PPP-AR Pilot Project

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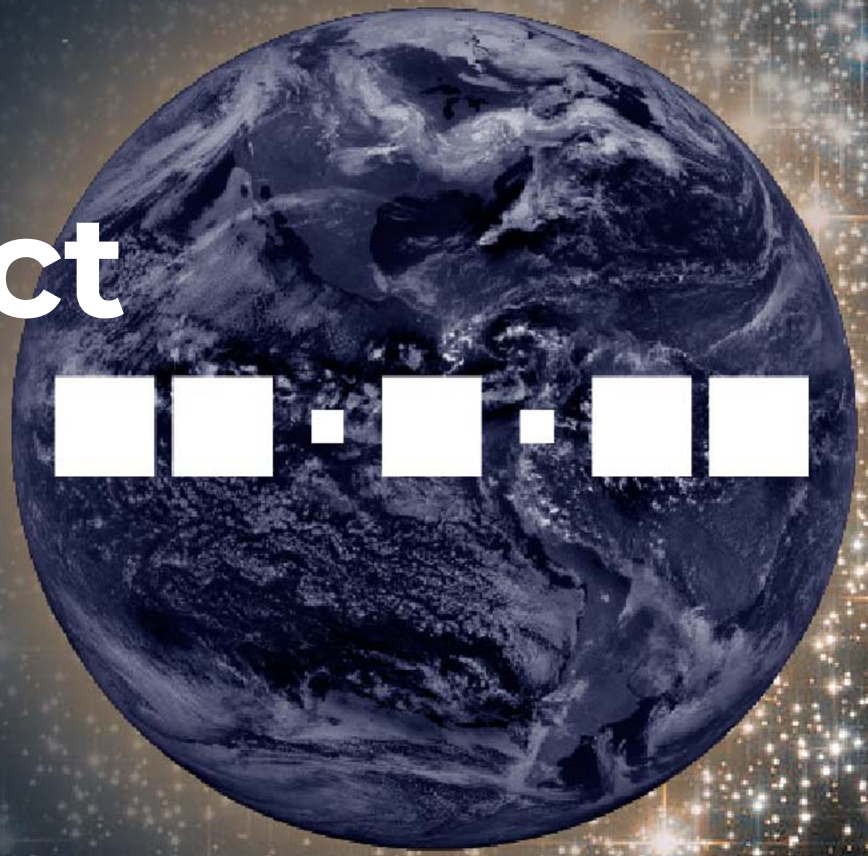


IGS INTERNATIONAL GNSS SERVICE

2023 Virtual Meeting

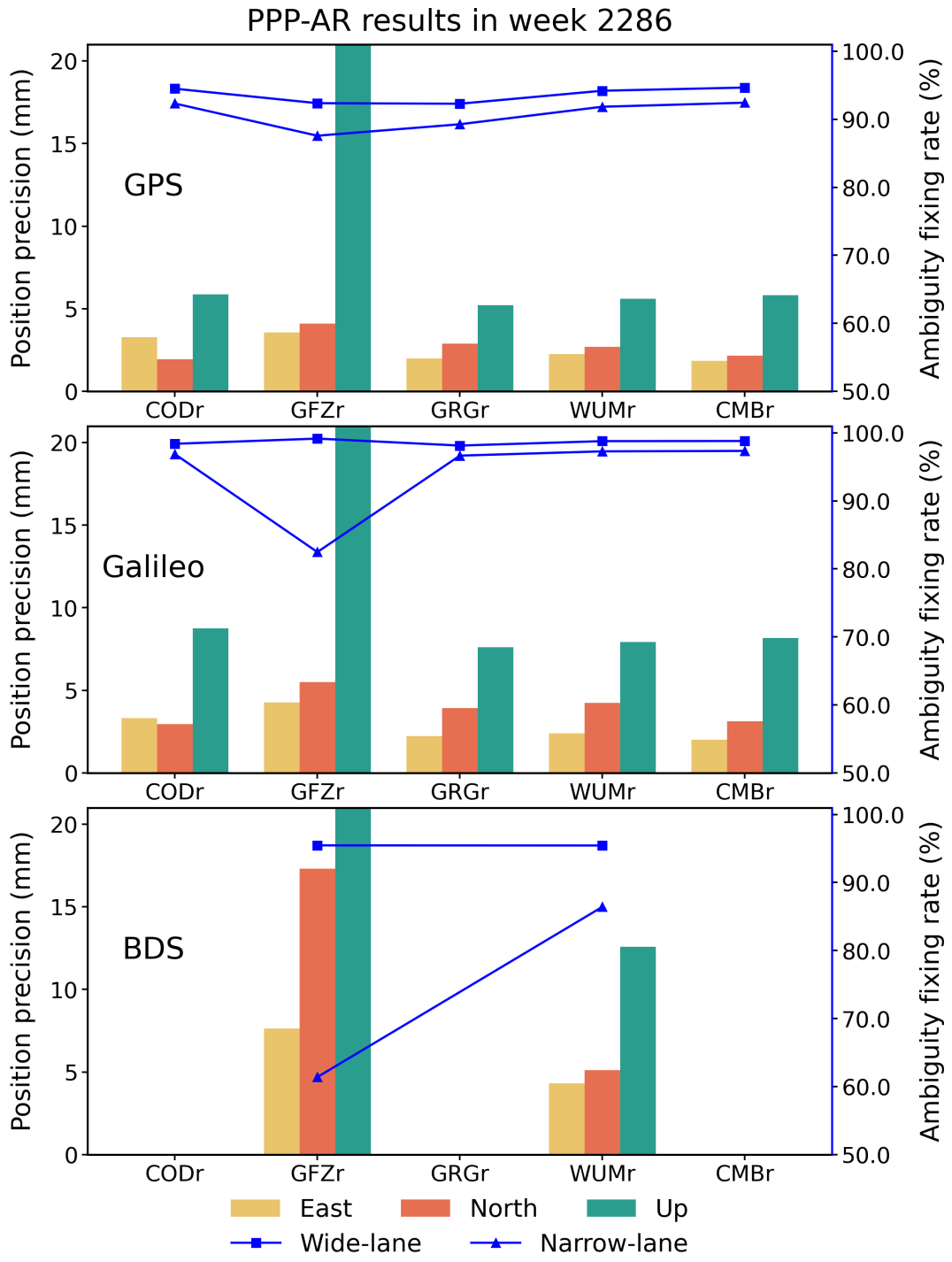
GFZ MGEX rapid

Phenomena:

- Galileo/BDS narrow-lane fixing rates are lower
- Up precisions are poorer

Product format

- Wide-lane phase biases (UPDs)
- Integer clock



Wide-lane bias & integer clock

- GRG rapid and GFZ MGEX rapid
- Standard Bias-SINEX format is encouraged

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WIDELANE SATELLITE FRACTIONNAL BIASES FOR GALILEO        COMMENT
WL E01 2023  11  4 12  0  0.000000  1   +1.200000E-01  0105 COMMENT
WL E02 2023  11  4 12  0  0.000000  1   -2.600000E-01  0105 COMMENT
WL E03 2023  11  4 12  0  0.000000  1   -3.200000E-01  0105 COMMENT
WL E04 2023  11  4 12  0  0.000000  1   +2.900000E-01  0105 COMMENT
WL E05 2023  11  4 12  0  0.000000  1   +1.700000E-01  0105 COMMENT
WL E06 2023  11  4 12  0  0.000000  1   +1.000000E-02  0105 COMMENT
WL E07 2023  11  4 12  0  0.000000  1   -3.200000E-01  0105 COMMENT
WL E08 2023  11  4 12  0  0.000000  1   -1.400000E-01  0105 COMMENT
WL E09 2023  11  4 12  0  0.000000  1   +4.900000E-01  0105 COMMENT
WL E10 2023  11  4 12  0  0.000000  1   -2.200000E-01  0105 COMMENT
WL E11 2023  11  4 12  0  0.000000  1   -6.000000E-02  0105 COMMENT
```

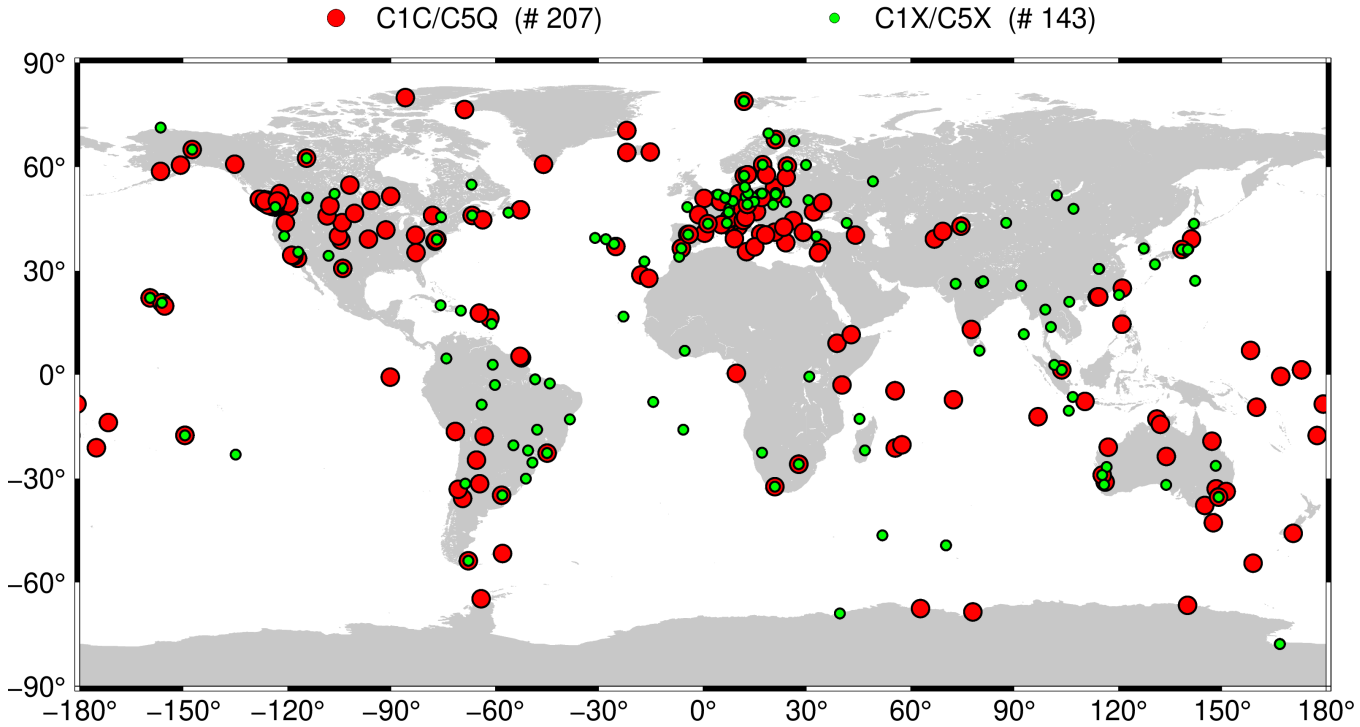
Near-zero code OSBs

- CODE mgex code OSBs on baseline frequencies are zero

OSB	G063 G01	C1C	2023:308:00000 2023:309:00000	ns	-1.6080 0.0092
OSB	G063 G01	C1W	2023:308:00000 2023:309:00000	ns	-0.0000 0.0000
OSB	G063 G01	C2L	2023:308:00000 2023:309:00000	ns	-0.0009 0.0009
OSB	G063 G01	C2S	2023:308:00000 2023:309:00000	ns	-0.0001 0.0009
OSB	G063 G01	C2X	2023:308:00000 2023:309:00000	ns	-0.0007 0.0009
OSB	G063 G01	C2W	2023:308:00000 2023:309:00000	ns	-0.0000 0.0000

Discrepancy between Galileo C/Q and X/X signals

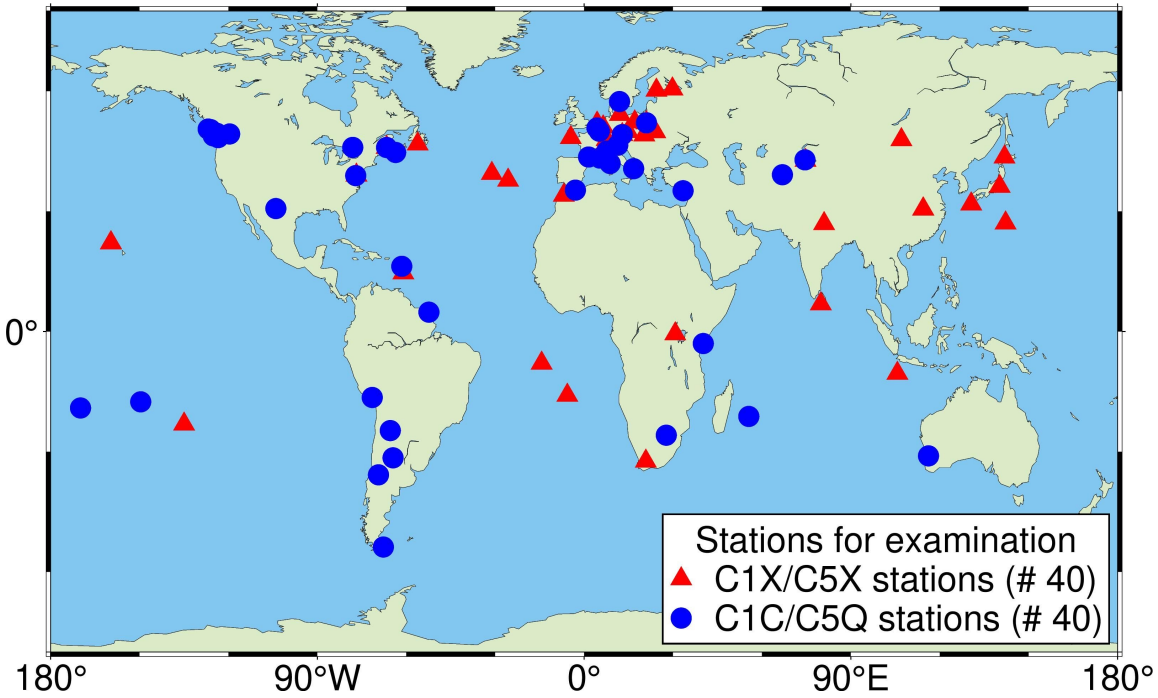
- C/Q and X/X signals are tracked by different receivers
- Phase biases on them are presumed the same or not?



Channels	Receiver Manufacture
C1C/C5Q	SEPT, LEICA, etc.
C1X/C5X	JAVAD, TRIMBLE JPS, CHC, TPS, etc.

Discrepancy between Galileo C/Q and X/X signals

- COD final and WUM rapid: the same phase OSBs on C/Q and X/X channels
- WUM final and GRG final: different phase OSBs on C/Q and X/X channels



PPP-AR examinations on DOY 200

Products	Fixing rates (WL/NL)	
	C1C/C5Q	C1X/C5X
COD0OPSFIN	99.66%/95.64%	99.36%/94.71%
WUM0MGXRAP	99.60%/96.37%	99.79%/95.74%
GRG0OPSFIN	95.45%/95.01%	96.05%/94.95%
WUM0MGXFIN	99.51%/95.74%	98.59%/95.16%

Decimal digits of quaternions

- The maximum PCO differences (mm) after reducing quaternion decimal digits to 3, 5, 6 or 7

Decimal digits	ΔX (mm)	ΔY (mm)	ΔZ (mm)
3	5.044	4.909	4.792
5	0.050	0.051	0.052
6	0.00745	0.00511	0.00480
7	0.000501	0.000501	0.000504

- Keeping six decimal digits for quaternions would be enough