However, our results showed that using proper (E01 and E05) corrections for Galileo observations do not increase the overall agreement with the GPS solutions. On the contrary, for test period (GPS weeks 2000-2002) G02 values give better agreement in Up component with the GPS solutions. Only at POTS00DEU station G02 values cause horizontal bias (confirmed also using PPP), which came from *the azimuthal asymmetry in dPCC (5)*.

More analyses and samples are needed to explain this issue.

![](_page_0_Figure_31.jpeg)