

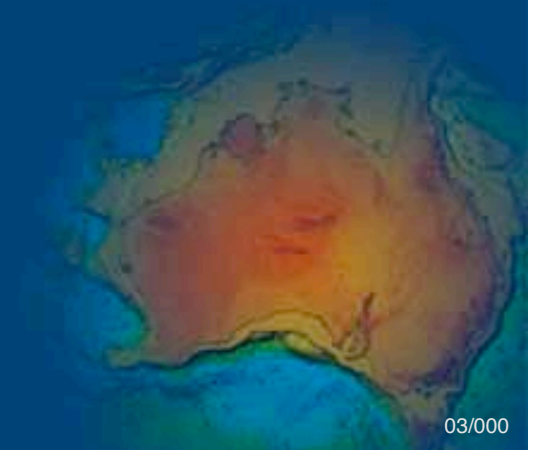


Australian Government
Geoscience Australia

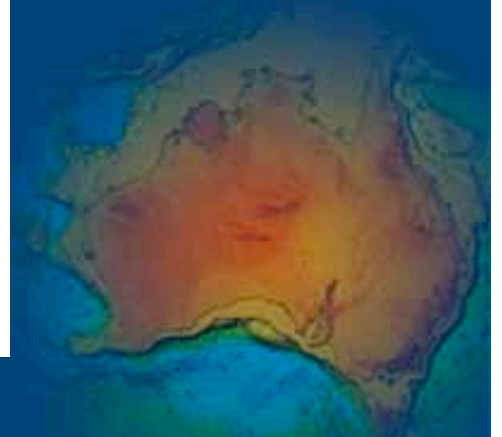
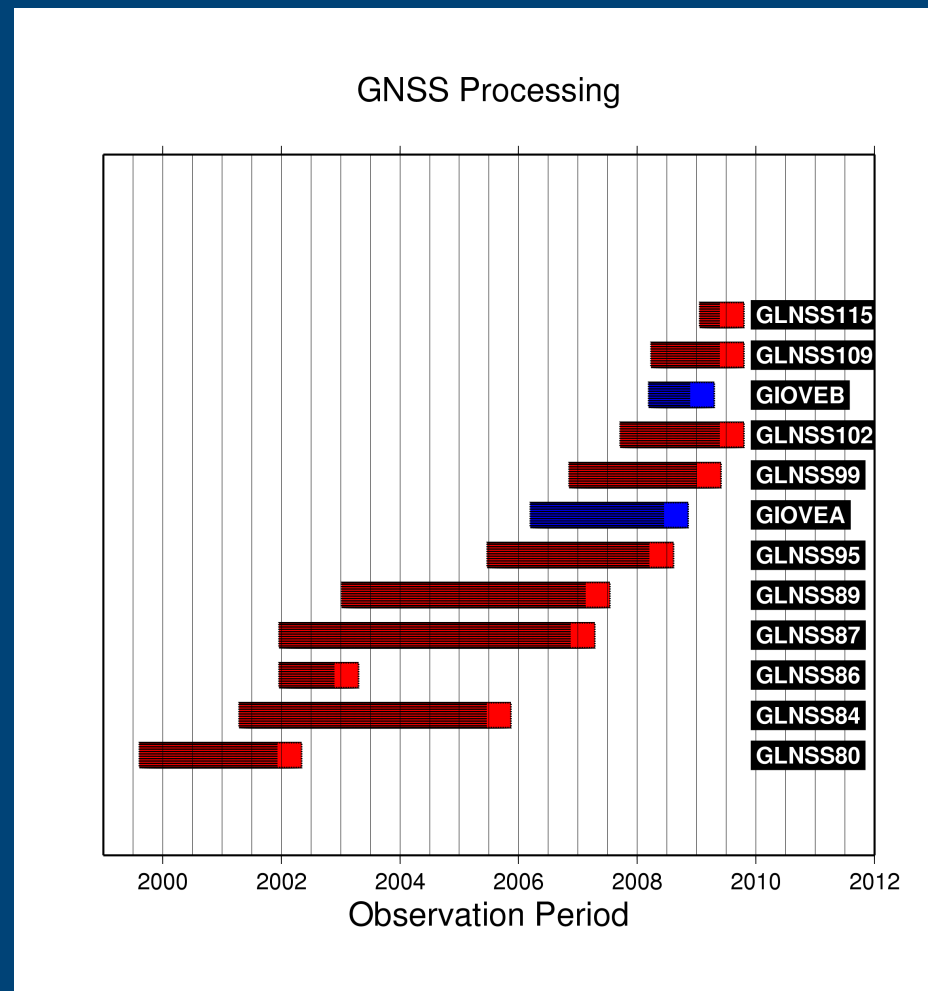
An Assessment of the Value of SLR Observations to GNSS

Ramesh GOVIND

**ILRS Workshop on SLR Tracking of GNSS
Constellations, 14th – 18th September 2009,
Metsovo, Greece.**

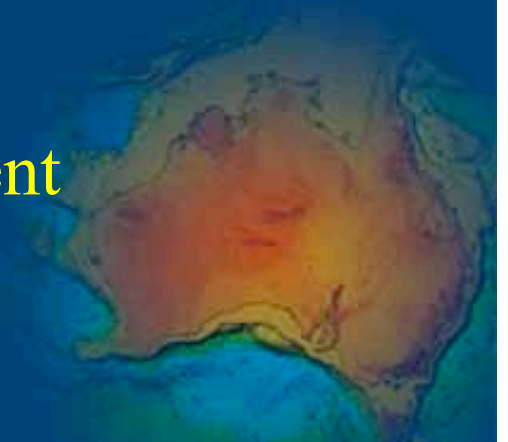


Inventory of GNSS Data Processed 9910 -- 0908



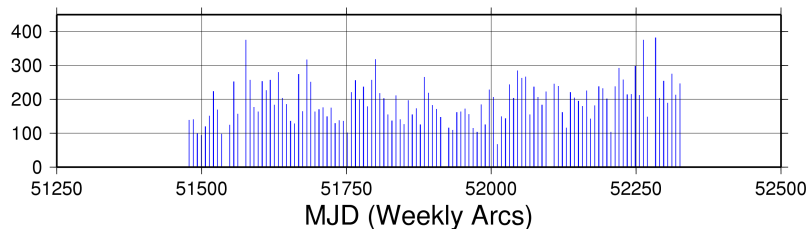
Assessment Measures

- Orbit Quality –
 - WRMS of Fit
 - SRP Scale -- consistency
- SLR Products -- Benchmark solution
 - GA ITRF2008 submission + 2009 Weekly solutions
 - Geocentre from degree one coefficients
 - XPOLE, YPOLE, LOD
 - Minimally Constrained
- Single Number Description of Assessment



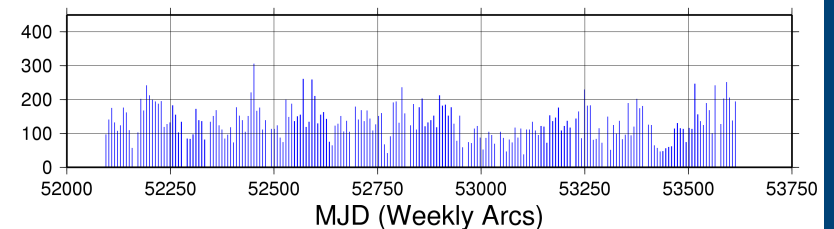
Number of Observations per satellite – per 7-day arc

GLONASS-80



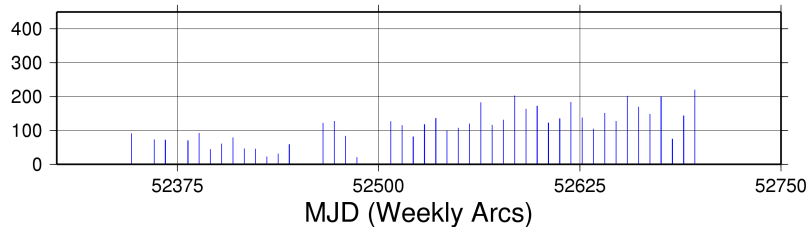
Median = 185

GLONASS-84



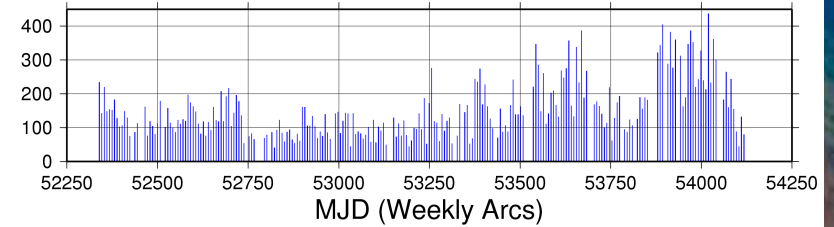
Median = 105

GLONASS-86



Median = 117

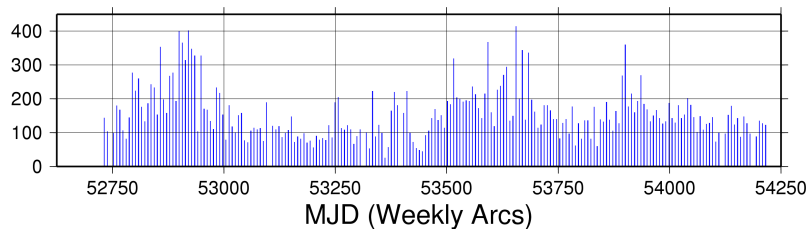
GLONASS-87



Median = 130

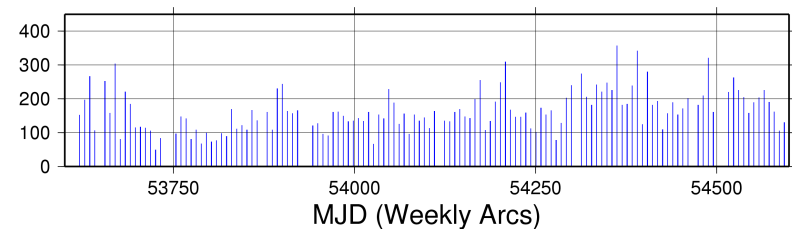
Number of Observations per satellite – per 7-day arc

GLONASS-89



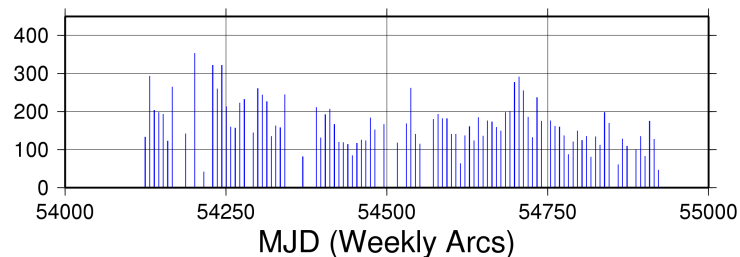
Median = 142

GLONASS-95



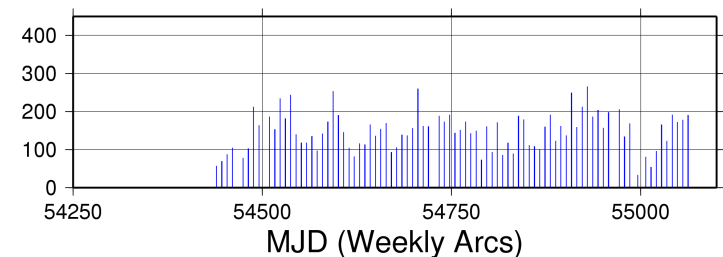
Median = 157

GLONASS-99



Median = 160

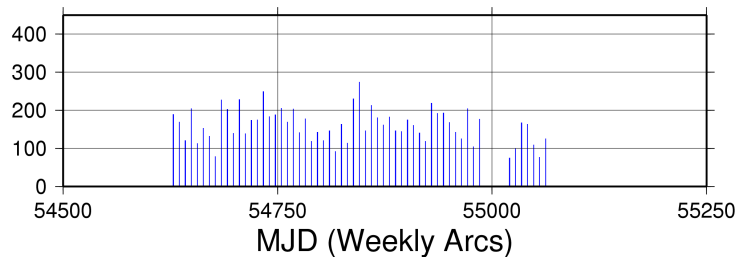
GLONASS-102



Median = 152

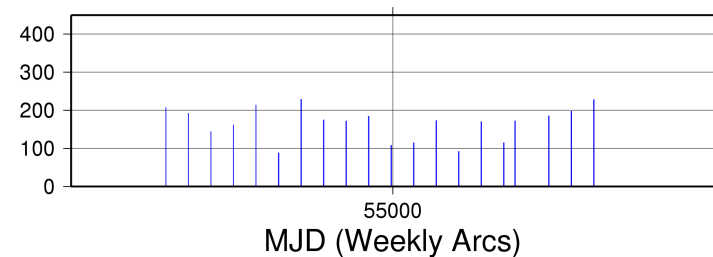
Number of Observations per satellite – per 7-day arc

GLONASS-109



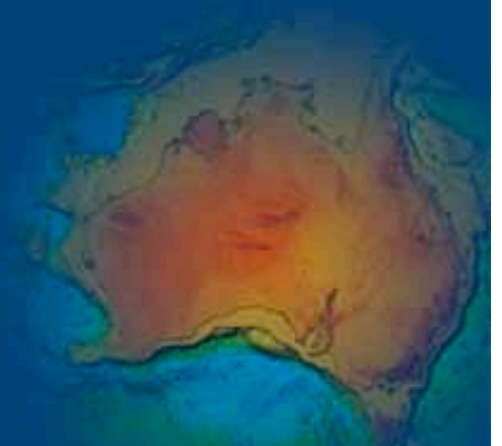
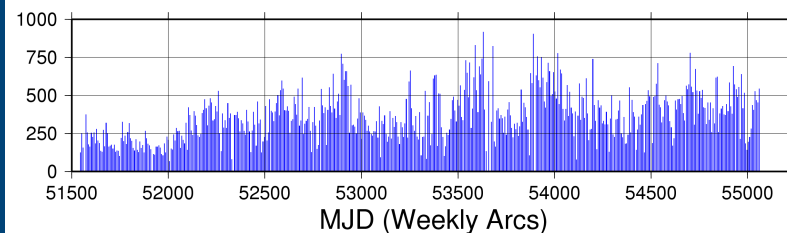
Median = 163

GLONASS-115



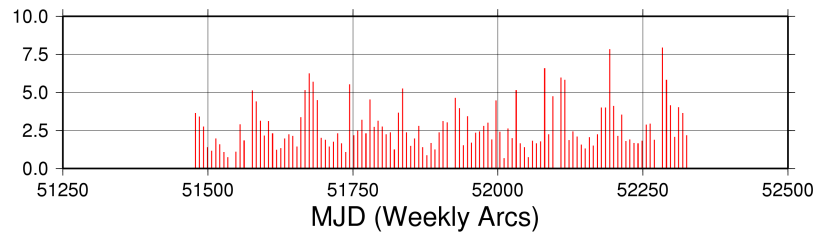
Median = 170

GLONASS TOTAL PER ARC



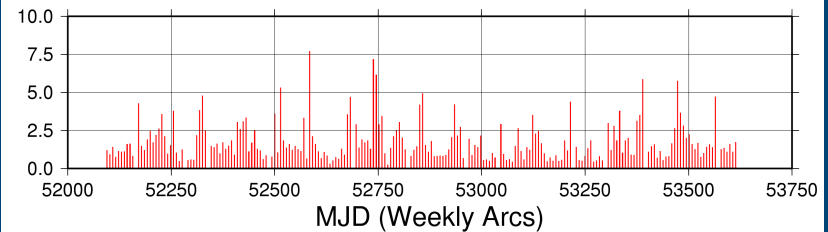
POD Results: RMS of Orbit Fit (cm)

GLONASS-80



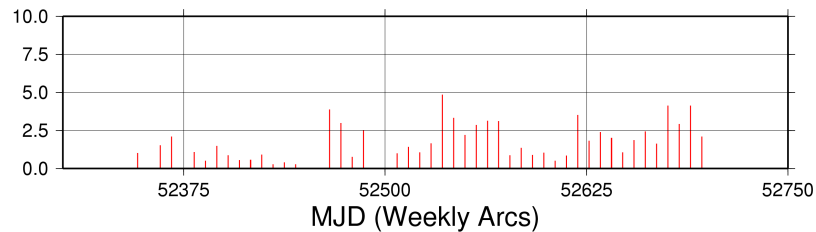
Mean WRMS = 2.74

GLONASS-84



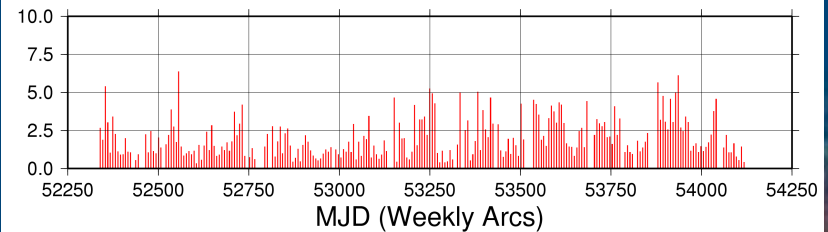
Mean WRMS = 1.75

GLONASS-86



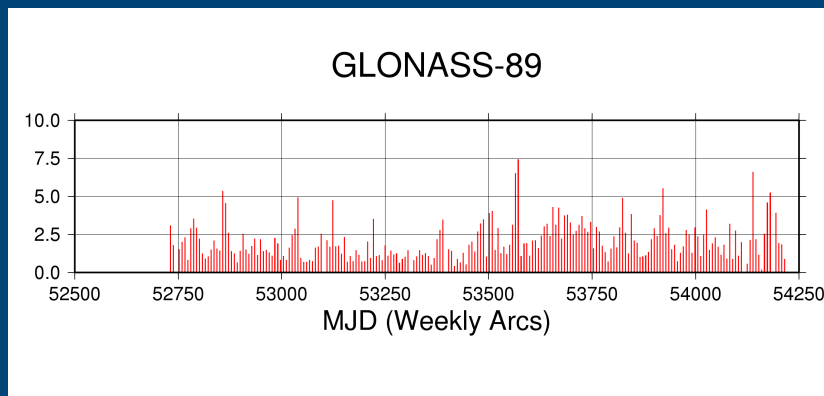
Mean WRMS = 1.79

GLONASS-87

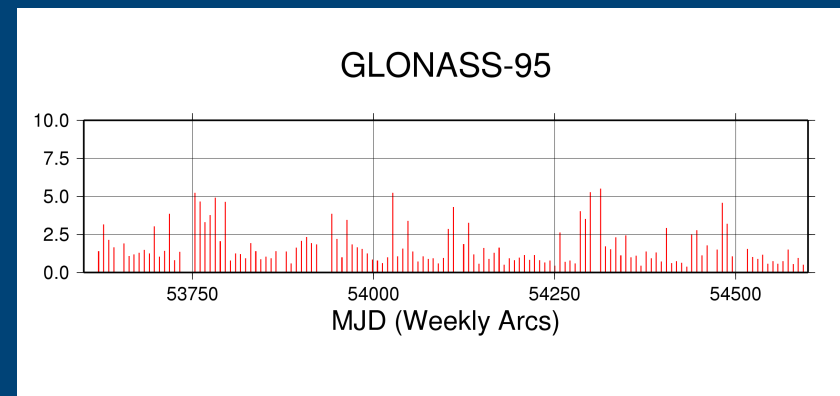


Mean WRMS = 2.00

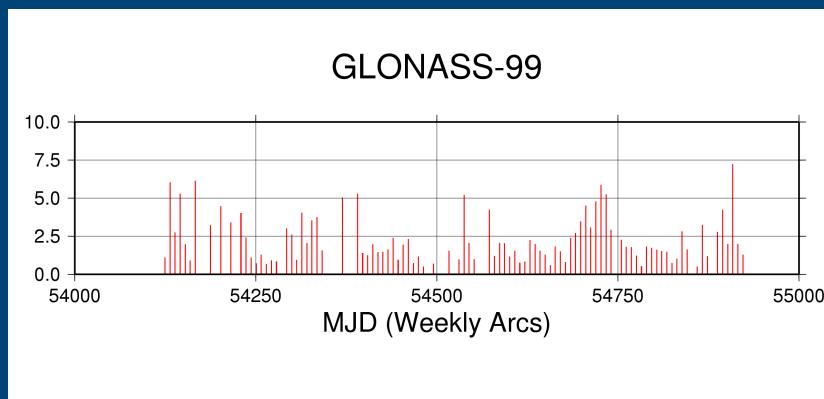
POD Results: RMS of Orbit Fit



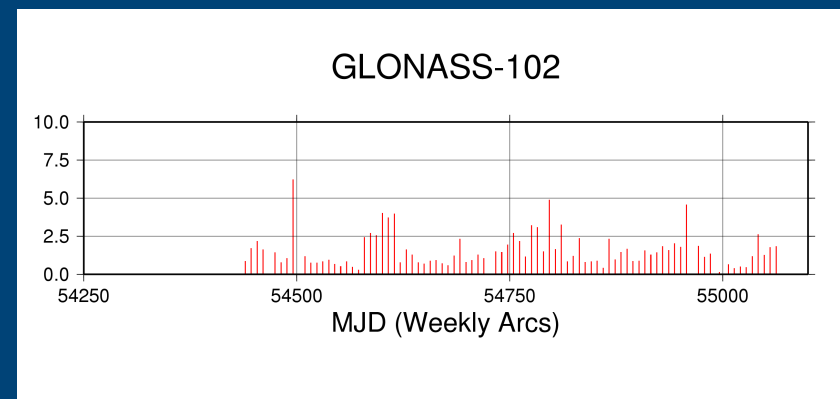
Mean WRMS = 2.04



Mean WRMS = 1.68



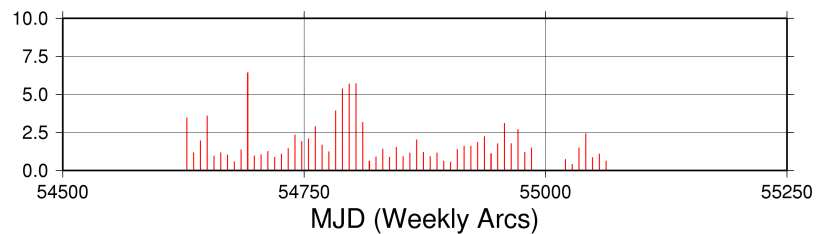
Mean WRMS = 2.26



Mean WRMS = 1.55

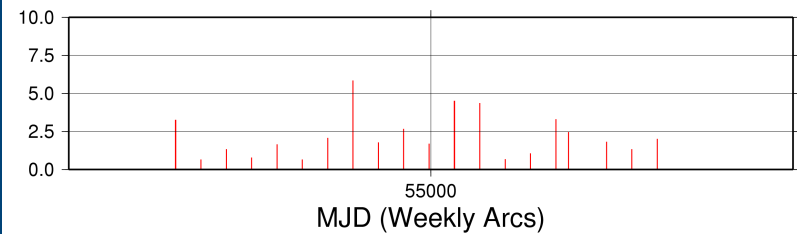
POD Results: RMS of Orbit Fit

GLONASS-109



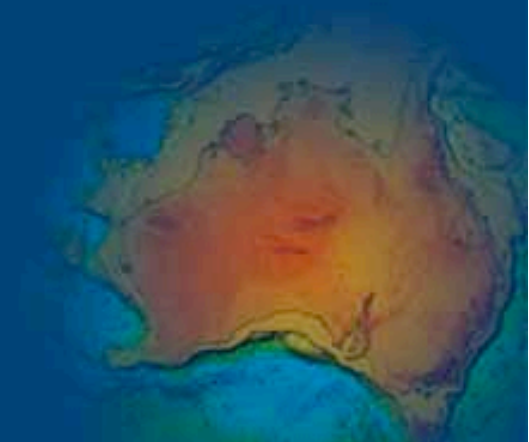
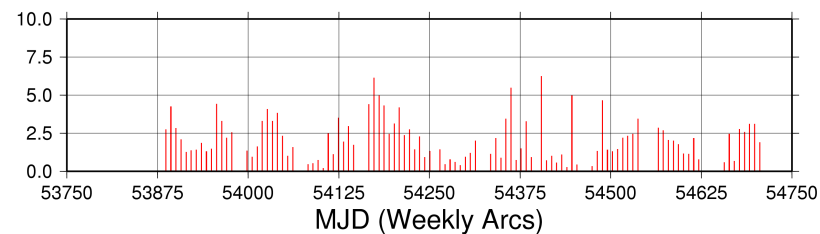
Mean WRMS = 1.81

GLONASS-115



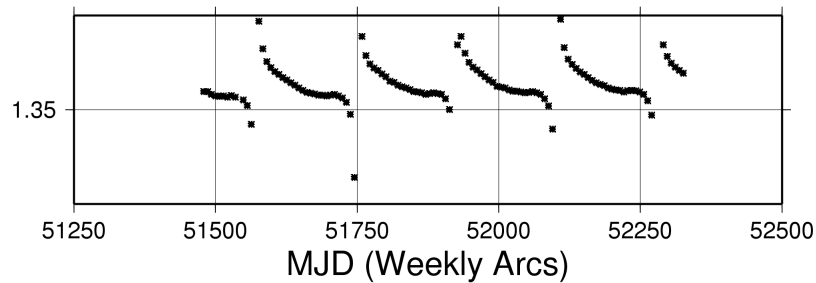
Mean WRMS = 2.17

GIOVEA

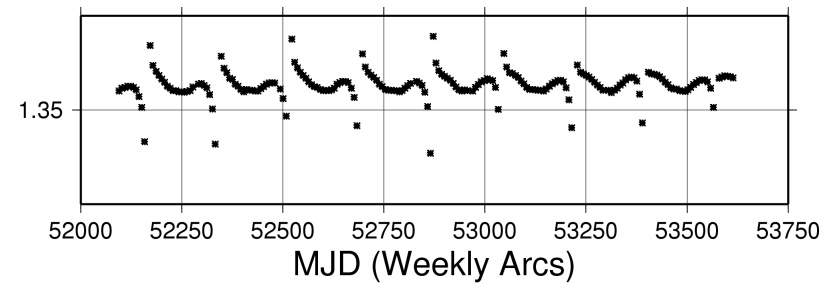


POD Results: SRP Scale Factor

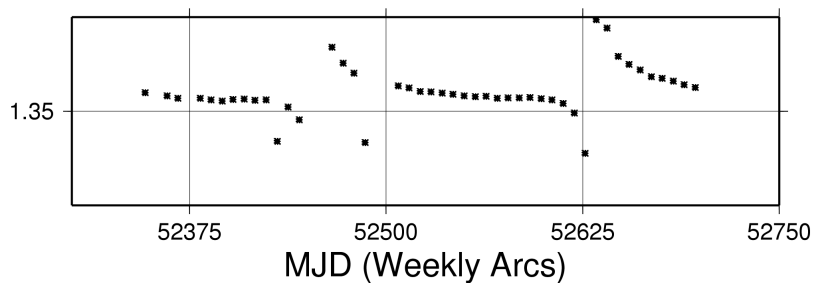
GLONASS-80



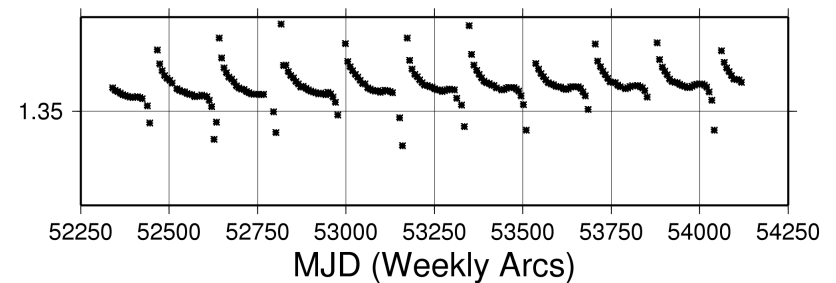
GLONASS-84



GLONASS-86

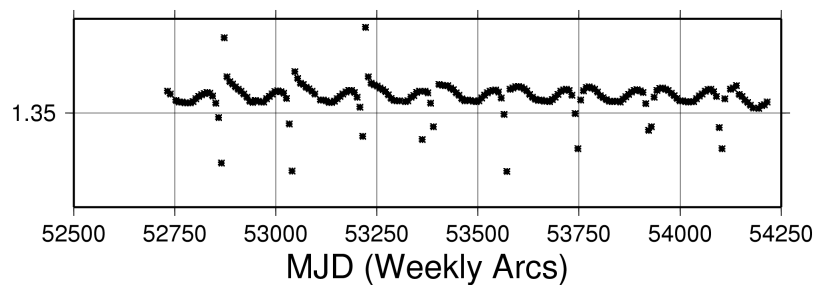


GLONASS-87

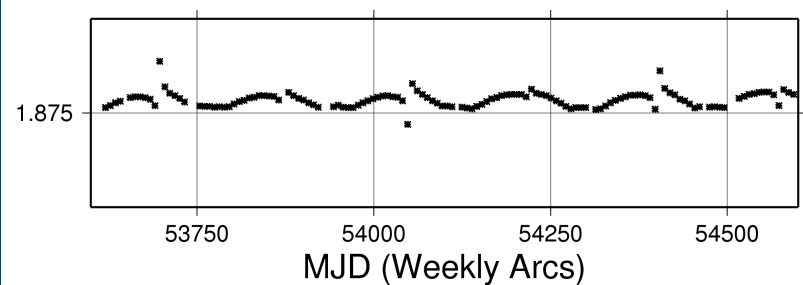


POD Results: SRP Scale Factor

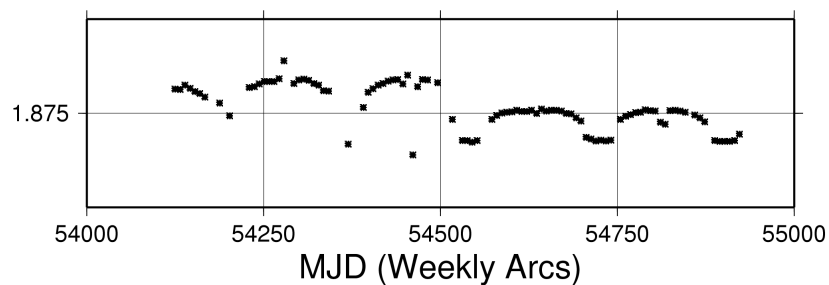
GLONASS-89



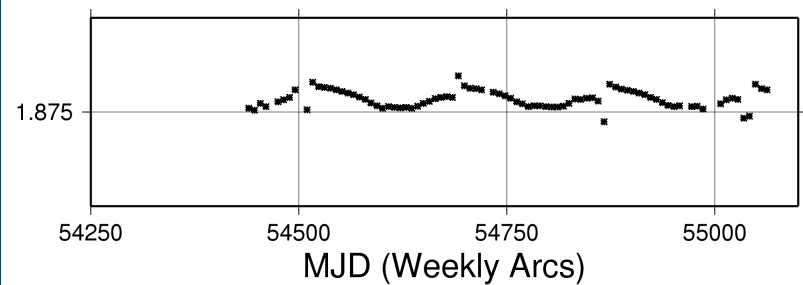
GLONASS-95



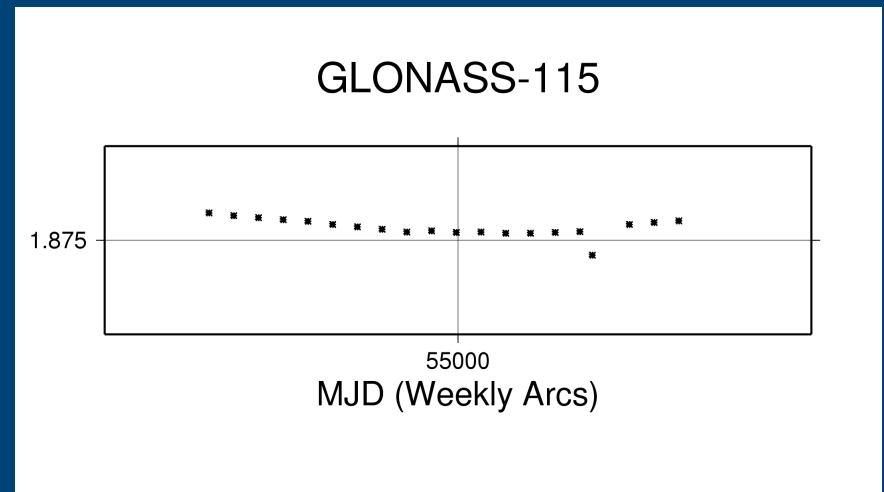
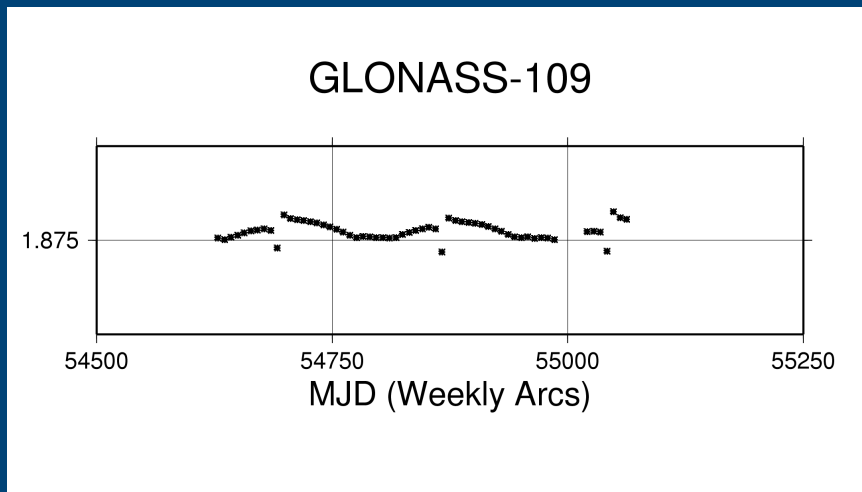
GLONASS-99



GLONASS-102



POD Results: SRP Scale Factor



SRP Scale Factor

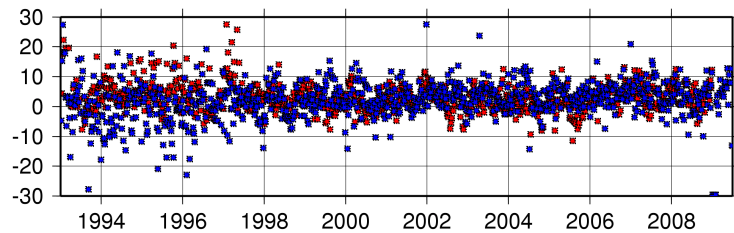
1.3 for GLONASS 80 – 89; 1.8 for GLONASS 95-115

Two Different Spacecraft – Mass, Surface Area, SRP Model ?

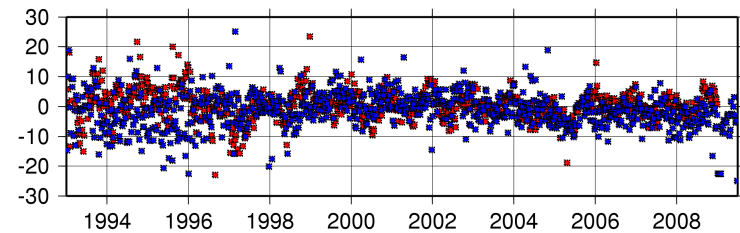
Slow Attitude change, Changing Orientation of Solar Panels ?

180-day Jumps ?

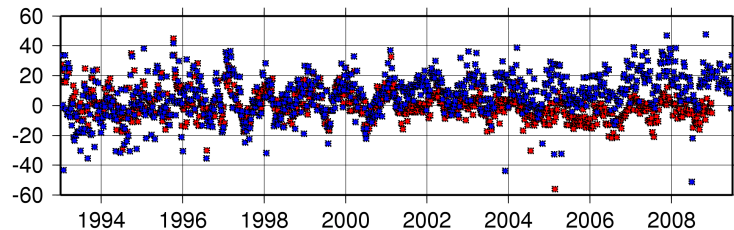
Results: COM Benchmark Solution



X-Geocentre (mm)



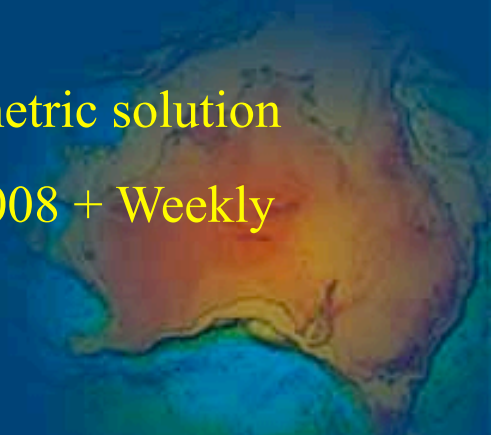
Y-Geocentre (mm)



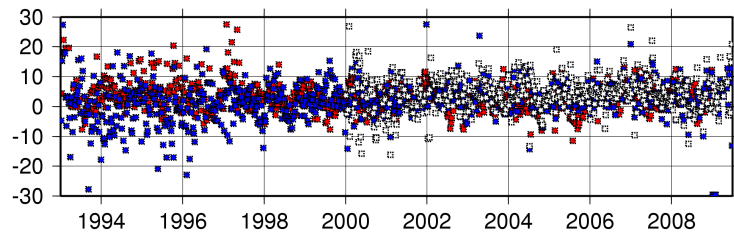
Z-Geocentre (mm)

Blue = GA gravimetric solution

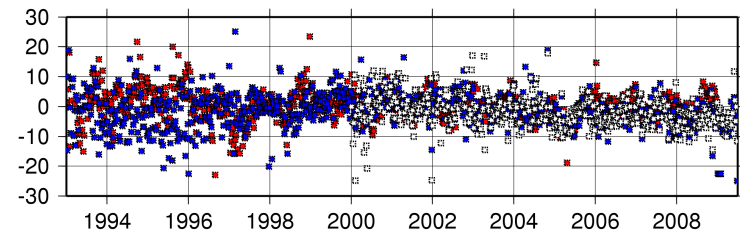
Red = GA ITRF2008 + Weekly



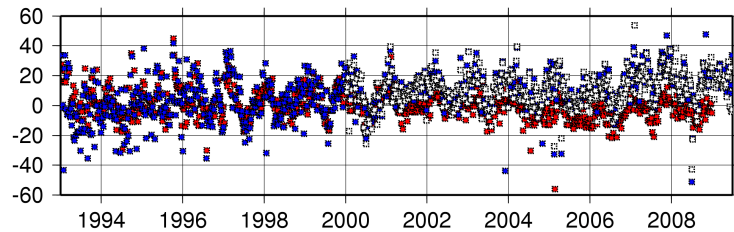
LAGET + GLNSS Geocentre



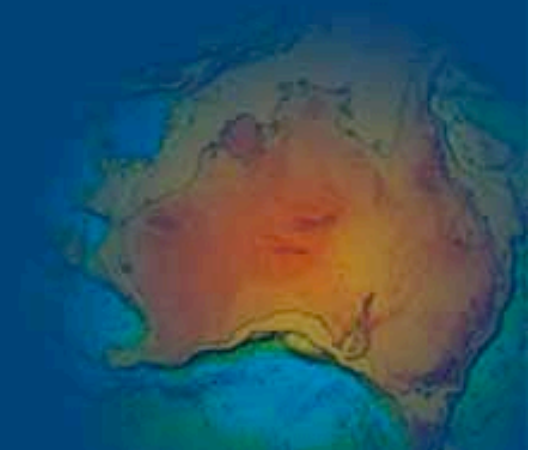
X-Geocentre (mm)



Y-Geocentre (mm)



Z-Geocentre (mm)



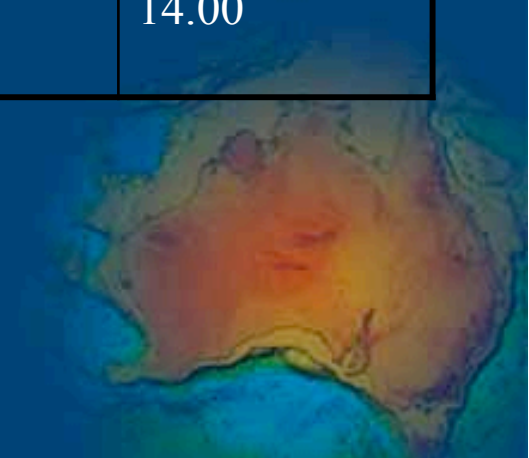
Assessment of CoM

LAGET+GLNSS

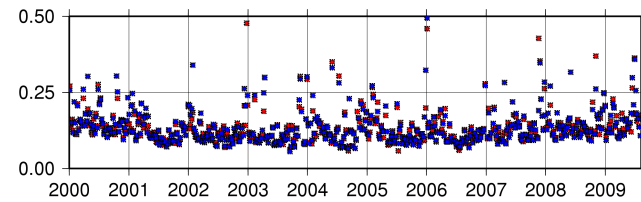
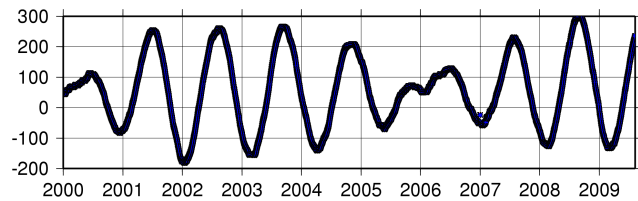
	Mean of Uncertainty	RMS of Uncertainty
X-com	2.01	9.92
Y-com	2.06	11.36
Z-com	3.97	14.46

LAGET

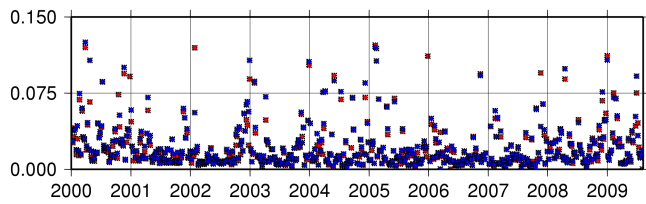
	Mean of Uncertainty	RMS of Uncertainty
X-com	2.02	9.20
Y-com	2.01	8.84
Z-com	3.54	14.00



XPOLE

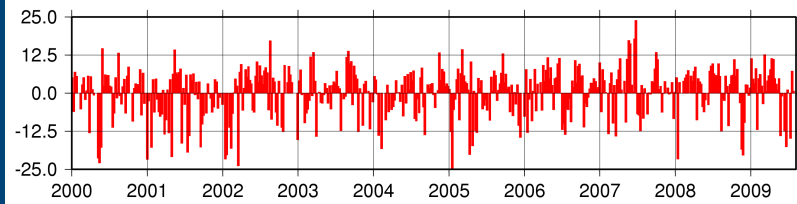


Mean uncertainty per arc



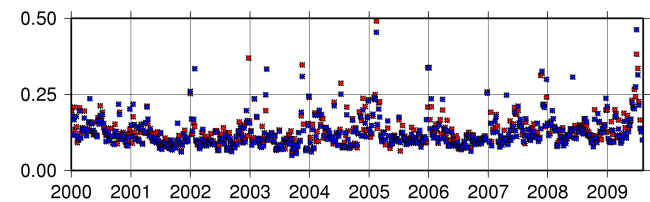
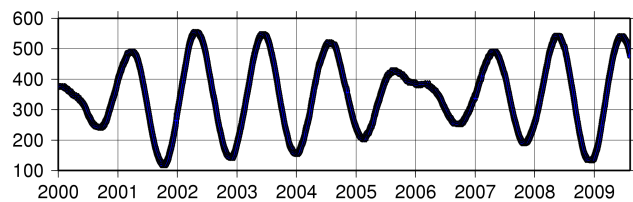
RMS of uncertainty per arc

+VE = improvement

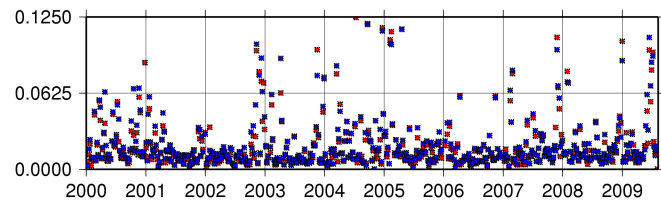


%difference in uncertainty

YPOLE

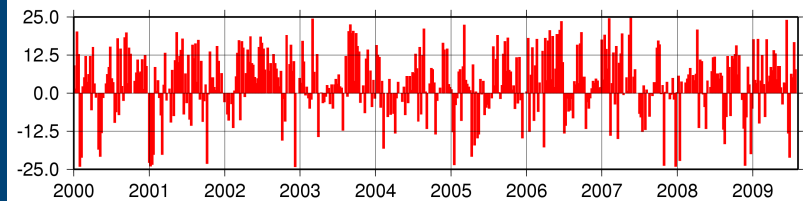


Mean uncertainty per arc



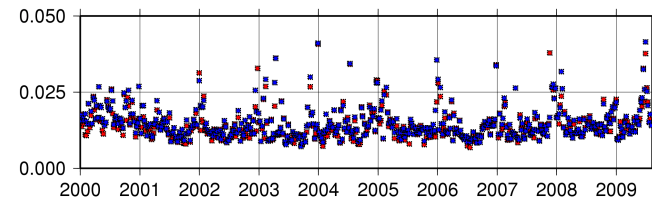
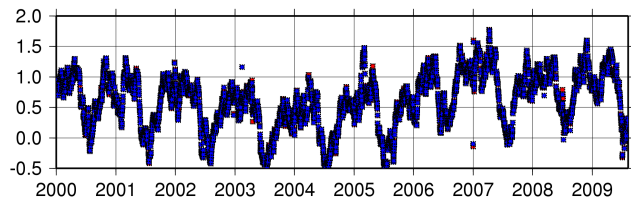
RMS of uncertainty per arc

+VE = improvement

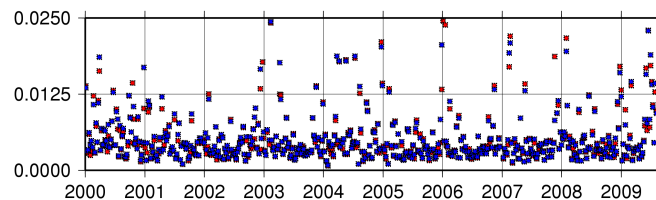


%difference in uncertainty

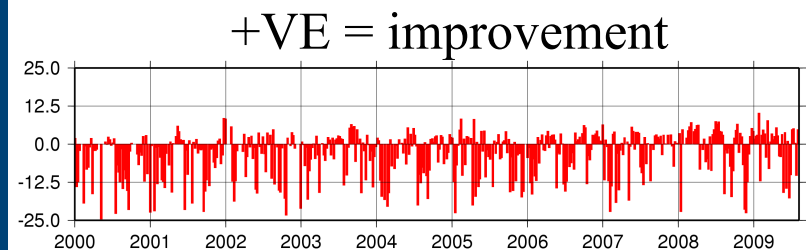
LOD: LARET vs. LARET+GLNSS



Mean uncertainty per arc



RMS of uncertainty per arc



%difference in uncertainty

Assessment: 10% improvement

Arc 021027

GLNSS-84	118	8
GLNSS-86	131	9
GLNSS-87	119	8

Arc 060924

GLNSS-87	240	13
GLNSS-89	142	8
GLNSS-95	143	11

GLNSS-99	150	10
GLNSS-10 2	106	8
GLNSS-10 9	79	5

Arc 080727

