Results from ILRS
GNSS Tracking Campaigns

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ILRS Network Participation
Campaigns 1, 2, 3
Weekly GNSS Tracking by Campaign Constellation

- All GLONASS
- 6 GLONASS (Campaign 2)
- 6 GLONASS (Campaign 3)
- All Galileo
- 4/5 Galileo (Campaign 2)
- 4 Galileo (Campaign 3)
- Compass-M1
Campaign 1 Summary
August 01 – September 30, 2014 (2 months/8 weeks/61 days)

• Instructions:
  - Track all GNSS satellites on current ILRS priority list (18 satellites); can track more if able (total of 33 satellites available, 24 GLONASS/5 Galileo/4 Beidou)
  - Acquire three sets of two normal points distributed over that transit of each satellite; normal point includes 1000 FR points or last 5 minutes, whichever is shorter; no need to obtain more than 1000 FR points
  - Cycle through all of the GNSS satellites (GLONASS, Galileo, and Beidou); and track the full cycle at least three times per week
  - Attempt some daytime passes if conditions are favorable

• Conclusions:
  - Number of stations tracked all of the satellites
  - Few stations tracked a thousand or more pass segments and a few thousand normal points
  - Several stations averaged 2 – 4 passes a week on all of the satellites
  - Largest data yield was achieved by the Yarragadee site
  - Increased GNSS tracking did not appear to noticeably reduce LAGEOS and LEO data yield
  - Few stations got more than one segment per pass
  - Small amount of data in daylight
Campaign 1
August 01 – September 30, 2014 (2 months/8 weeks/61 days)

\[ N = \text{Average number GNSS pass segments per satellites per week} \]
Campaign 1
August 01 – September 30, 2014 (2 months/8 weeks/61 days)
Campaign 2 Summary
November 22, 2014 – February 28, 2015 (3 months/14 weeks/99 days)

- Instructions:
  - Track six GLONASS only: GLONASS-123, -125, -129, -130, -131, and -132 (first priority)
  - Track Beidou and Galileo as second priority
  - Tracking remaining GLONASS satellites as third priority
  - At minimum, stations obtain three segments along each pass, with three NPTs in each segment
  - Include daylight data, even if it is just a couple of hours after sunrise and a couple of hours before sunset

- Conclusions:
  - Some stations obtained 2 and 3 segments and daylight data on some passes
  - Need more sectors covered for the six higher priority GLONASS satellites and Galileo and M class Compass satellites. More important to get 2 and 3 sectors of data in the higher priority GLONASS satellites than to track the lower priority GLONASS satellites
  - Need more data in daylight, or at least around sunrise and sunset
Campaign 2
November 22, 2014 – February 28, 2015 (3 months/14 weeks/99 days)

N = Average number GNSS pass segments per satellites per week

Number of Pass Segments vs Number of Satellites

Campaign 2 Graph

- Yarragadee
- Changchun
- Mt. Stromlo

Each point represents a city or location, with the number of pass segments and satellites shown.

N=1
N=2
N=3
N=4

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Campaign 2
November 22, 2014 – February 28, 2015 (3 months/14 weeks/99 days)
Percentage of the passes tracked that included one, two, and three segments for GLONASS.
Campaign 2: Pass Distribution Analysis

**7090 YARL Glonass**
- BME, 26, 7.88%
- ME, 46, 13.94%
- BE, 12, 3.64%
- BM, 54, 16.36%
- E, 30, 9.09%
- B, 31, 9.39%
- M, 131, 39.7%

**7237 CHAL Glonass**
- BME, 5, 1.4%
- ME, 11, 3.08%
- BE, 6, 1.68%
- BM, 24, 6.72%
- E, 13, 3.64%
- M, 161, 45.1%
- B, 137, 38.38%

**1879 ALTL Glonass**
- BME, 22, 12.87%
- ME, 21, 12.28%
- BE, 14, 8.19%
- BM, 35, 20.47%
- E, 5, 2.92%
- B, 40, 23.39%
- M, 34, 19.88%

**7839 GRZL Glonass**
- BME, 10, 8.33%
- ME, 15, 12.5%
- BE, 2, 1.67%
- BM, 22, 18.33%
- E, 7, 5.83%
- B, 11, 9.17%
- M, 53, 44.17%

Percentage of the pass segments distributed within pass (B-beginning, M-middle, E-end)
Campaign 3 Summary
August 20 – October 16, 2015 (2 months/8 weeks/58 days)

• Instructions:
  – Track six GLONASS only: GLONASS-123, -125, -128, -129, -133, and -134 (first priority)
  – Track Compass-M3 and Galileo-101, -102, -103, and -104 (second priority)
  – Tracking remaining GLONASS satellites as third priority but less important
  – Obtain nine NPTs over the pass;
    • 3 during the ascending or early region of the pass
    • 3 in the central region of the pass
    • 3 in the descending or late region of the pass
  – NPTs in each region may be taken together of separately whichever is better for your operation
  – Obtain more daylight ranging even if it is around sunrise and sunset

• Conclusions:
  – TBD, but
  – High data yields can be expected when conditions are very good
  – Need more data in daylight, or at least around sunrise and sunset
  – May have same issues as with previous campaigns
Campaign 3
August 20 – October 16, 2015 (2 months/8 weeks/58 days)

- Yarragadee
- Changchun
- Mount Stromlo
- Matera
- Wettzell
- Zimmerwald
- Monument Peak
- Herstmonceux
- Greenbelt
- Irkutsk
- Graz
- Arkhyz
- Brasilia
- Altay
- Shanghai
- Baikonur
- Komsomolsk
- Svetloe
- Tahiti
- Zelenchukskaya

Number of Pass Segments

- Compass Segments (1 satellite)
- Galileo Segments (4 satellites)
- GLONASS Segments (6 satellites)
It appears that a GNSS campaign yields more data for both GNSS and LAGEOS. This trend is consistent for all three GNSS campaigns.