GFZ
Helmholtz Centre
POTSDAM

STATUS OF IGS REPRO3 ACTIVITIES AT GFZ

B. Männel, A. Brandt, M. Bradke, A. Brack, P. Sakic, T. Nischan
GeoForschungsZentrum Potsdam

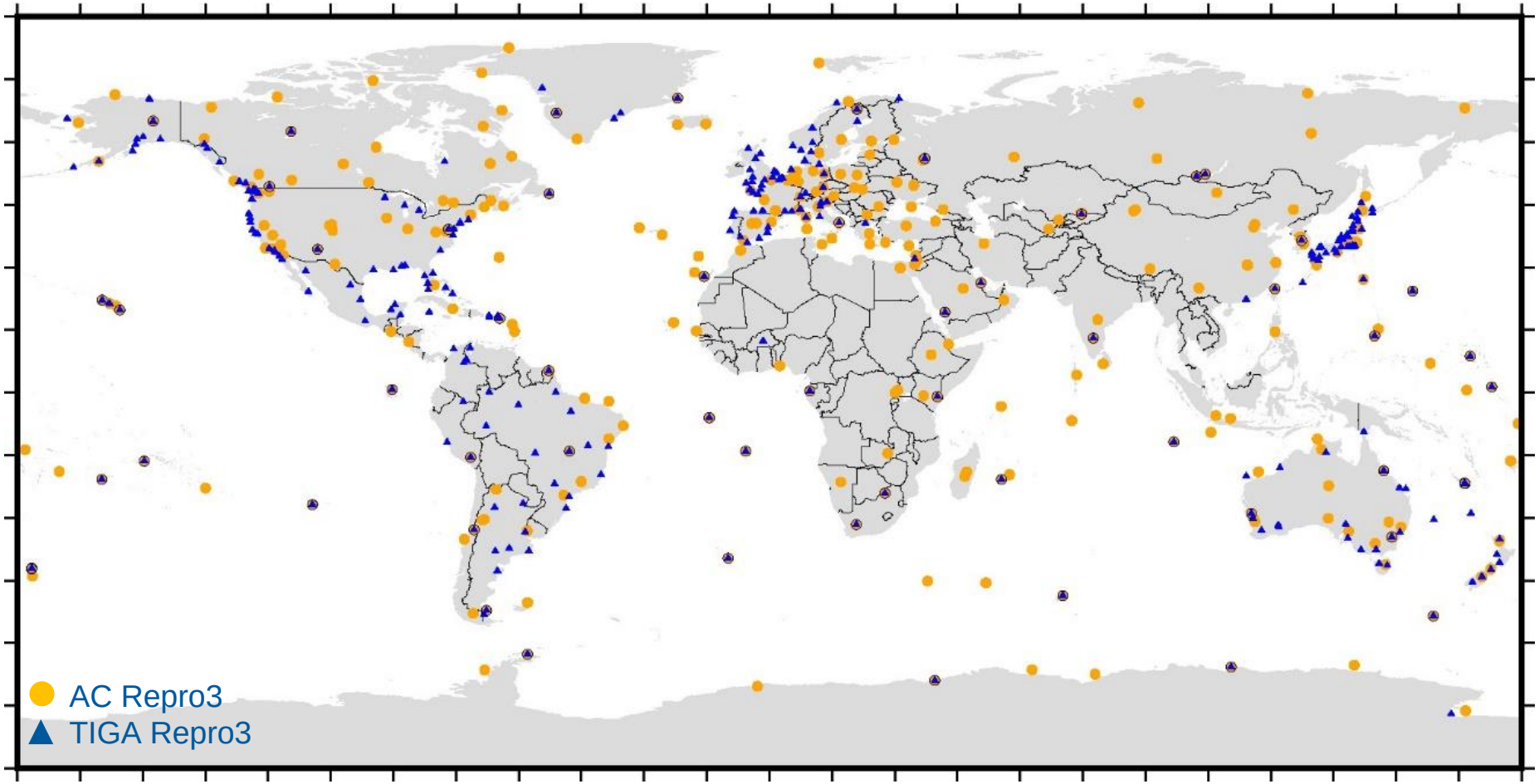
EGU2020: Sharing Geoscience Online

GFZ Contribution to Repro3

- Full repro solution provided by GFZ IGS AC
- TIGA repro as network solution with GFZ repro orbit & clock products

	GFZ IGS AC solution	GFZ TIGA solution
Systems	GPS GLONASS (>2012) Galileo (>2014)	GPS
Initial products	---	GFZ IGS AC solution
GNSS phase center	Multi-GNSS ANTEX (igsR3_2077.atx)	
Gravity potential	GOCO6s	
Ocean loading / ocean tide model	FES2014b	
Mean pole tide	Linear mean pole as adopted by IERS in 2018	
High-frequent EOP	Desai-Sibois, 2016	
Parameters	Coordinates, Troposphere, Orbits, Clocks, ERP, Antenna Phase Centers	Coordinates, Troposphere

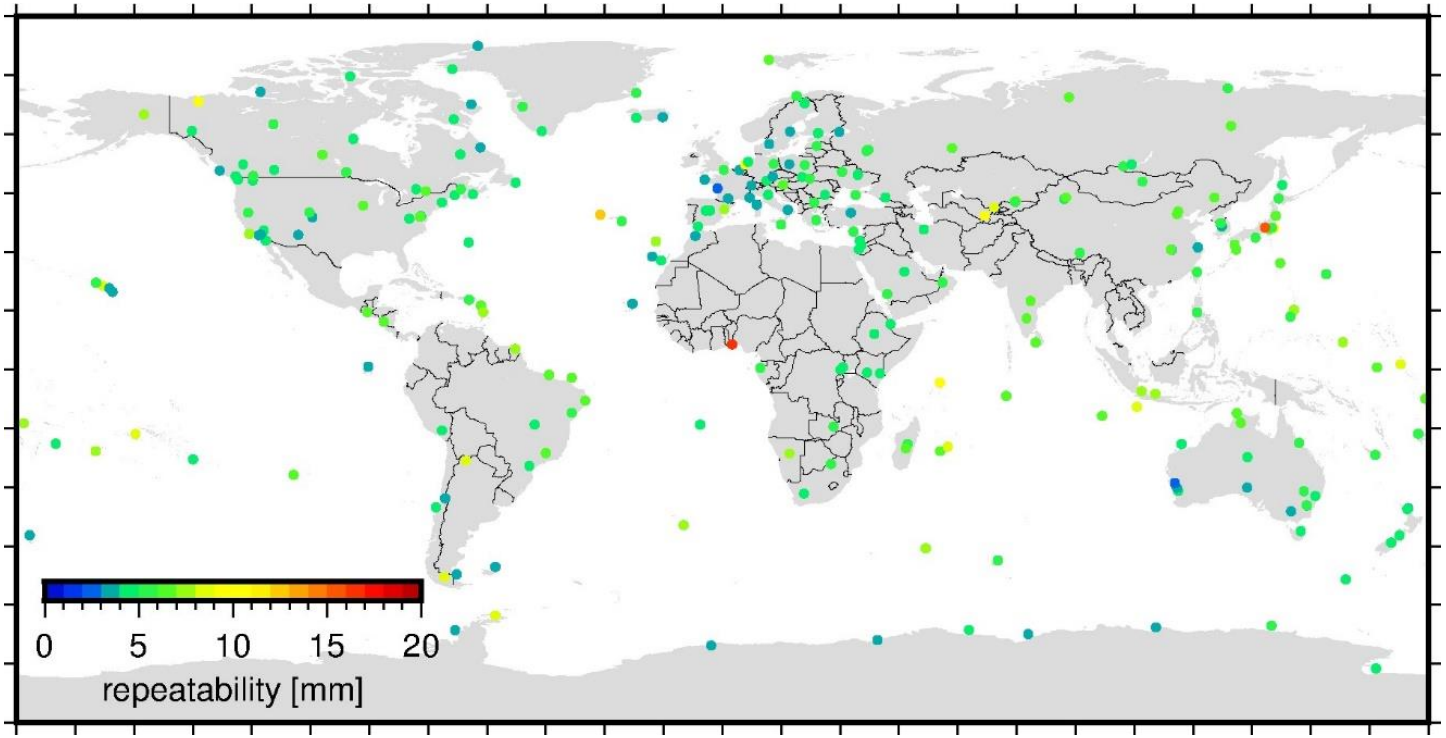
Station Network

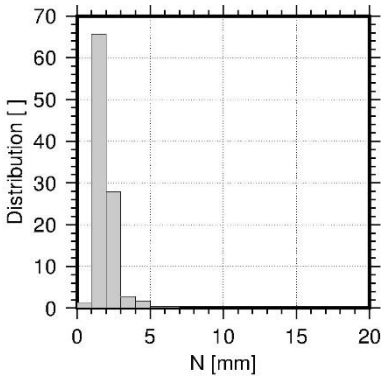


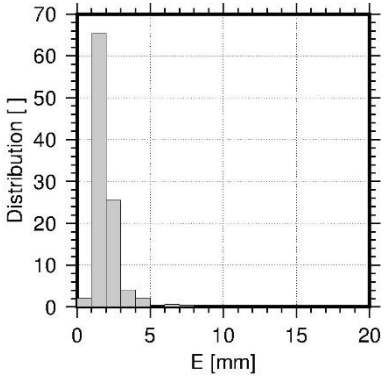
- Repro3 (AC): Categories 1 – 4 according to station priority list provided by Paul Rebischung + GFZ IGS stations
- TIGA: additional stations connected to tide gauges + South America + Datum stations

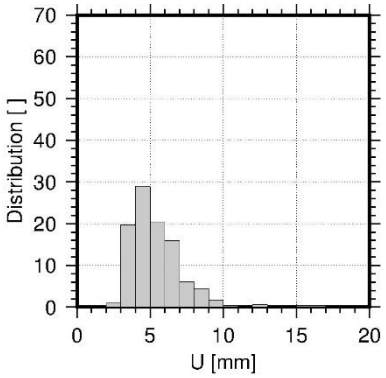
Station Coordinates: GFZ IGS AC – 2014 Test

- Station coordinate repeatability estimated over one year with velocity estimation*
- Horizontal components within 1-3 mm
- Vertical component mainly 3-7 mm, large values for BJCO (Benin) 16.3mm and USUD (Japan) 15.5mm







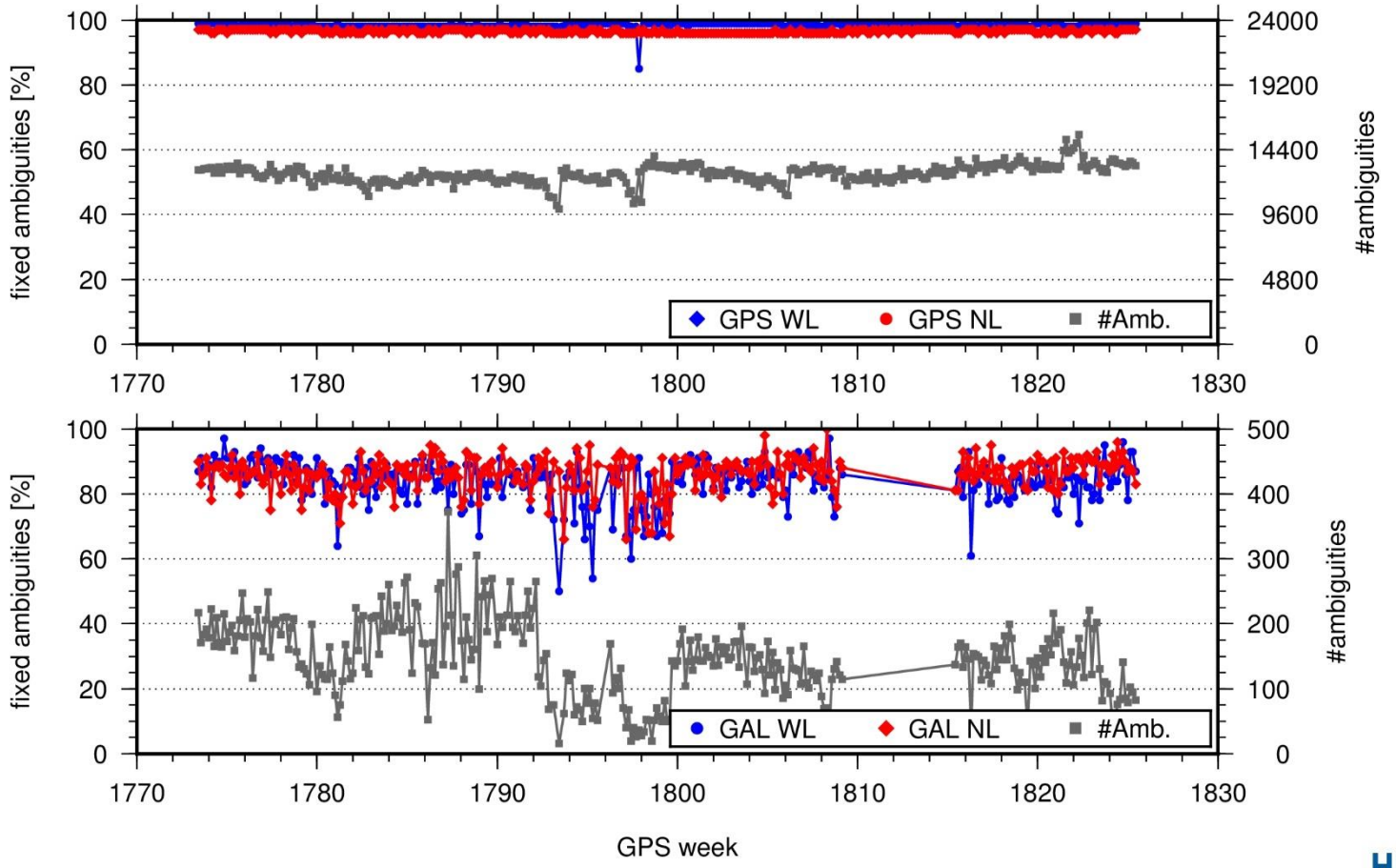


* estimated velocities are not interpreted further due to their short estimation period

Ambiguity fixing: GFZ IGS AC – 2014 Test

GFZ Helmholtz Centre Potsdam

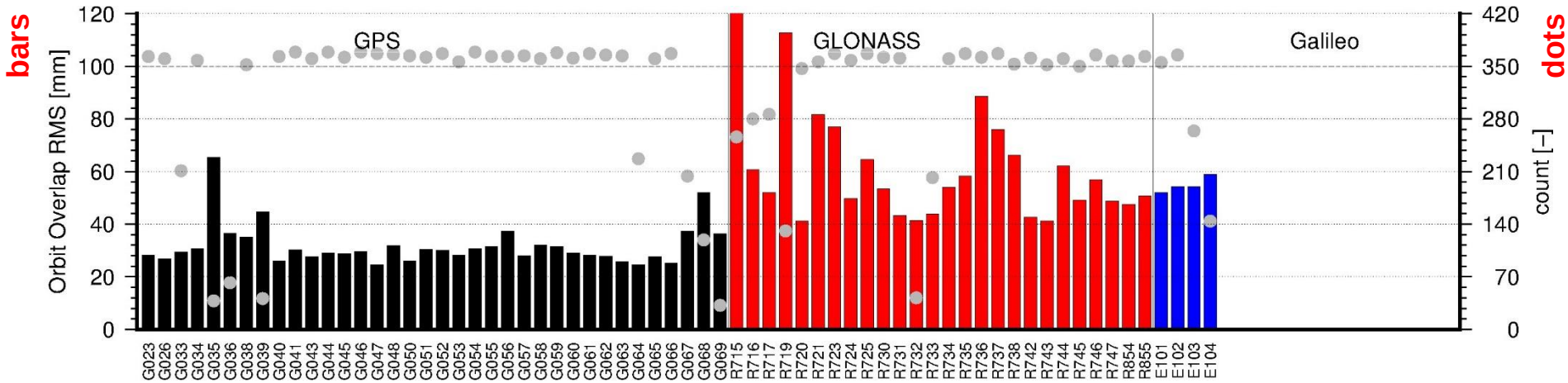
- Ambiguities for GPS 2014/001 and 2014/365 and ration of fixed narrow and widelane ambiguities (>90%)
- Galileo ambiguity fixing is at 80-90%, Galileo missing in the test solution weeks 1809 to 1815, Galileo network 40 - 60 stations during 2014



HELMHOLTZ

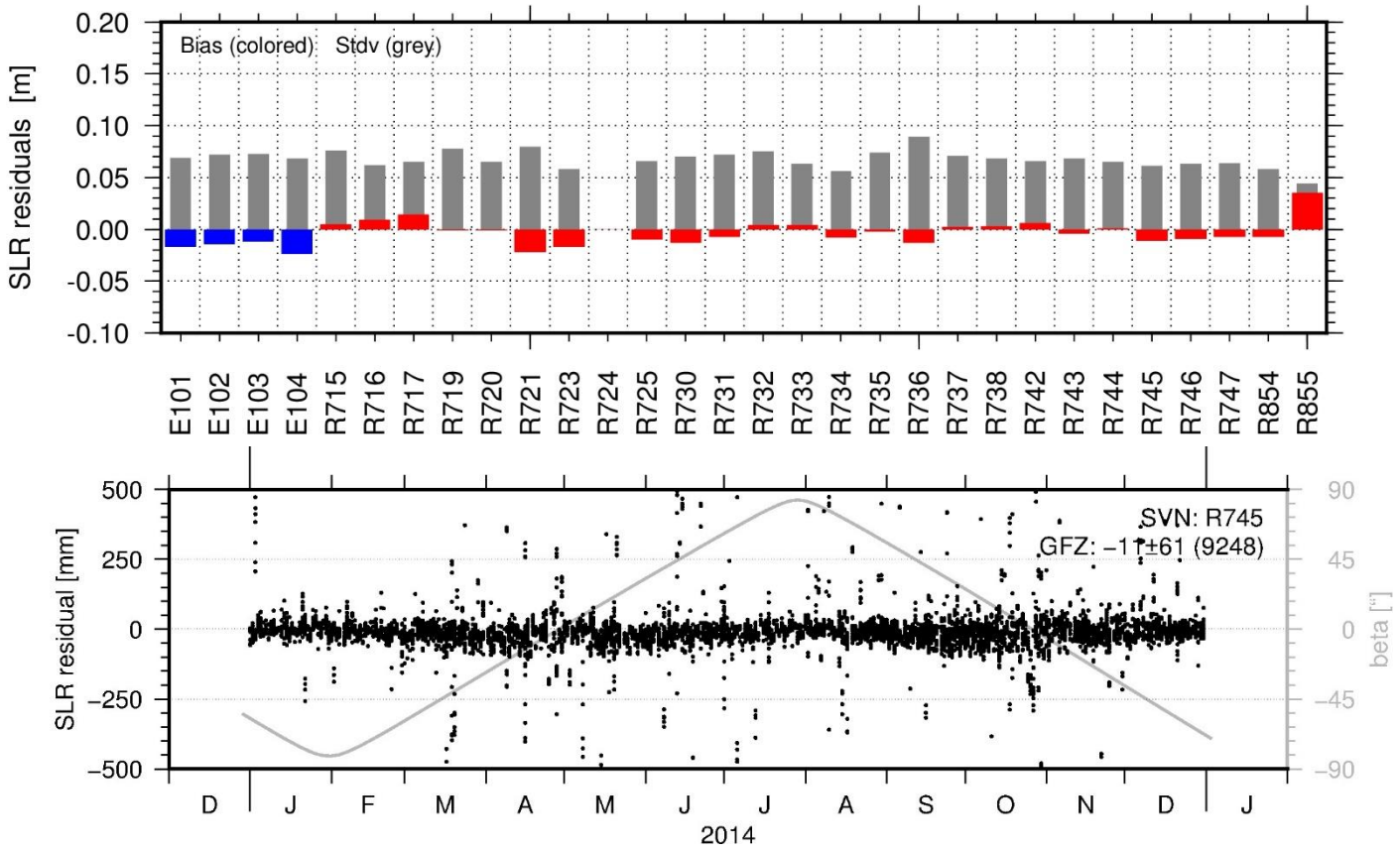
Orbit overlaps: GFZ IGS AC – 2014 Test

- Orbit overlap analysis (2h extrapolation at begin and end of each arc)
- Several spacecraft with less than 365 arcs (spacecraft added to or removed from constellations), Galileo also with partly sparse station network in 2014
- GPS 31.8±8.2 mm, GLONASS 62.4±17.4 mm, Galileo 54.8±2.7 mm
- Previous test for 2017-2018 showed GPS: 27mm, GLONASS: 70mm, and Galileo: 49mm



SLR validation: GFZ IGS AC – 2014 Test

- SLR orbit validation for GLONASS and Galileo
- Only small biases, mainly for satellites with few observations
- Galileo on average 3’200 observations/satellite, GLONASS 5’700 observations/satellite in 2014



Männel et al. 2020 – EGU2020: Sharing Geoscience Online

Spacecraft Attitude: GFZ IGS AC – 2014 Test

- Comparison of modeled spacecraft attitude
- Quaternions provided via ORBEX transferred to Eulerian angles
- No “truth” available: differences with respect to TU Graz solution computed
- Individual lines are shifted by 0.1
- Differences > 5° for

PRN	Block	β
G04	IIA	5.5
G08	IIA	3.5
G30	IIF	6.5