International Laser Ranging Service

A View of ILRS Station Performance

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ILRS satellite applications

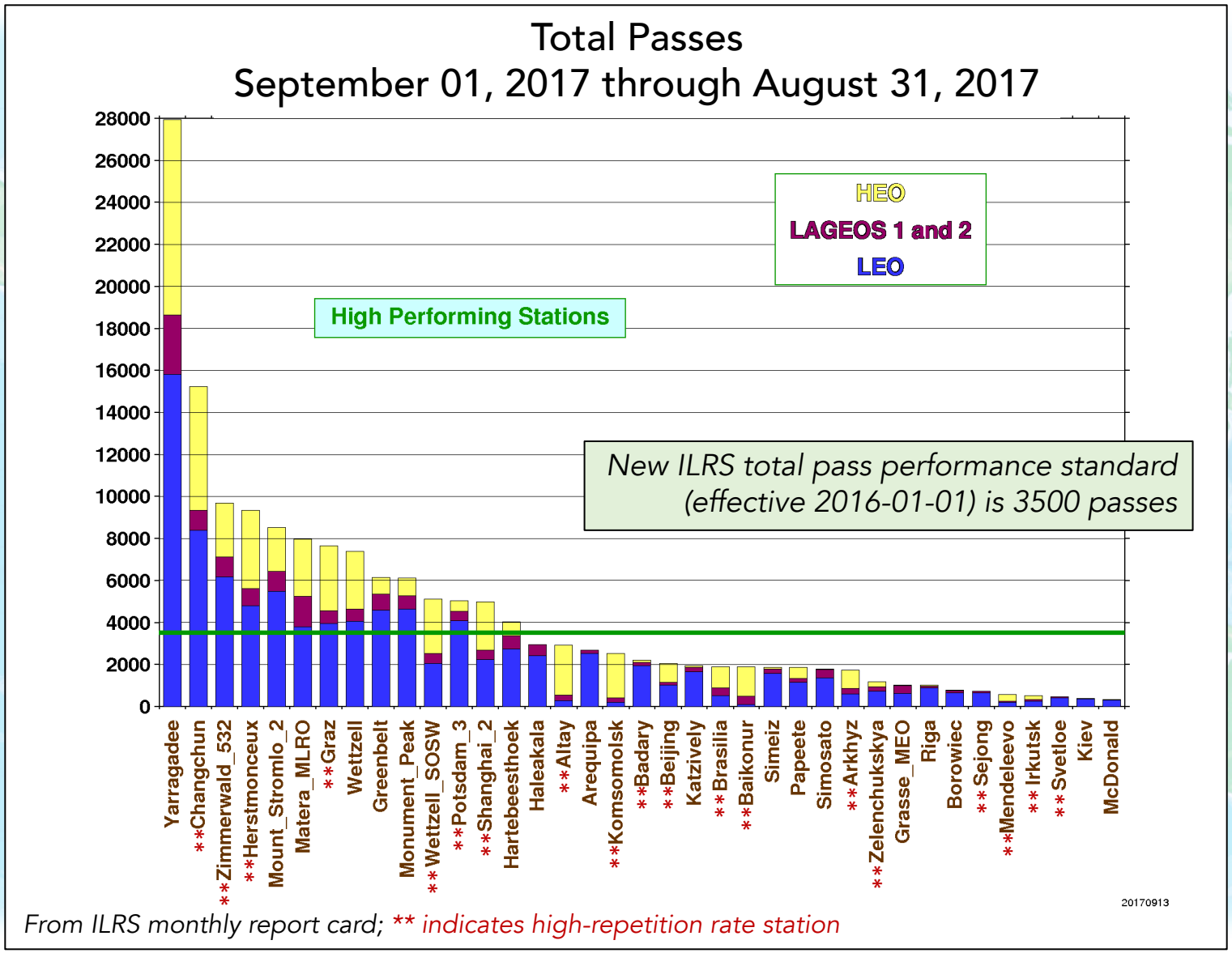
Satellite	Application
BE-C	Intercomparison of techniques; secular and long-period variations in gravity field; Earth rheology and post glacial rebound
CryoSat-2	Thickness of sea ice, surface elevation of ice; Ocean/Ice altimetry
GRACE-A, -B	Static and time-varying gravity field
HY-2A	Ocean altimetry; Dynamics of the ocean environment sea surface height and temperature
Jason-2, -3	Ocean altimetry; global circulation, air-sea interaction, monitor ocean events (El Nino); precision time transfer
KOMPSAT-5	SAR imaging; atmospheric sounding; radio occultation
PN-1A	Multi-technique Precision orbit determination; atmospheric density
SARAL	Ocean altimetry; ocean surface topography; Wave height; wind speed; ocean circualtion. model
Sentinel-3A	Ocean altimetry; SAR, sea surface topography; sea and land surface temperatures; ocean and land color; climate monitoring and forecasting
STSat-2C	Atmospheric monitoring; electronic temperature and electron density and plasma potential; measure and monitor near-space density
SWARM-A, -B, -C	Survey of Earth's geomagnetic field and its temporal evolution
TanDEM-X	SAR; high accuracy digital elevation models; tandem with TettaSAR-X
TerraSAR-X	SAR; X-band SAR data for scientific research and commercial applications

Satellite	Application
RadioAstron	Interometer measurements
TechnoSat	Technology experiments; demonstration of small COTS reflectors for the array
Ajisai	Gravity Field, Sateliite spin studies, Force model, EOP
Etalon-1, -2	Satellite and refinement of the Earth gravity Field model; .support GLONASS
LAGEOS-1, -2	Geodynamics/Reference Frame
LARES	Gravito-magnetic field, Lense-Thirring Effect, Reference Frame
Larets	Geodesy and Geodynamics; test of array design
Starlette/Stella	Static and Time varying gravity field, tides,long period perturbations
Compass/Beidou	Navigation/Time Transfer
Galileo	Navigation/Time Transfer
GLONASS	Navigation/Time Transfer
IRNSS	Navigation
QZSS	Navigation

ILRS pass performance standard

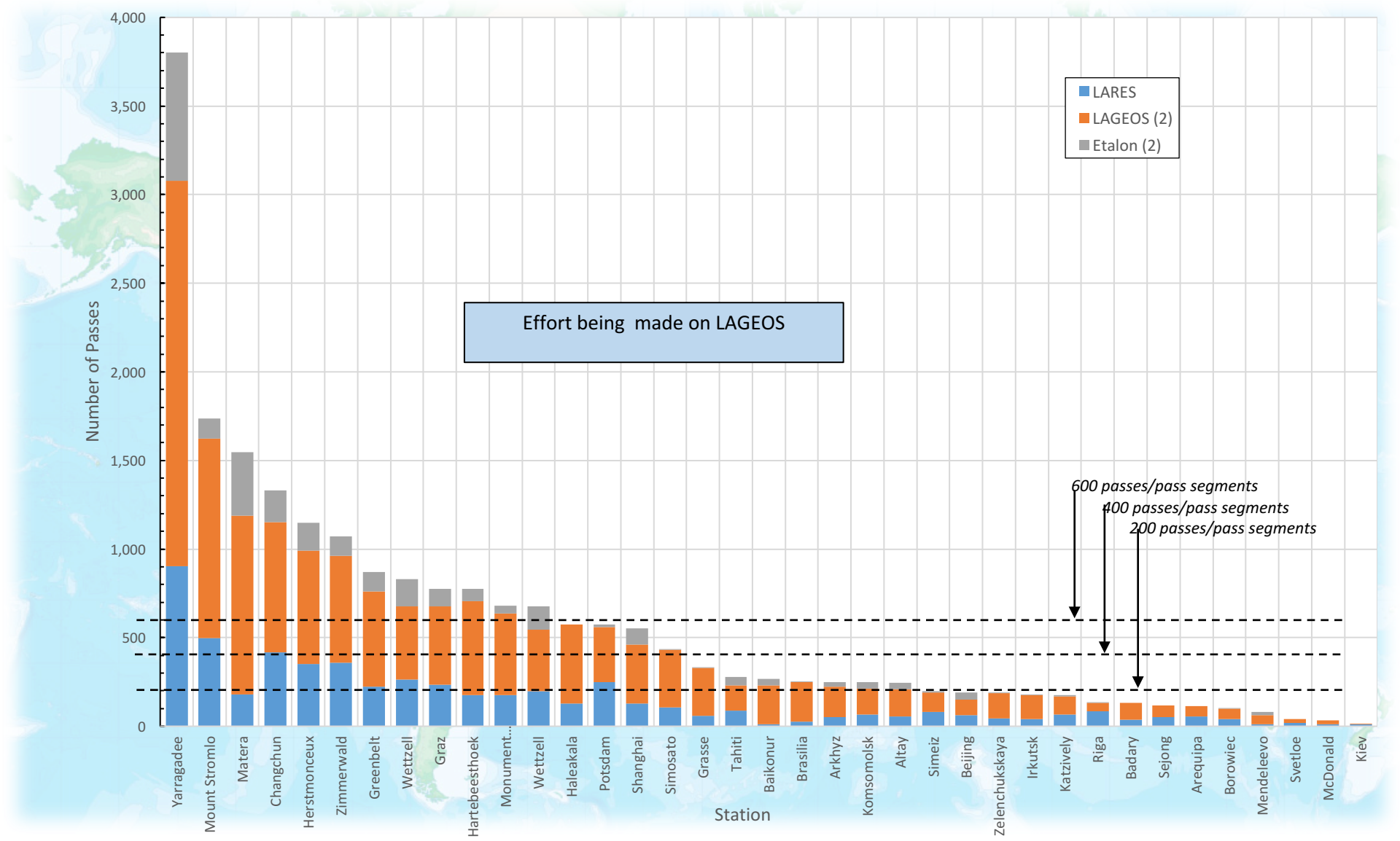
- At the 2015 ILRS Technical Workshop in Matera, the ILRS Governing Board instituted a new station pass performance standard:
  - 3500 passes per year
  - Increased from previous standard of 1500 passes per year (LEO/1000 passes, LAGEOS/400 passes, and HEO satellites/100 passes)
- In redefining the ILRS Pass Performance Standard we considered the following performance target levels as a basis:
  - 2 passes per week on each LEO satellite (2300 LEO passes per year)
  - 4 passes per week on each LAGEOS satellite (600 LAGEOS passes per year)
  - 2 passes per week on each HEO satellite (>3000 HEO passes per year)
- Acknowledges improvements in technology and procedures, increased experience and success in daylight ranging
- Currently tracking 23 LEO, 3 LAGEOS/LARES, 46+ HEO

Network performance (1 of 2)

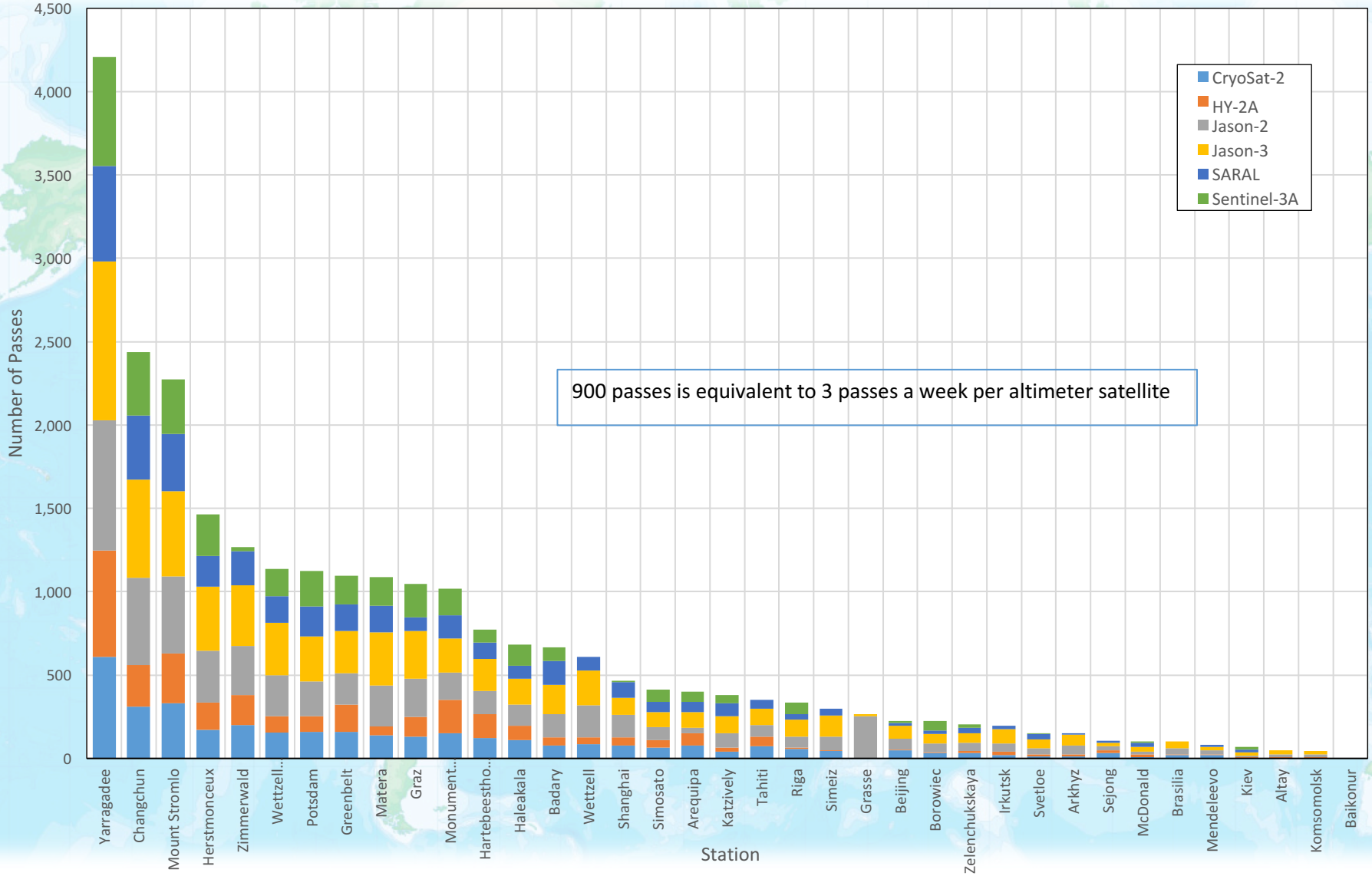


*From ILRS monthly report card; ** indicates high-repetition rate station*

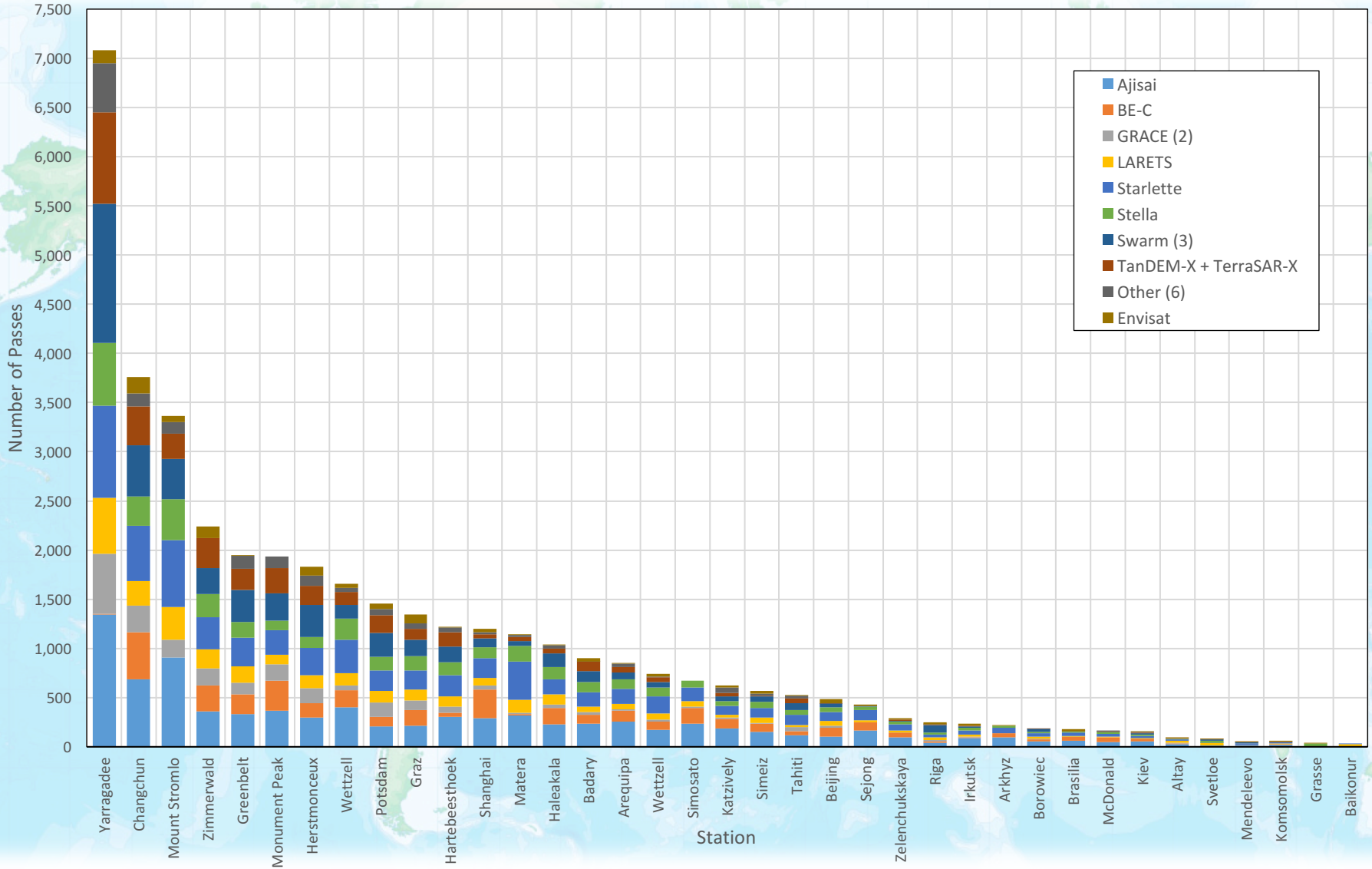
Reference frame satellite pass totals



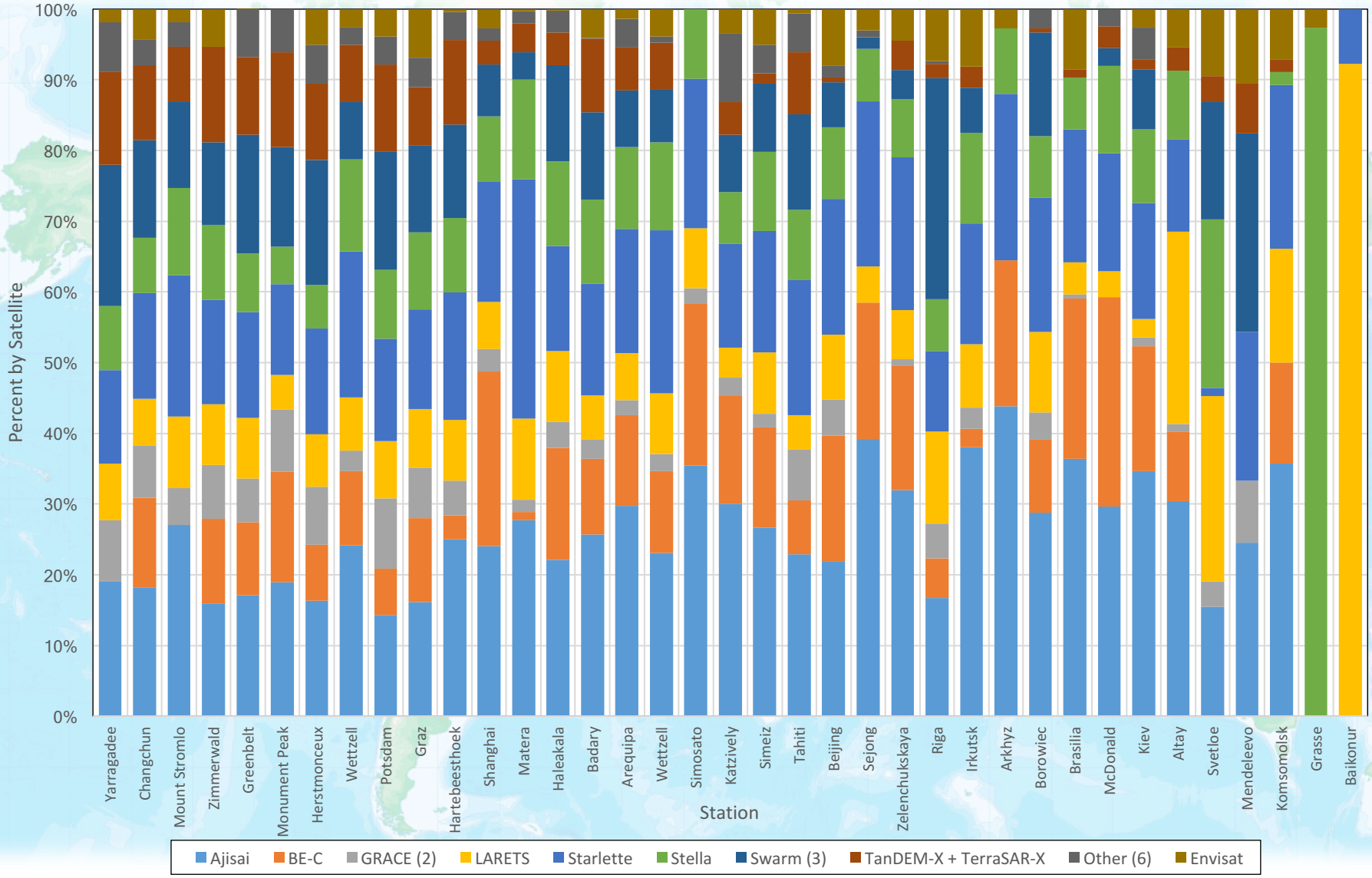
Altimetry satellite pass totals



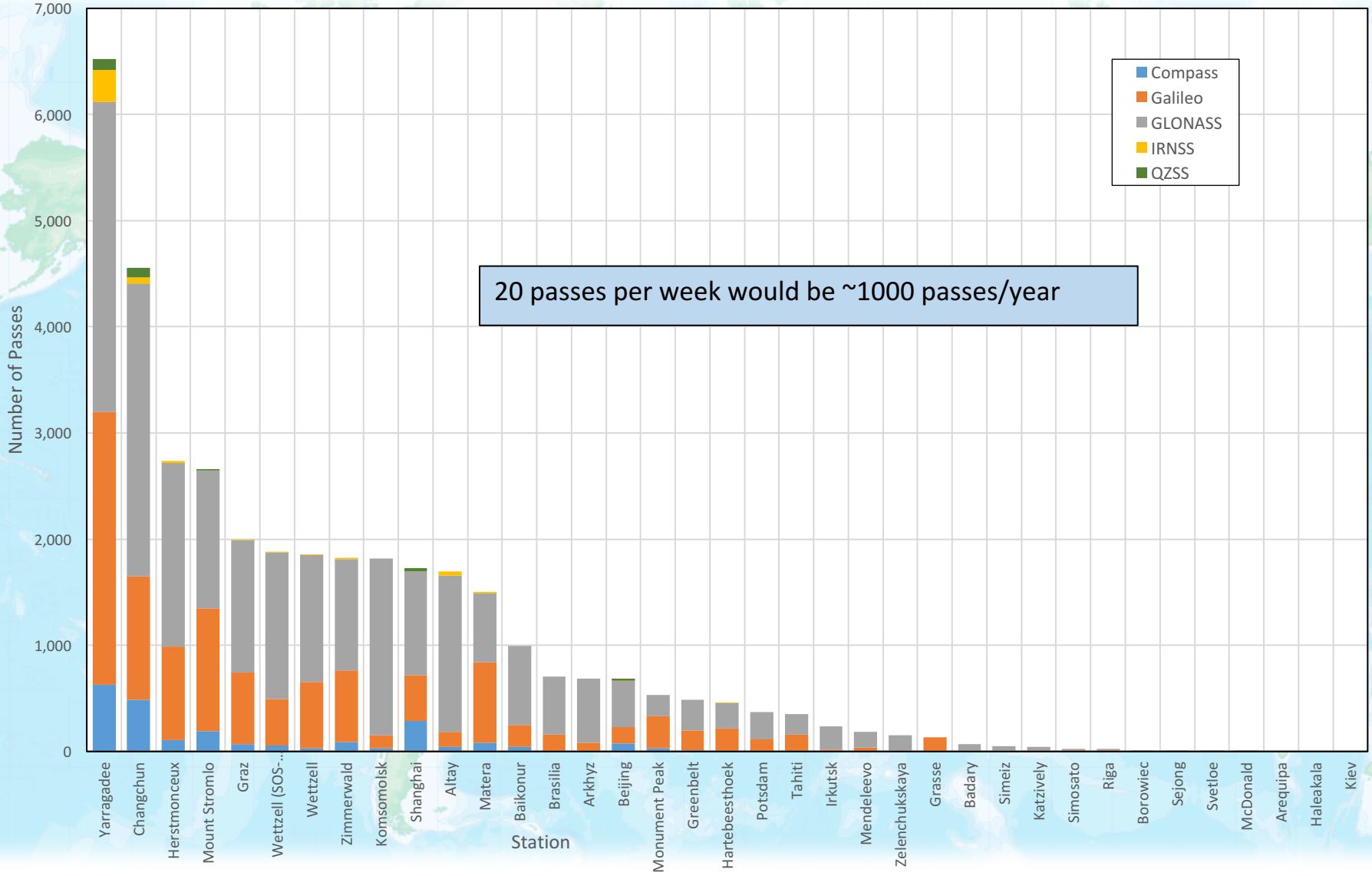
LEO satellite pass totals (no altimetry)



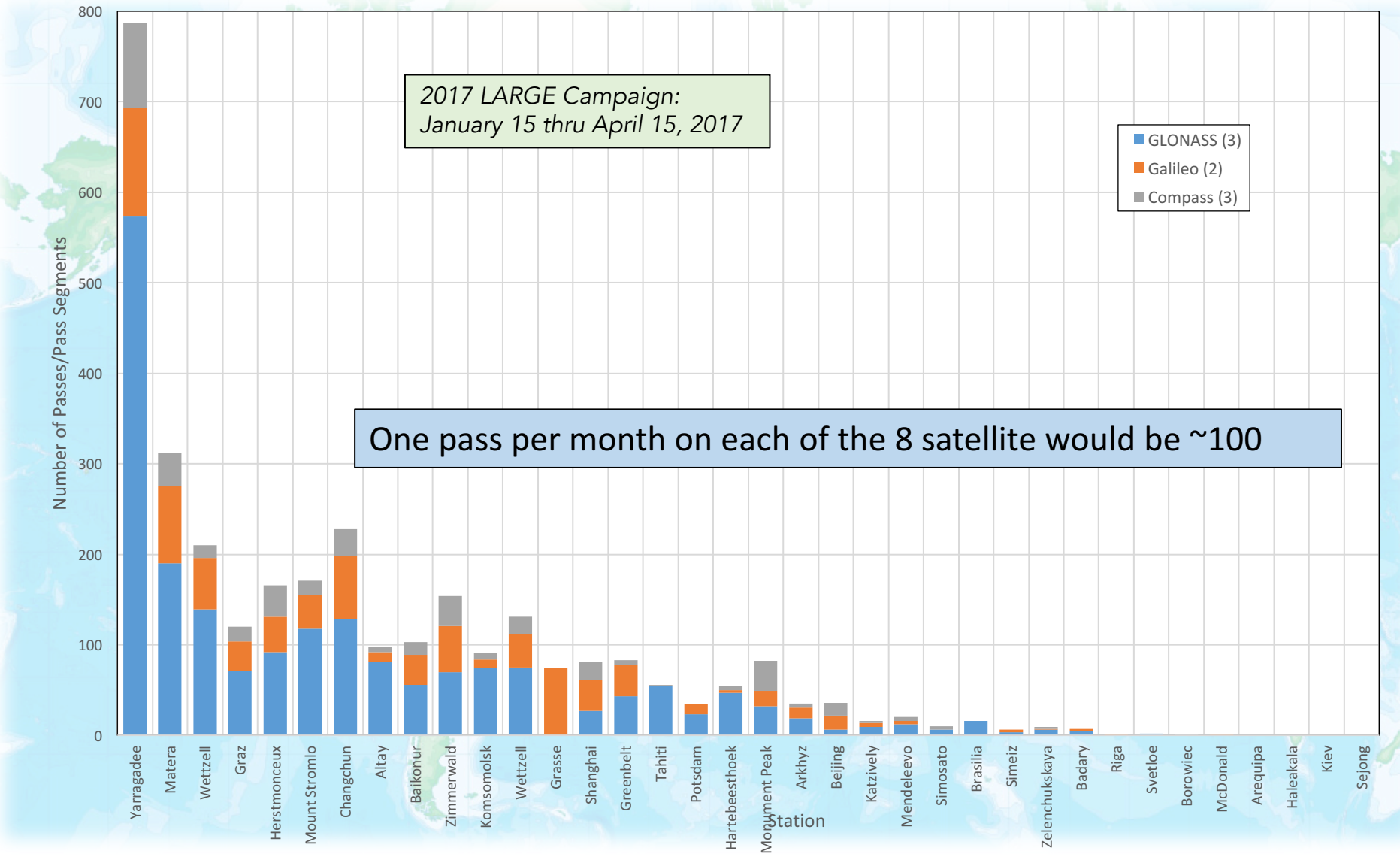
LEO satellite pass totals (no altimetry)



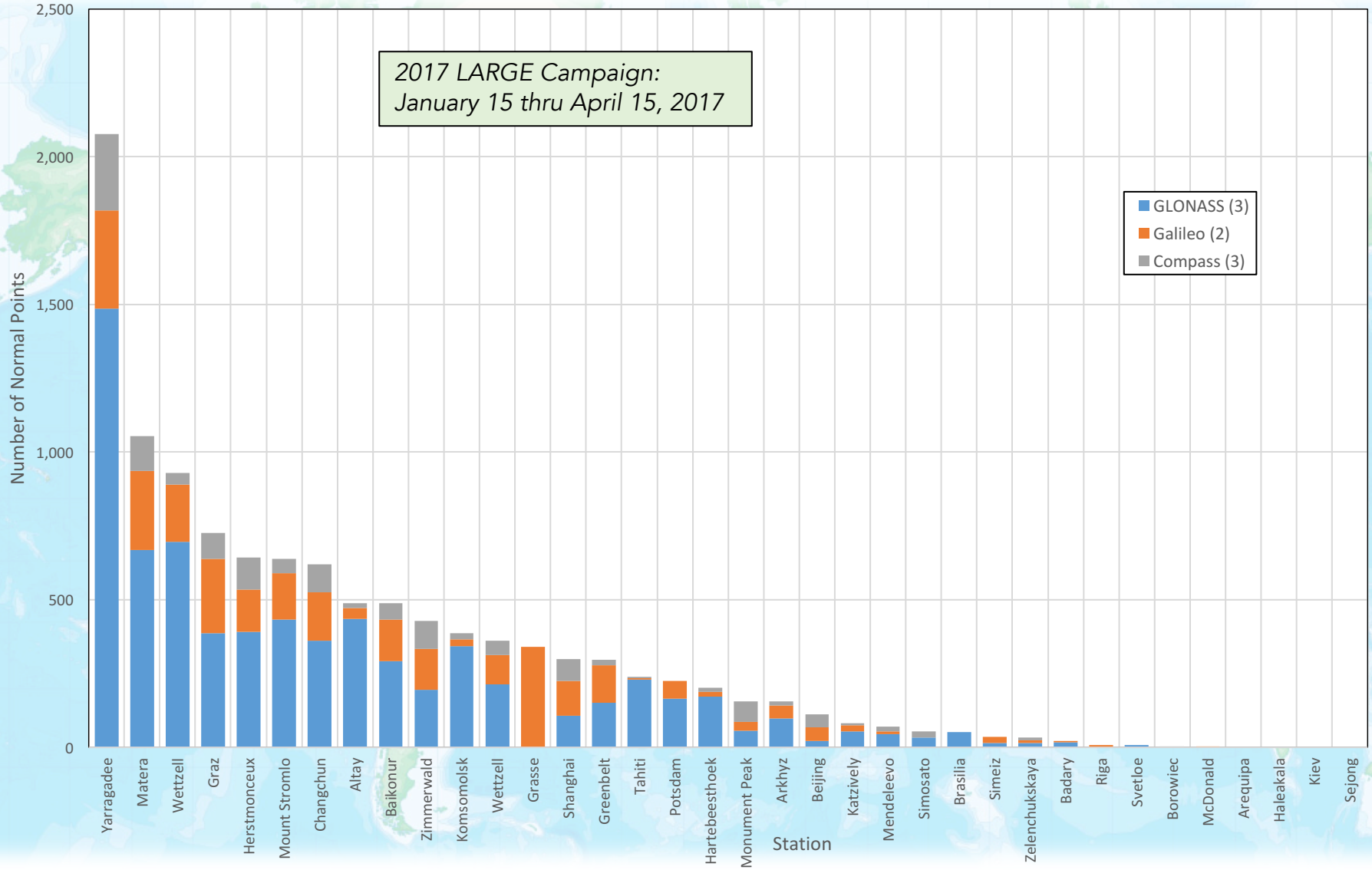
GNSS pass totals



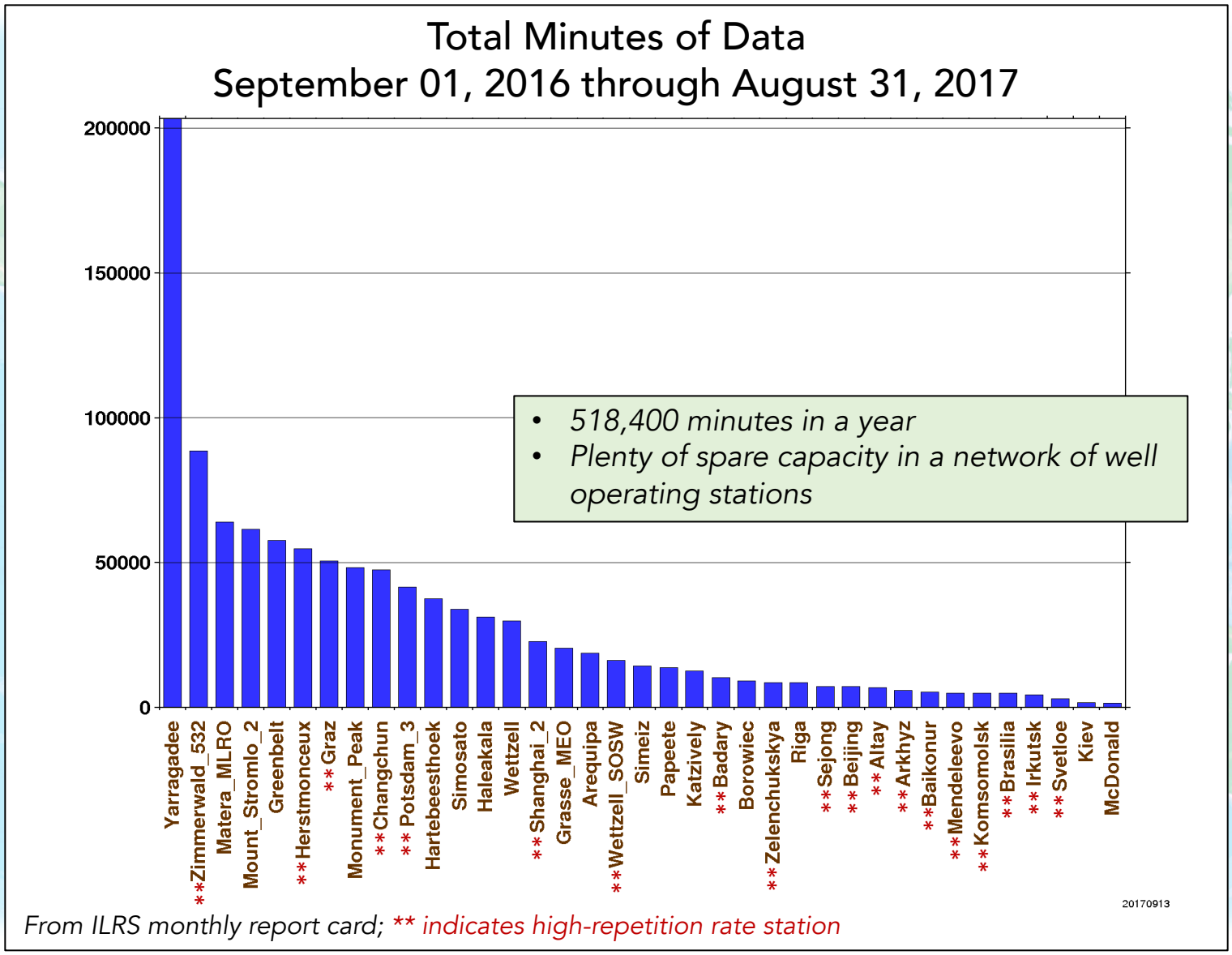
LARGE campaign (passes/pass segments)



LARGE campaign (normal points)



Network performance (2 of 2)



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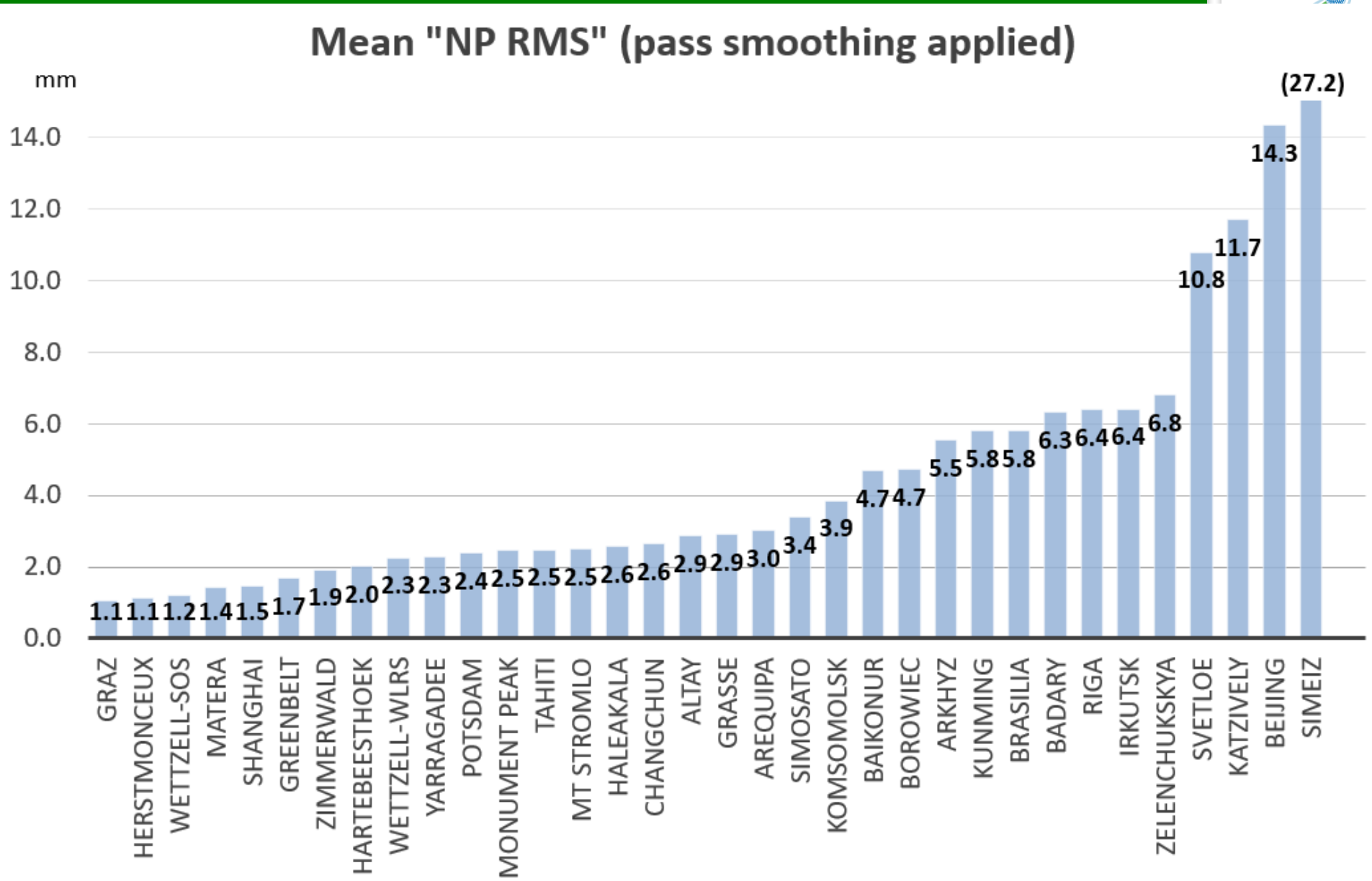
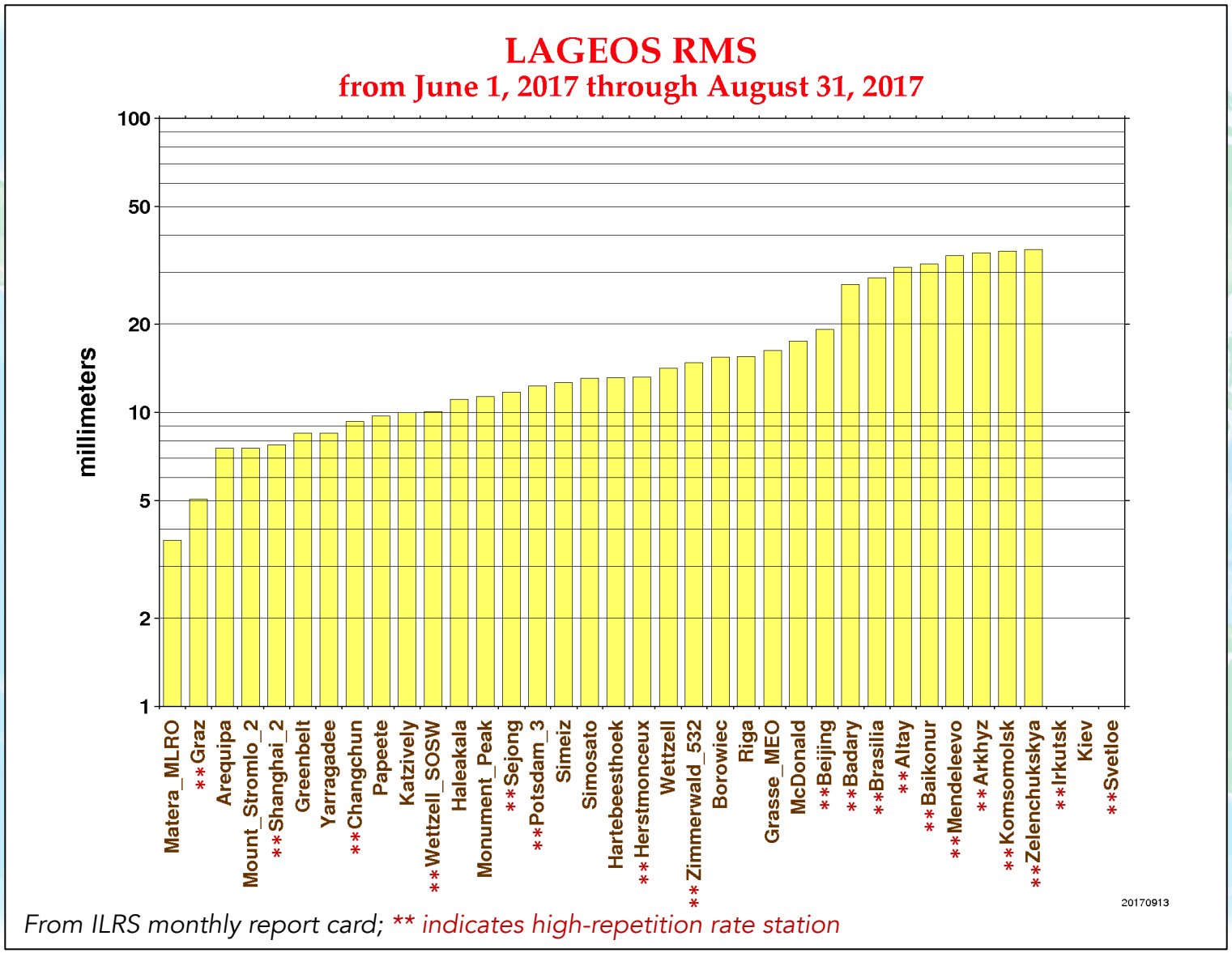


LAGEOS-1 & -2. July 2016 to June 2017.

A simple smoothing function (RB only or RB+TB) are applied to see the scatter of each NP.

Average single-shot LAGEOS RMS



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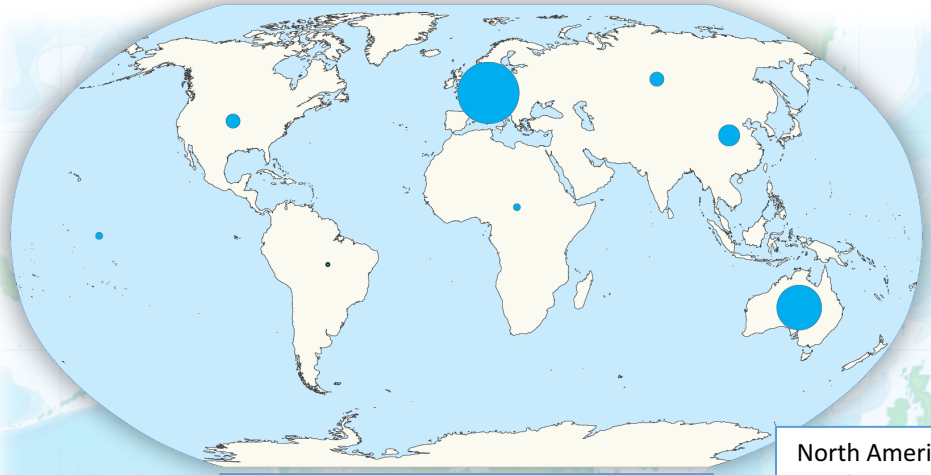
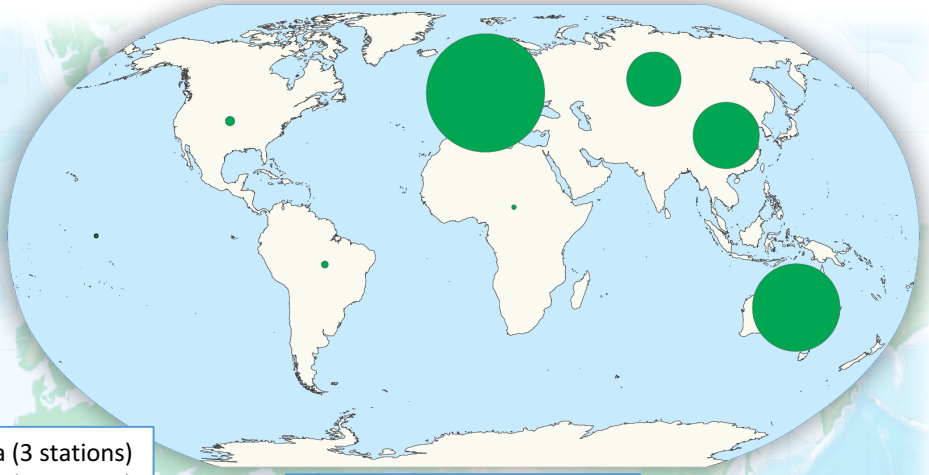
Satellite tracking by region

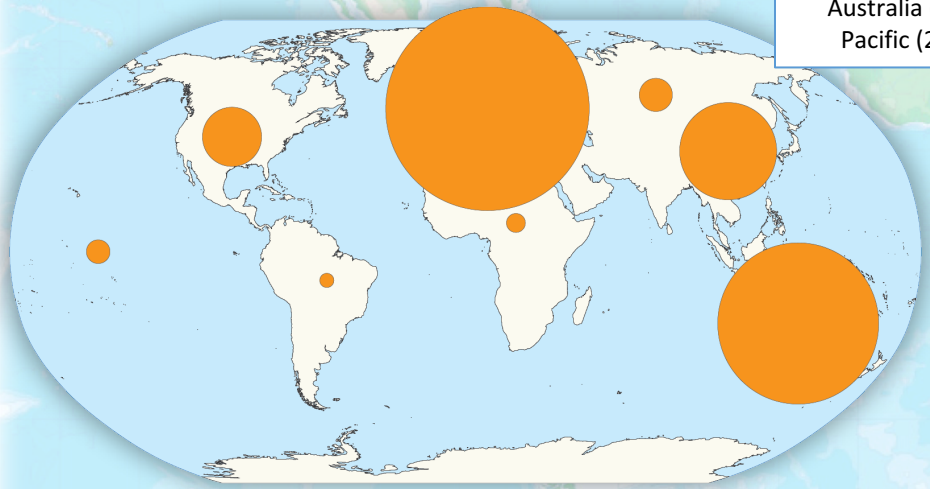


Reference Frame (5 satellites)

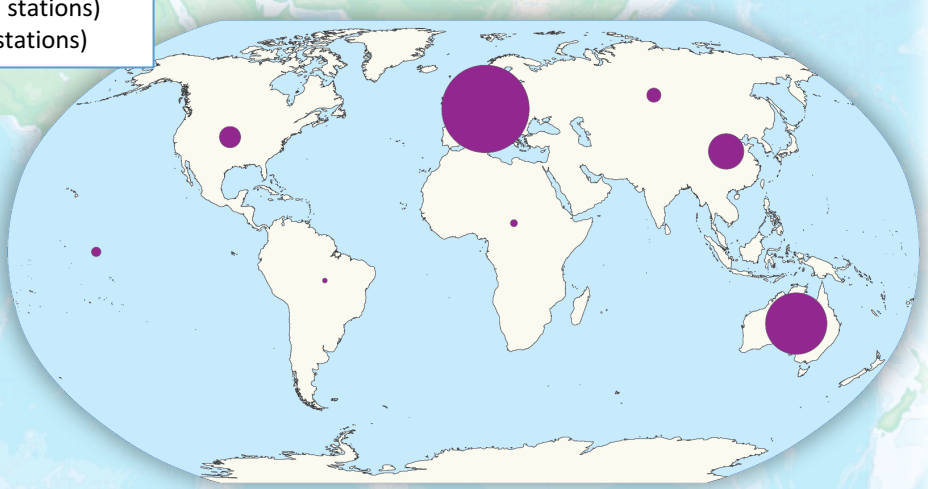


GNSS (30+ satellites)

North America (3 stations)
South America (2 stations)
Europe (13 stations)
Russia (9 stations)
East Asia (5 stations)
Australia (2 stations)
Pacific (2 stations)



LEO (10 satellites)



Altimeter (6 satellites)

Some observations

- Less than half of the stations are meeting or coming close to the 3500 pass target;
- Less than half of of the stations are meeting or coming close to the 600 pass level for the Reference Frame Satellites;
- Less than half the stations are averaging more that a pass per day on the altimeter satellites.

- We need to focus on how we can increase data yield