

Multi GNSS Monitoring System

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РОСКОСМОС





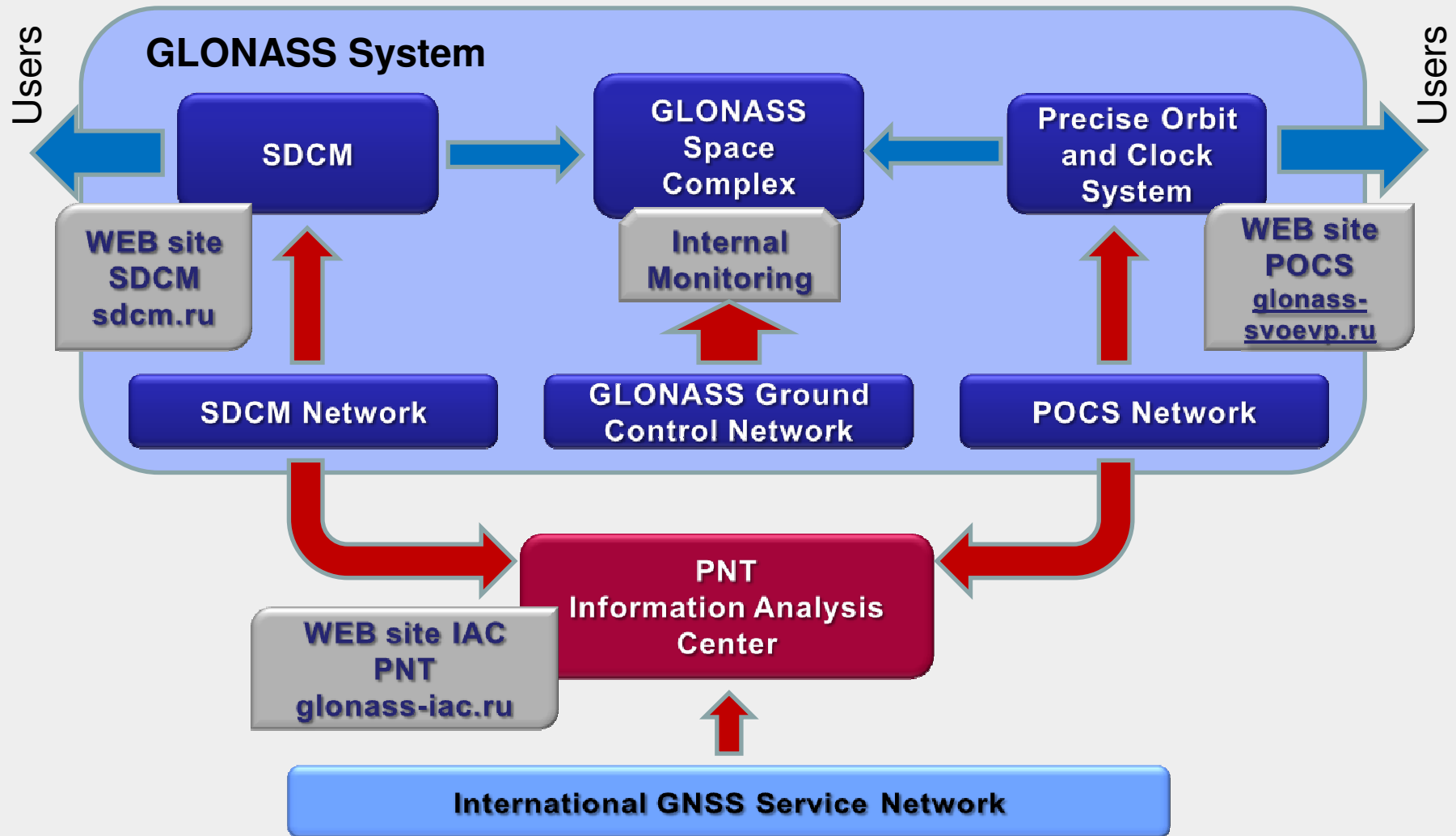
Content



- GNSS Monitoring in Russia
- International Multi GNSS Monitoring System approach



GNSS Performance Monitoring Structure in Russia



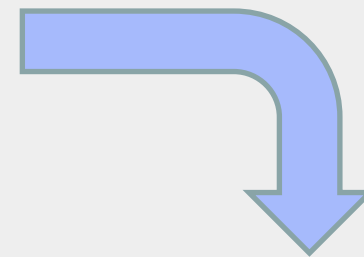
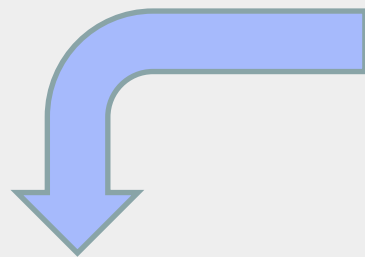


IAC PNT web-site structure



www.glonass-center.ru (www.glonass-iac.ru)

The screenshot shows the main page of the IAC website. It includes a navigation menu with links for Home, GLOMANS SCC, GLOMANS, GPS, News, Archive, Guide, Feedback, and About IAC. The main content area features a 'SC operability' section with a bar chart, a 'GNSS status' section with a summary table, and a 'GNSS news' section with a list of recent updates. A world map and a 'Positioning precision' graph are also visible.



This screenshot displays the 'News' section. The main article is titled 'The Northern Sea Route 2011 experiment' and includes a map showing the shipping route across the Arctic region. The text describes the experiment's goals and the use of GLONASS and GPS navigation equipment.

News

This screenshot shows the 'GNSS Status' section, which provides a detailed table of satellite health and navigation messages. The table includes columns for satellite ID, orbit type, launch date, operation start/end, and health status.

ID	Orbit	Launch	Operation start	Operation end	Life span (months)	Satellite health status	Comments		
1	L1	10	14.12.09	20.12.10	20.7	+	01.09.20.11.11 In operation		
2	L1	4	7.08	15.12.08	20.01.09	32.4	+	03.02.06.20.11.11 In operation	
3	L1	4	7.03	15.12.08	03.04.07	56.8	+	01.01.06.20.11.11 In operation	
4	L1	6	7.01	26.02.10	01.10.11	6.3	-	01.01.06.20.11.11 Flight Test	
5	L1	01	7.04	14.12.09	20.01.10	20.7	+	01.09.20.11.11 In operation	
6	L1	4	7.03	14.12.09	24.01.10	20.7	+	01.09.20.11.11 In operation	
7	L1	05	7.02	26.12.04	07.10.05	85.4	+	02.04.06.20.11.11 In operation	
8	L1	06	7.09	15.12.08	12.02.09	32.4	+	01.09.20.11.11 In operation	
9	L2	2	7.06	02.09.10	04.10.10	12.1	+	01.09.20.11.11 In operation	
10	L2	2	7.07	15.12.08	03.04.07	56.4	+	01.09.20.11.11 In operation	
11	L2	00	7.03	15.12.07	22.01.08	44.4	+	03.02.06.20.11.11 In operation	
12	L2	00	7.07	02.09.09	02.09.10	12.0	-	03.02.06.20.11.11 Maintenance	
13	L2	2	7.01	15.12.07	08.02.08	44.4	+	01.09.20.11.11 In operation	
14	L2	1	7.02	25.12.07	25.12.08	44.4	+	01.09.20.11.11 In operation	
15	L2	00	7.06	15.12.06	12.10.07	56.4	+	01.09.20.11.11 In operation	
16	L2	2	7.08	02.09.10	11.10.10	12.1	+	01.09.20.11.11 In operation	
17	L2	04	7.04	15.12.06	11.06.06	46.4	+	01.09.20.11.11 In operation	
18	L2	3	7.04	20.09.08	26.10.08	35.4	+	03.02.06.20.11.11 In operation	
19	L2	00	7.09	14.12.07	12.11.07	46.4	+	01.09.20.11.11 In operation	
20	L2	02	7.09	26.10.07	27.11.07	46.4	+	01.09.20.11.11 In operation	
21	L2	04	7.02	15.12.08	15.11.08	35.4	+	01.09.20.11.11 In operation	
22	L2	1	7.01	02.09.10	28.10.10	18.2	+	01.09.20.11.11 In operation	
23	L2	01	7.02	02.09.10	28.10.10	18.2	+	01.09.20.11.11 In operation	
24	L2	02	7.05	02.09.10	28.10.10	18.2	+	01.09.20.11.11 In operation	
25	L2	00	7.07	02.09.08	27.08.09	32.4	+	01.09.20.11.11 In operation	
17	L2	3	7.08	26.10.07	04.12.07	28.11.08	46.4	+	Maintenance
18	L2	3	7.08	26.10.07	04.12.07	28.11.08	46.4	+	Maintenance
22	L2	1	7.06	20.09.08	13.11.08	39.4	+	Maintenance	

GNSS Status

This screenshot displays the 'GNSS Performances' section, featuring a line graph titled 'Многоканальный СИРРЕ КА (ГЛОМАНС, Г)'. The graph shows performance metrics over time, with a y-axis ranging from 0 to 4.5. The x-axis represents time from 15.08.2010 to 15.09.2010.

GNSS Performances



GNSS Performance Estimates



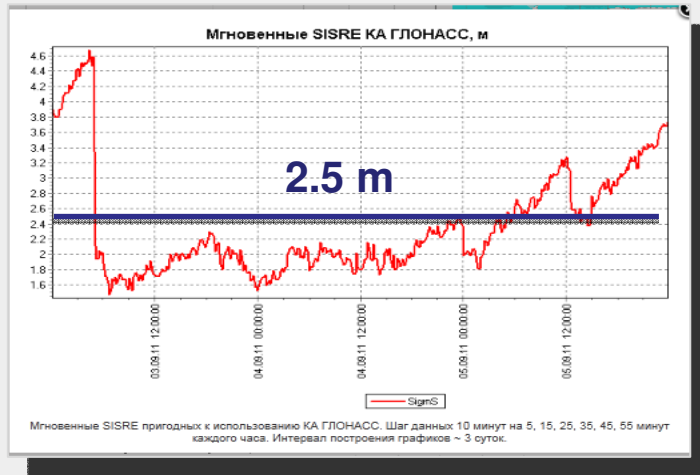
- SIS Accuracy
- User Accuracy
- Availability
- Orbit accuracy
- Clock accuracy and stability
- Time scale difference estimates
- Geodesy reference difference estimates



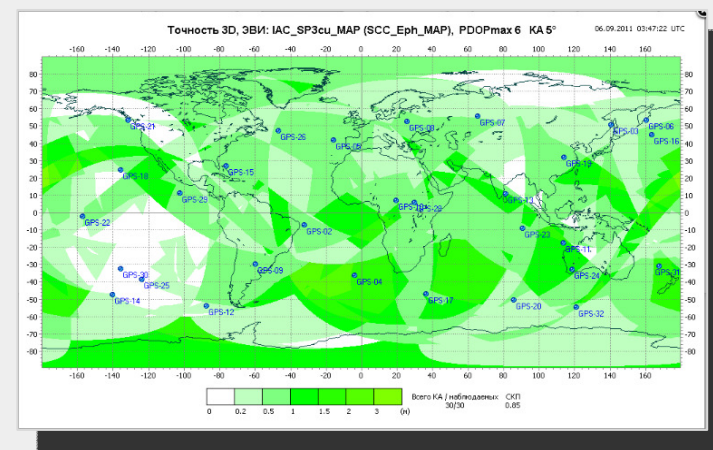
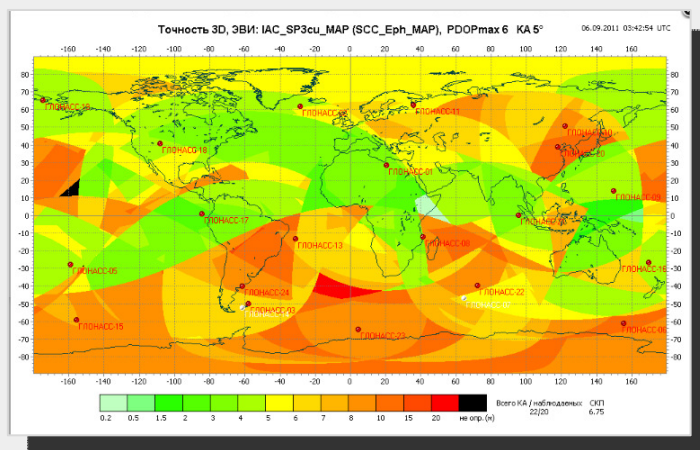
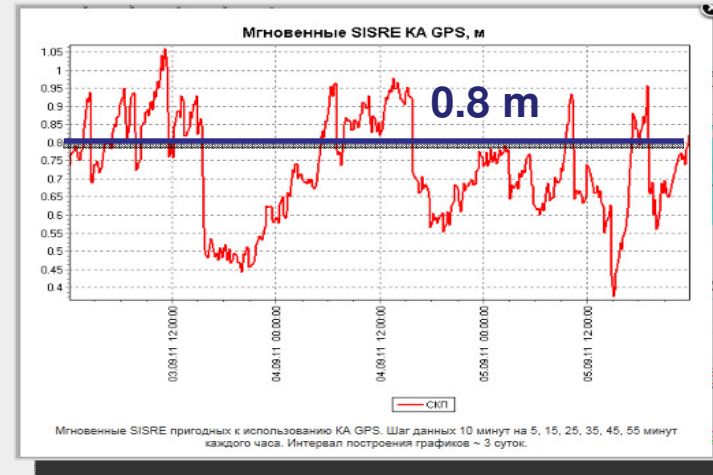
GNSS SISRE Accuracy



GLONASS



GPS

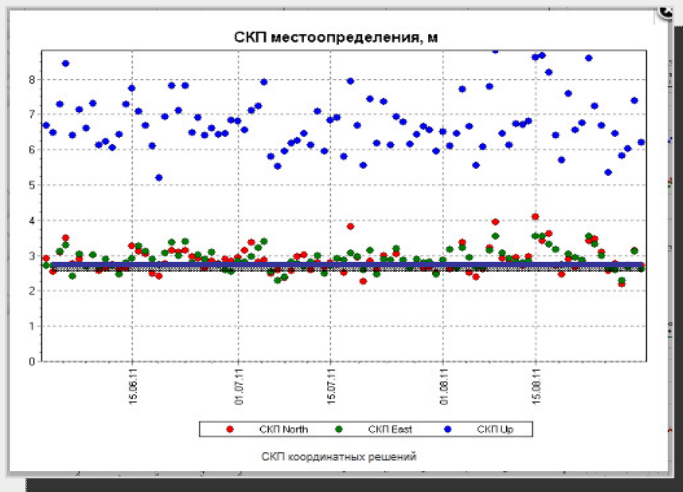




User Accuracy

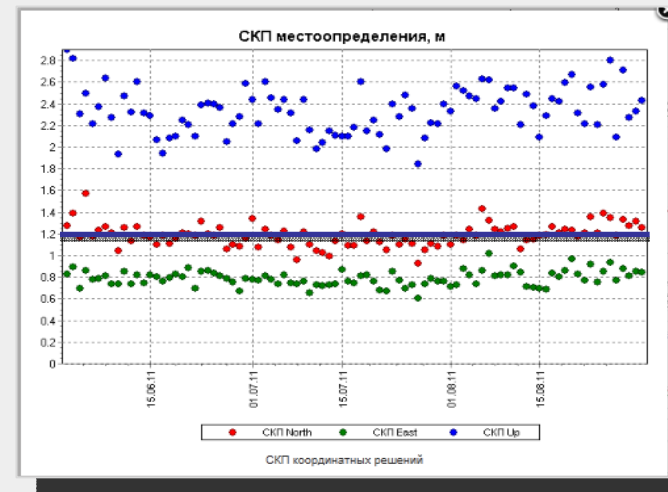


GLONASS

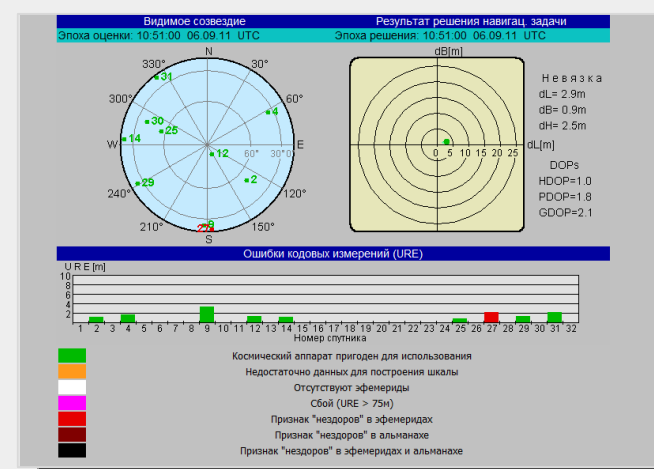
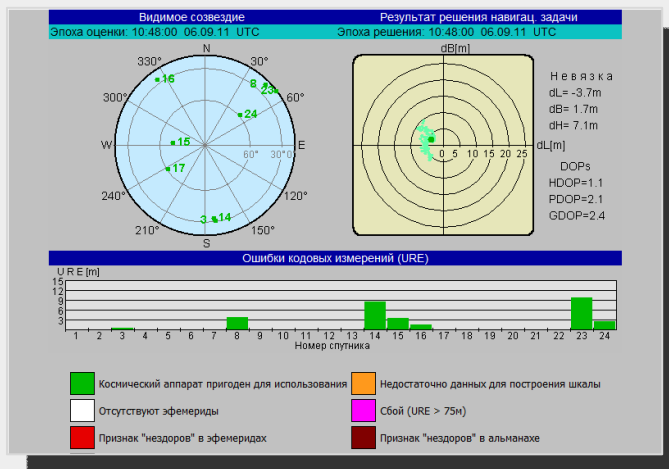


3 m

GPS



1.2 m

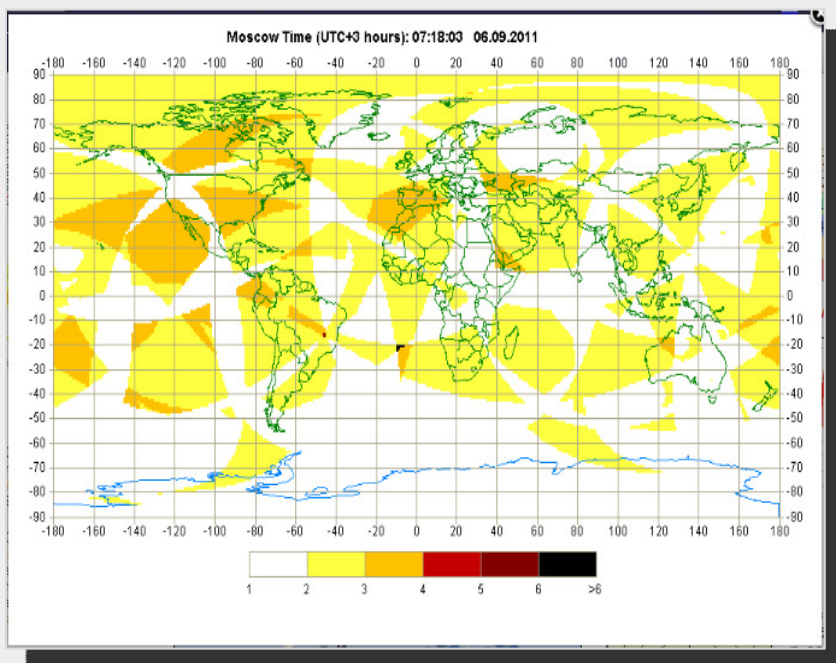




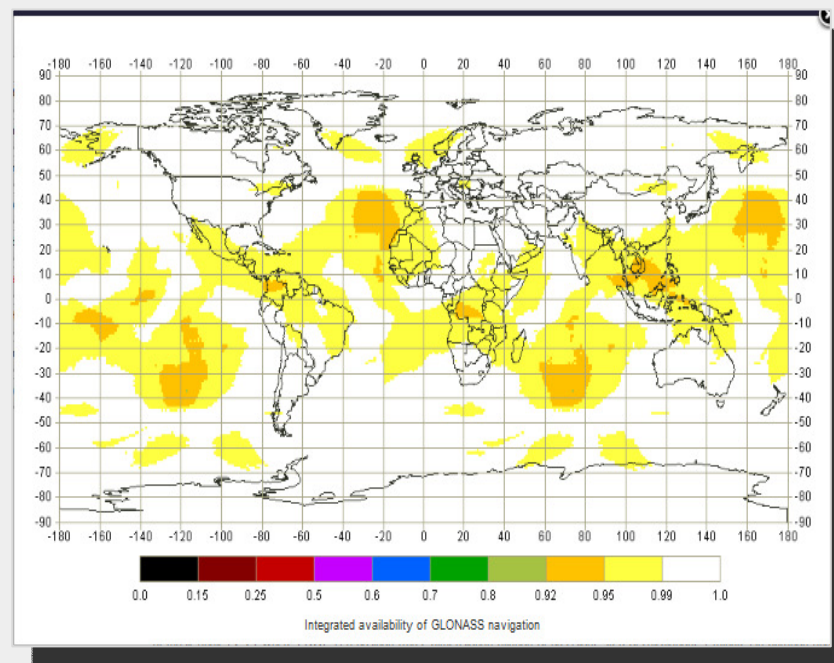
GLONASS Availability



Instant value



Mean value



(PDOP < 6, mask angle = 5°)



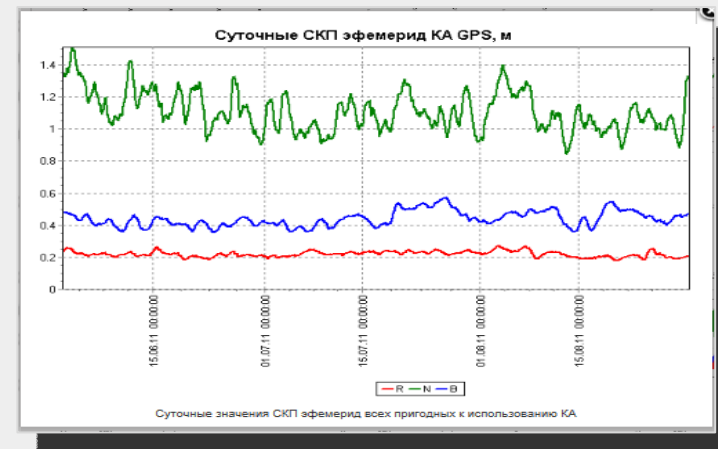
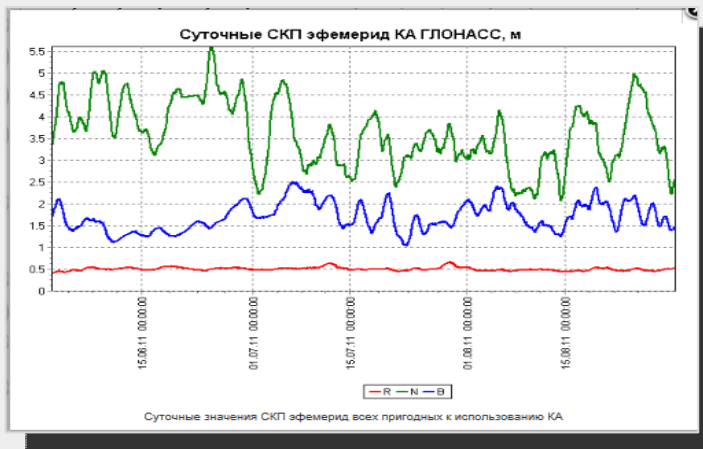
Orbit Accuracy



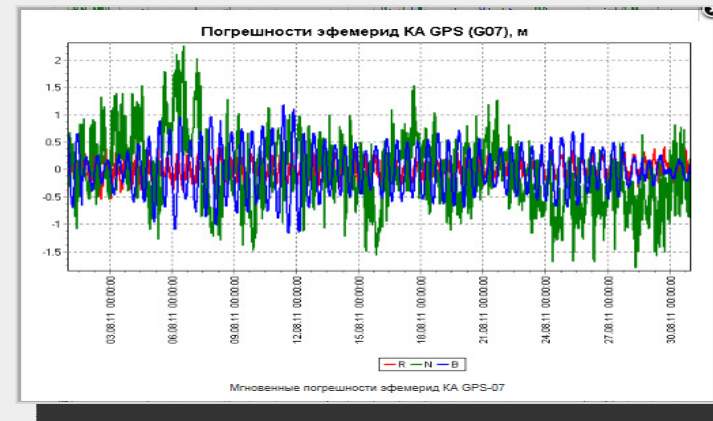
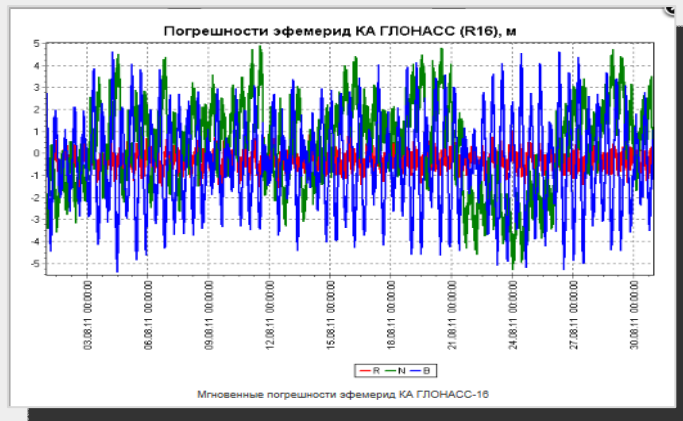
GLONASS

GPS

Constellation



Each satellite





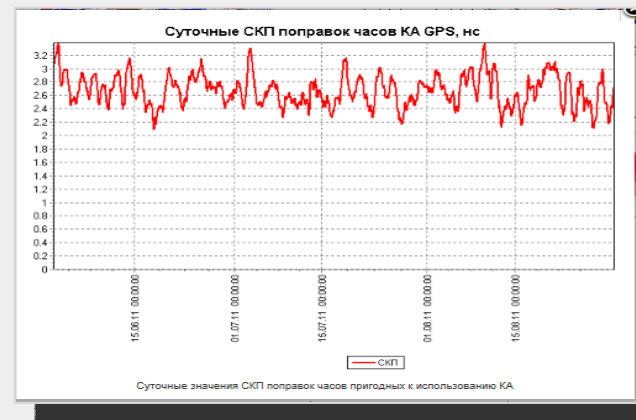
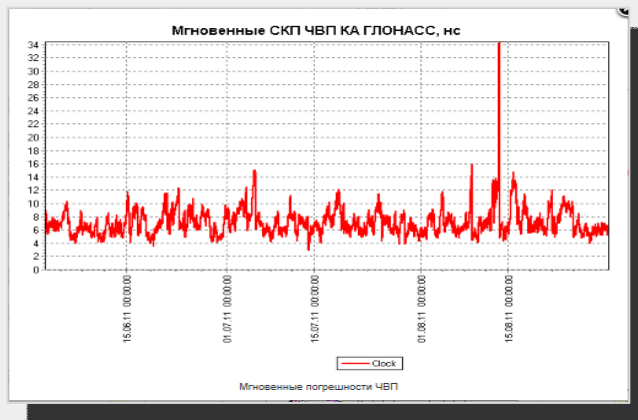
Clock Estimates



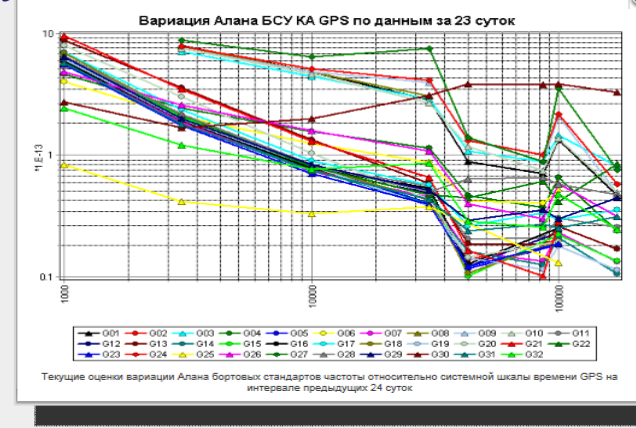
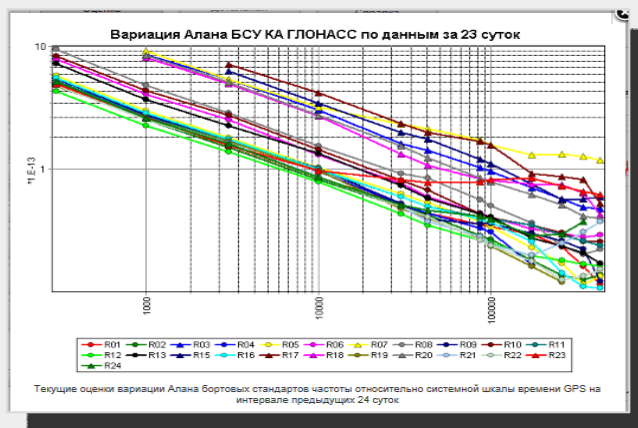
GLONASS

GPS

Clock corrections

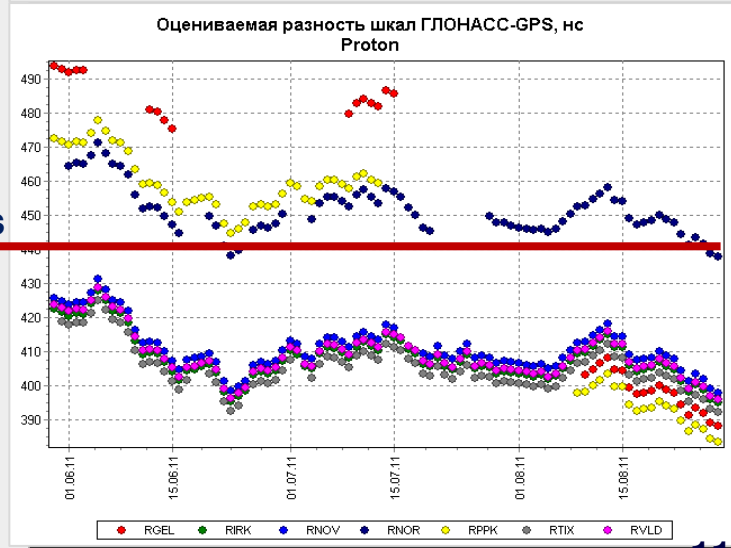
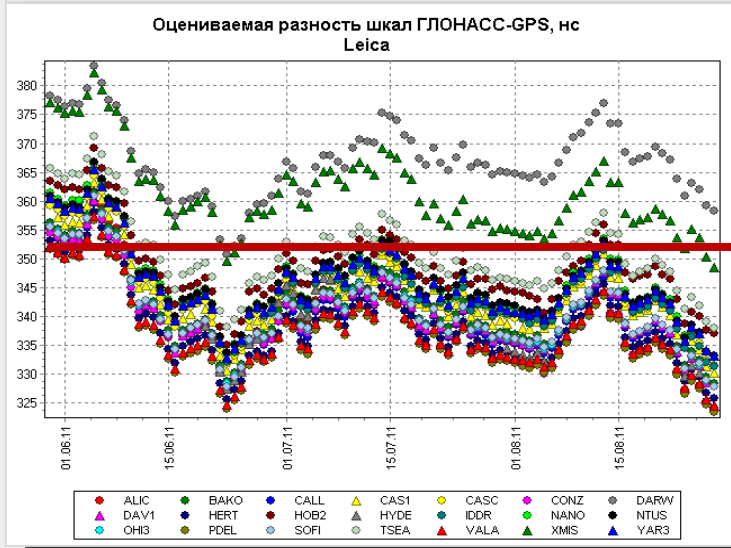
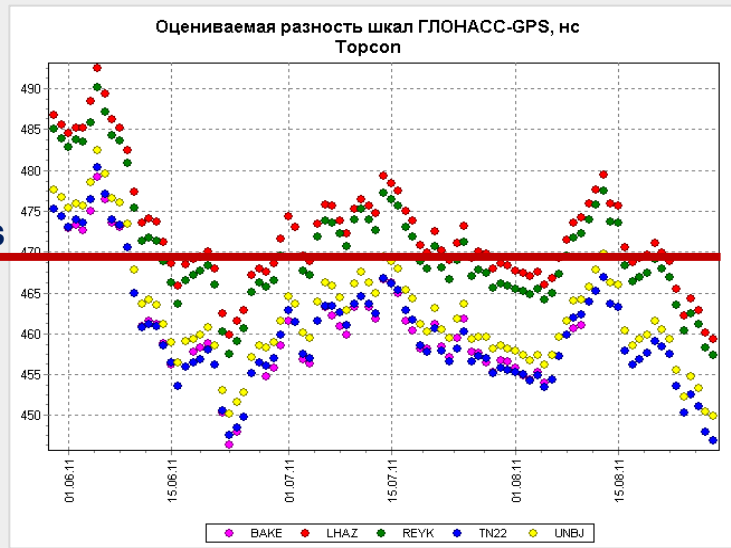
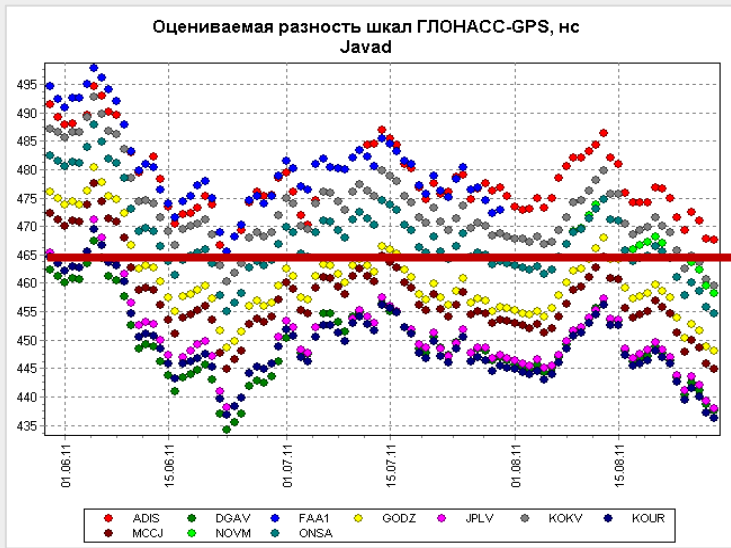


Clock stability





Time Scale Differences GLONASS/GPS

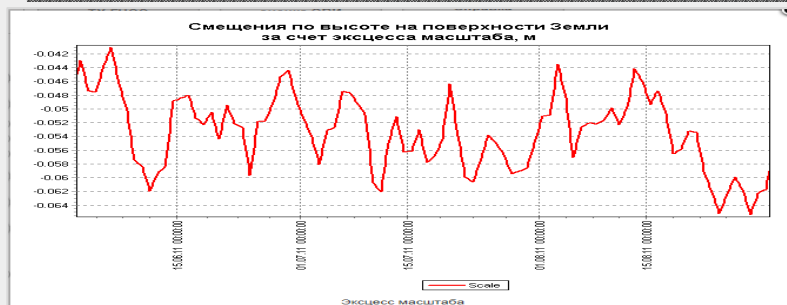
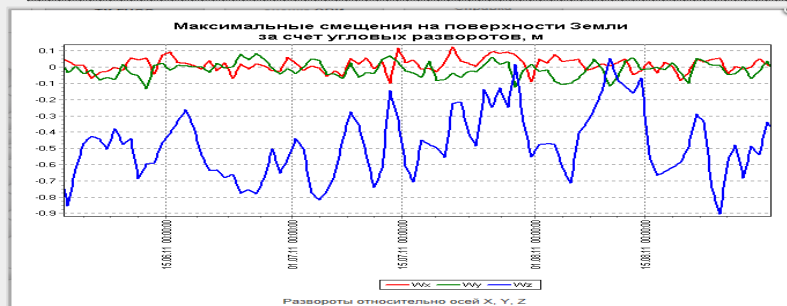
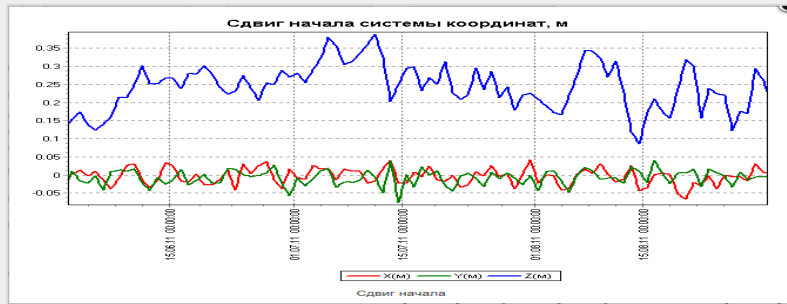




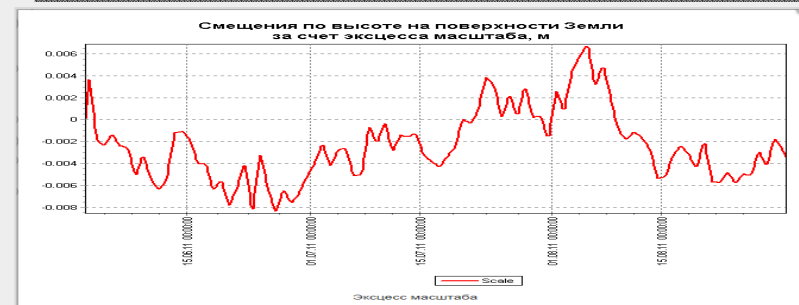
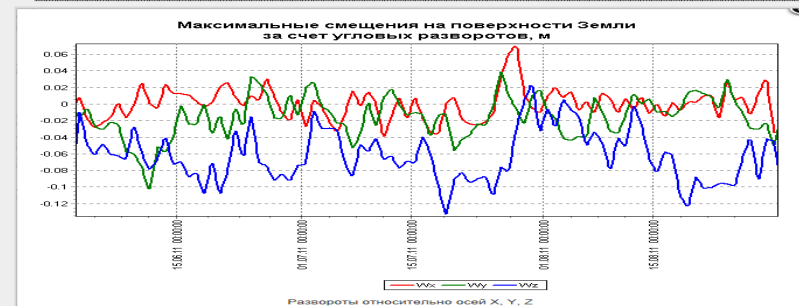
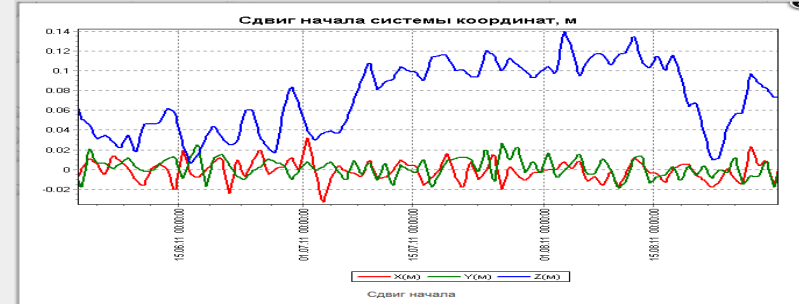
Geodesy Reference Difference



ПЗ-90.02 (GLONASS) vs ITRS



WGS-84 (GPS) vs ITRS





PNT IAC GNSS Performance Monitoring System Specification (AKVAPAS)



Performance assessment tool specification:

- The PNT IAC means for performance assessment have MOD and ROSSTANDART certificate
- Remaining error of the reference data is on the level of 3 cm (according to IGS)
- Total station number processed is about 200
- The number of simultaneously calculated solve-for parameters is about 85 000
- Total number of measurements for single solution is more than 10 millions
- Full automatic standard processing
- Flexible capabilities

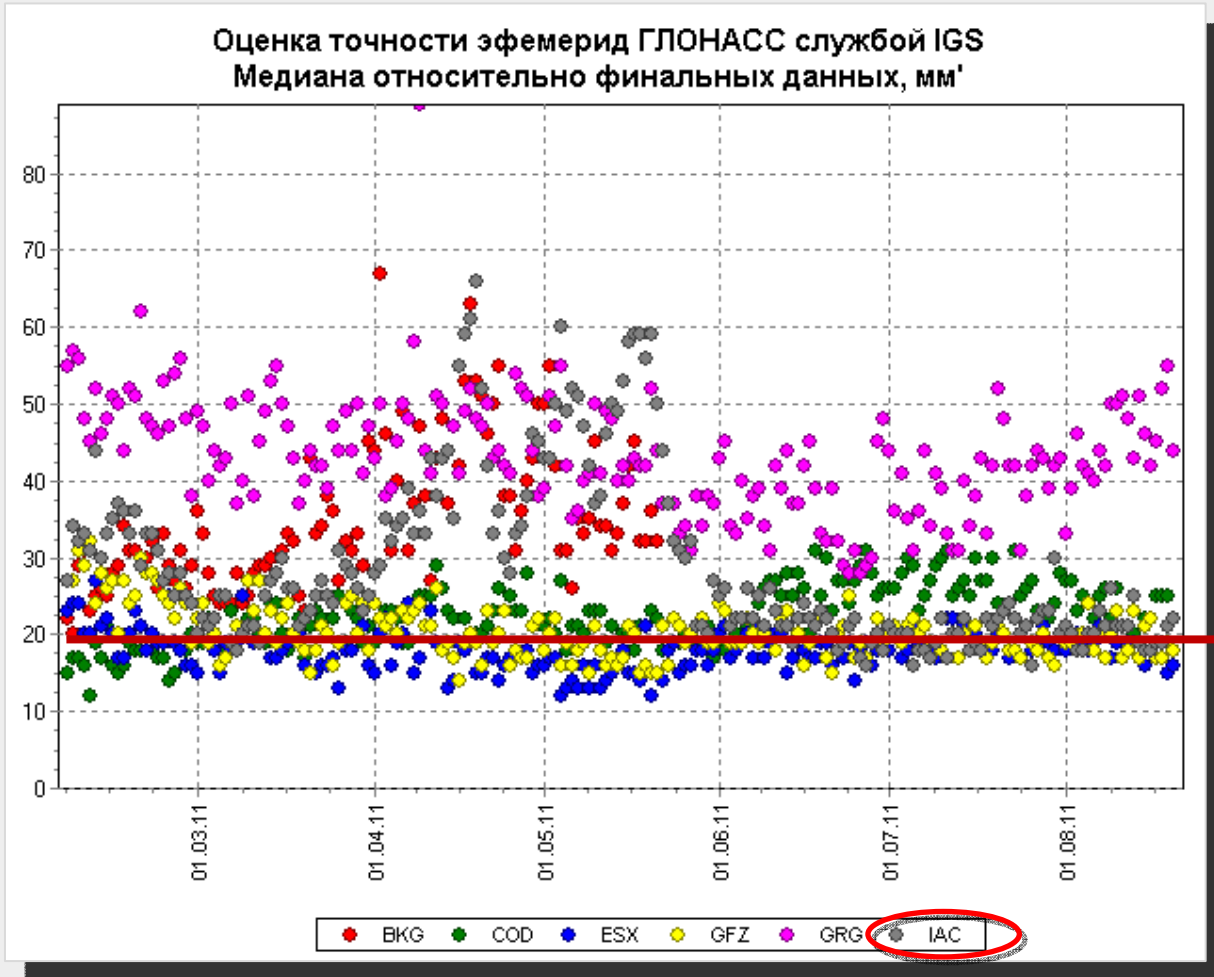




PNT IAC GNSS Performance Monitoring System Accuracy



Accuracy

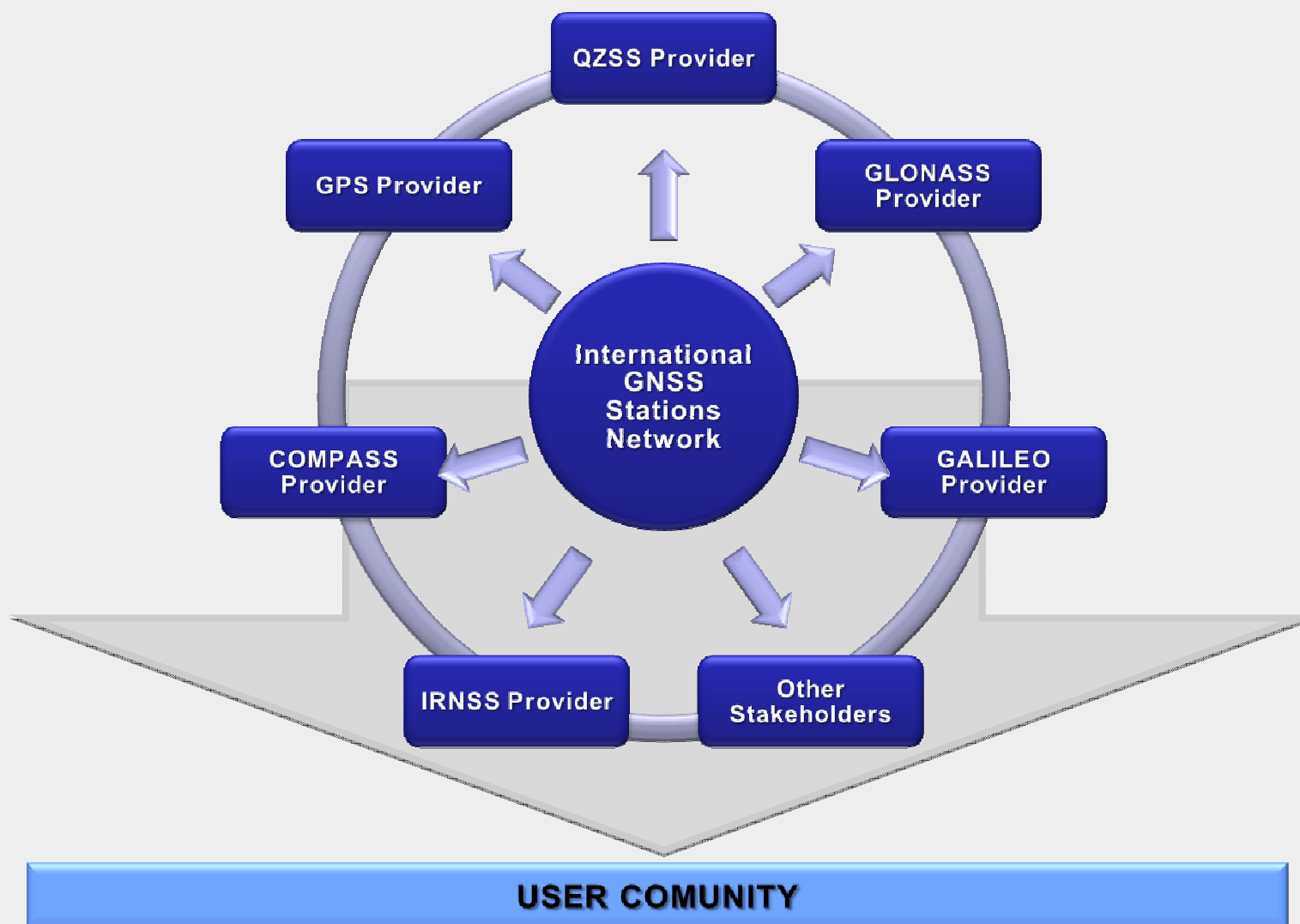


20 mm

Медиана погрешности относительно финальных данных IGS по результатам оценки координатора центров анализа



Monitoring System





General Principles



- Each Provider will have their own monitoring system
- National Monitoring Systems shall combine the international monitoring system
- Independent monitoring systems may also be involved
- Each Monitoring System shall be certified
- Each Monitoring System Should be out (independent) of GNSS developer and/or operator
- Each Monitoring System shall use identical performance definitions and methodology to calculate (Common Performance Document...)
- Results of each Monitoring system shall be validated and accepted by another monitoring systems



Thank you for your attention!

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INFORMATION and ANALYSIS CENTER for POSITIONING,
NAVIGATION and TIMING

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