

# ESOC Station Network Status and Progress



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## Abstract

ESA/ESOC continues to maintain and improve a worldwide network of GNSS stations. This poster will cover the changes and the upcoming upgrades. The ESOC station network is in the process of being upgraded to full GNSS receivers in an effort to continue to be a reliable provider of GNSS data for all the constellations.

## ESOC Station Network

The map below shows the current ESA/ESOC Navigation Support Office GNSS station network. The GNSS network currently comprises stations at ESA ESTRACK locations; Kourou (KOUR), Redu (REDU), Malindi (MAL2), Maspalomas (MAS1), Cebreros (CEBR), Villafranca (VILL), Kiruna (KIRU), Malargüe, Argentina (MGUE), Perth (PERT) and New Norcia (NNOR), as well as a station installed in Tahiti (FAA1) in cooperation with Meteo France.

The high rate tracking data files and streams are transferred from the remote sites to the Navigation Facility at ESOC. At ESOC the 15 minute files are sampled and joined appropriately for the generation of the hourly and daily files. The transfer protocol UDP is used for the data transfer of the Real-Time streaming using RTIGS data format.

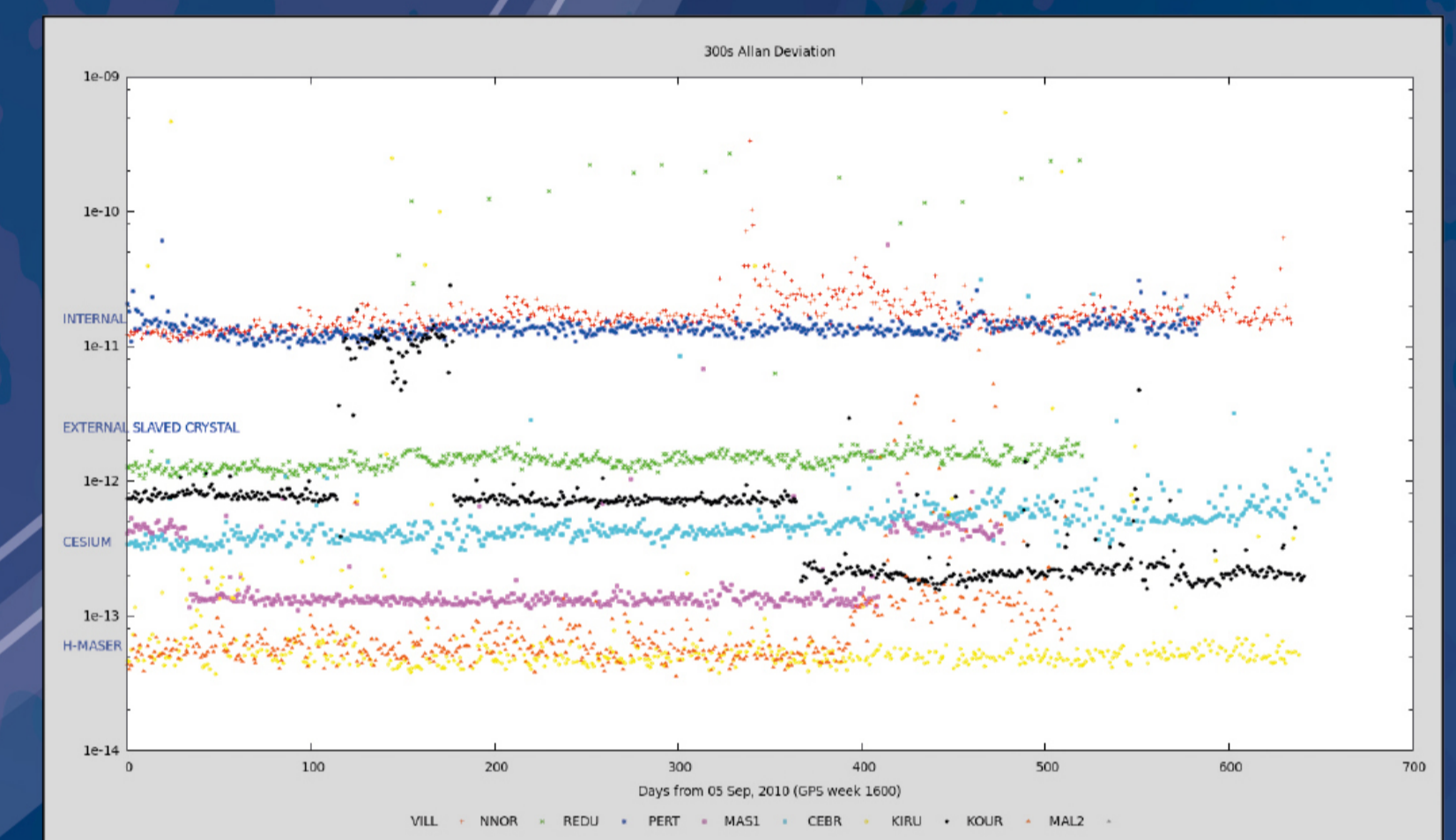
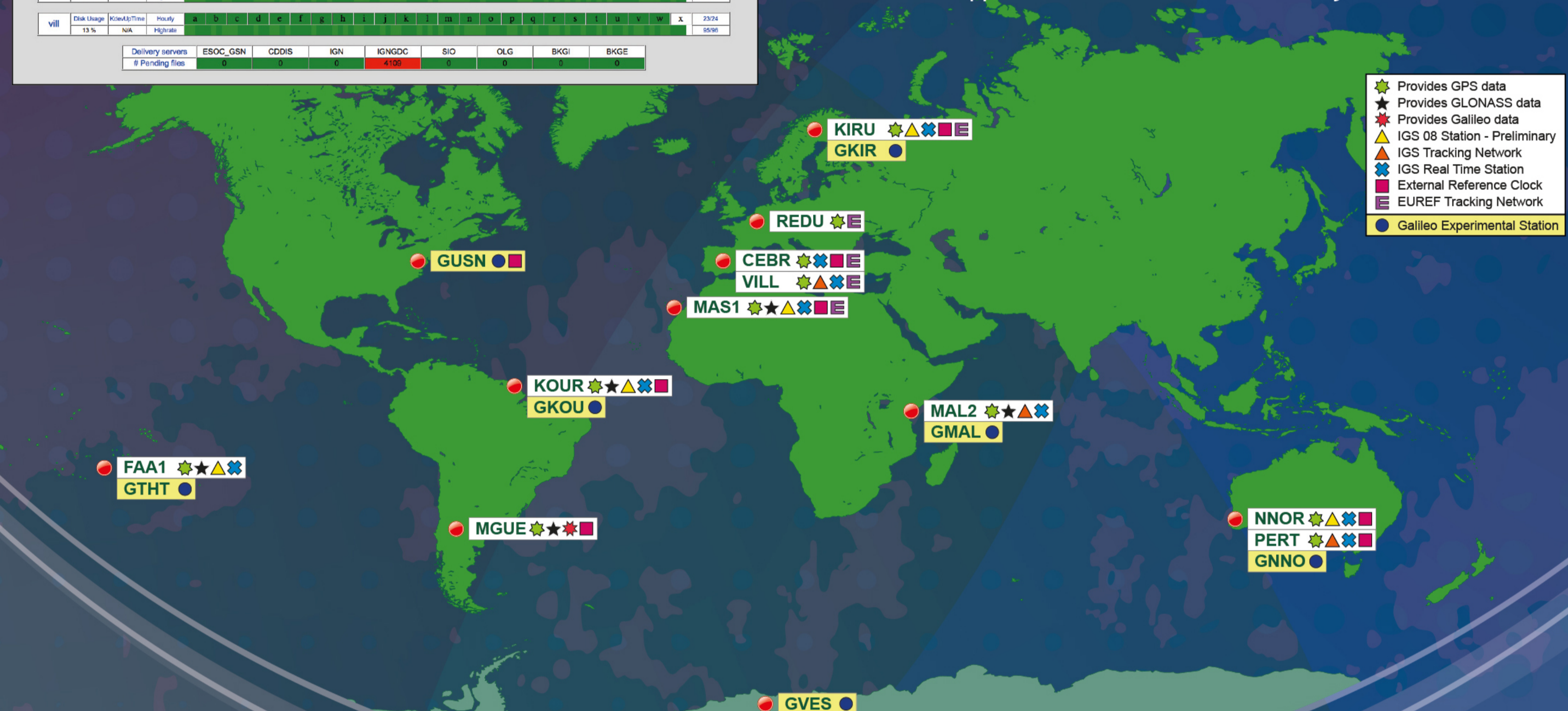
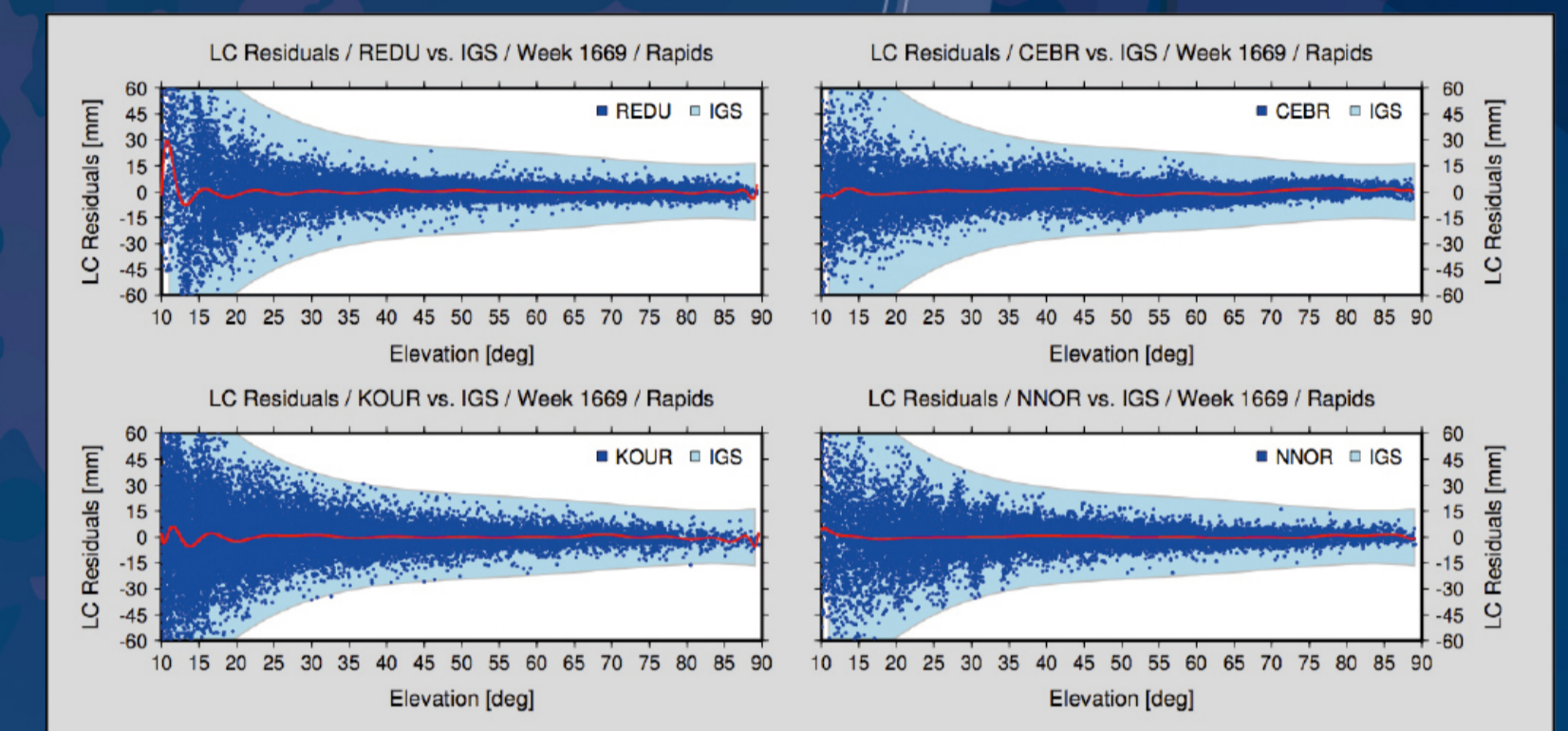
In order to perform routine operations, ESOC has developed a set of automated tools for monitoring the stations availability and distribution, and to monitor the data quality such as data processing residuals and clock Allan deviations (pictured below). With these tools, ESOC IGS team is able to react as soon as any anomaly appears in any station.

ESA Stations Data Retrieval 12176

Station	Del. Stage	Receiver	Antenna	Height	Frequency	Status
cebr	24%	FAA1	FAA1	1.0	1575.42	OK
gtht	100%	FAA1	FAA1	1.0	1575.42	OK
kour	24%	FAA1	FAA1	1.0	1575.42	OK
mal2	1%	FAA1	FAA1	1.0	1575.42	OK
mas1	28%	FAA1	FAA1	1.0	1575.42	OK
nnor	7%	FAA1	FAA1	1.0	1575.42	OK
perth	10%	FAA1	FAA1	1.0	1575.42	OK
vill	13%	FAA1	FAA1	1.0	1575.42	OK
gves	100%	FAA1	FAA1	1.0	1575.42	OK

Delivery servers: ESOC\_GSN, CDDIS, ION, IONVOC, SIO, OLC, BKGI, BKGE

Over the last few months we have had long term data outages at KOUR, PERT and FAA1 which will be resolved soon with the installation of new receivers and antennas as part of the planned network upgrade as described below. The aim of the ESOC station network is to provide full worldwide GNSS constellation coverage to support ESOC internal projects and the IGS community-at-large. The data's arrival is monitored every 15 minutes and it is processed in the ESOC IGS processing (Ultras and Finals) allowing for data quality and clock stability to be monitored, as shown in the plots below. The ESOC stations also stream data in real-time in support of the IGS Real-Time Pilot Project.



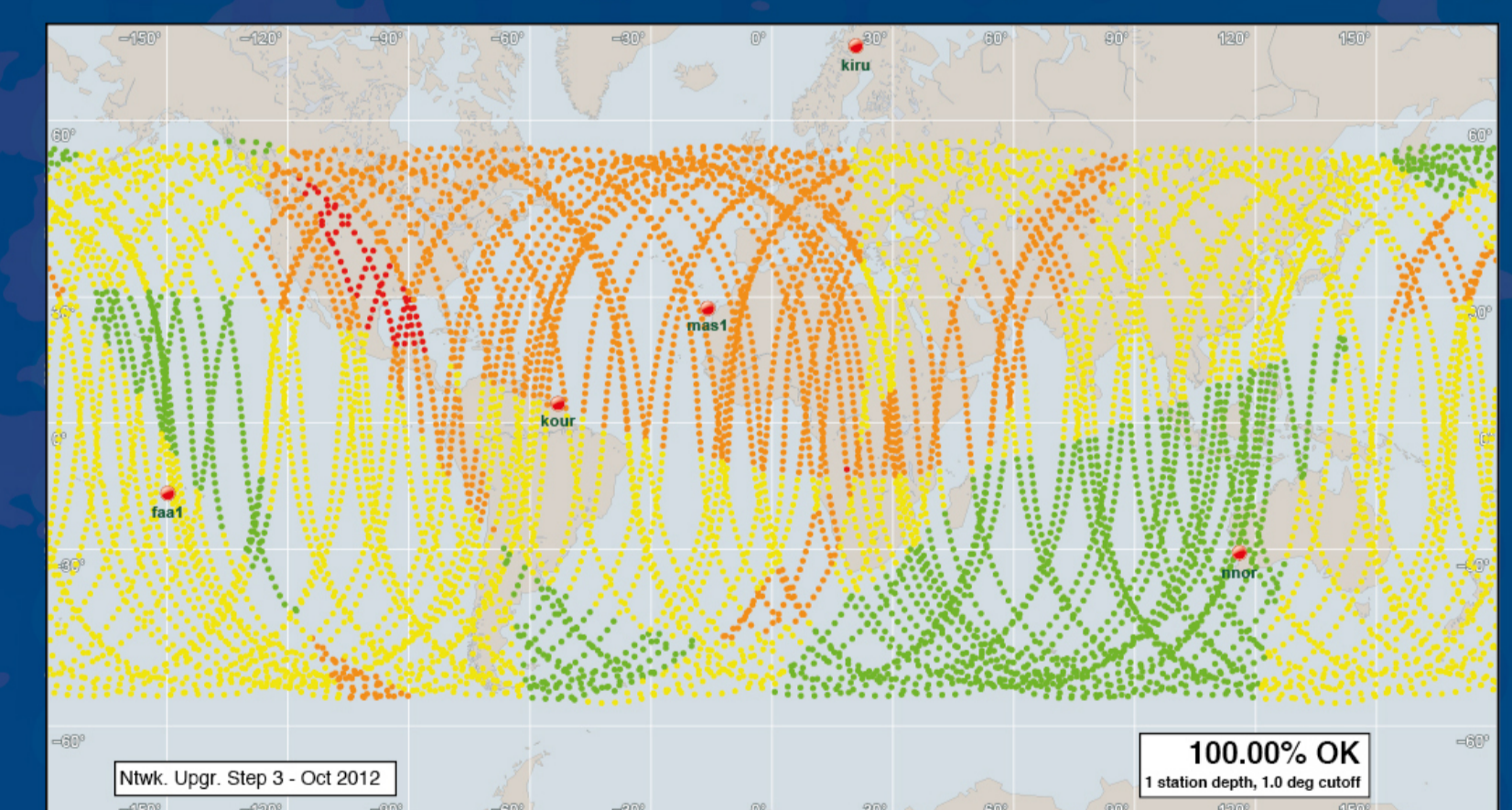
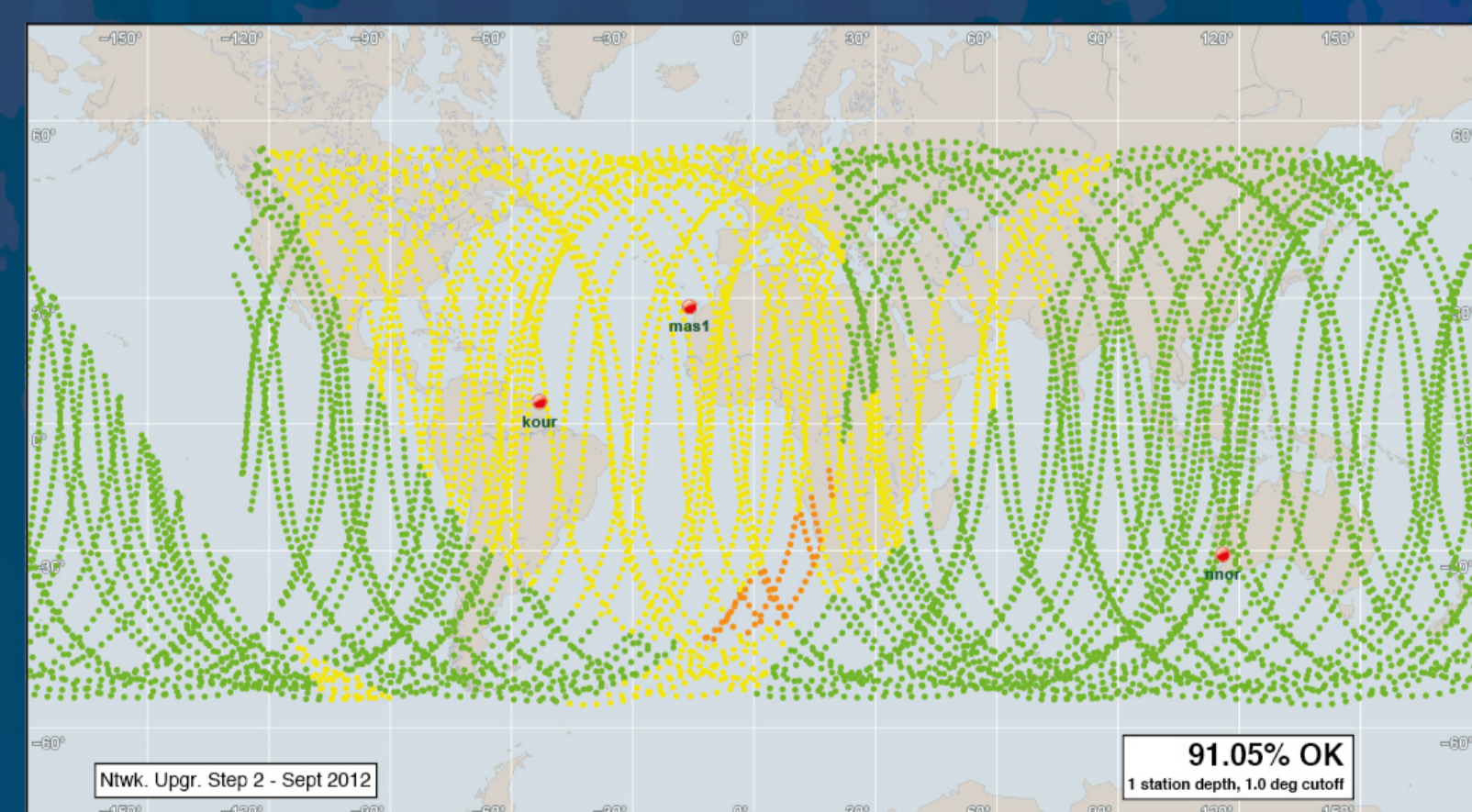
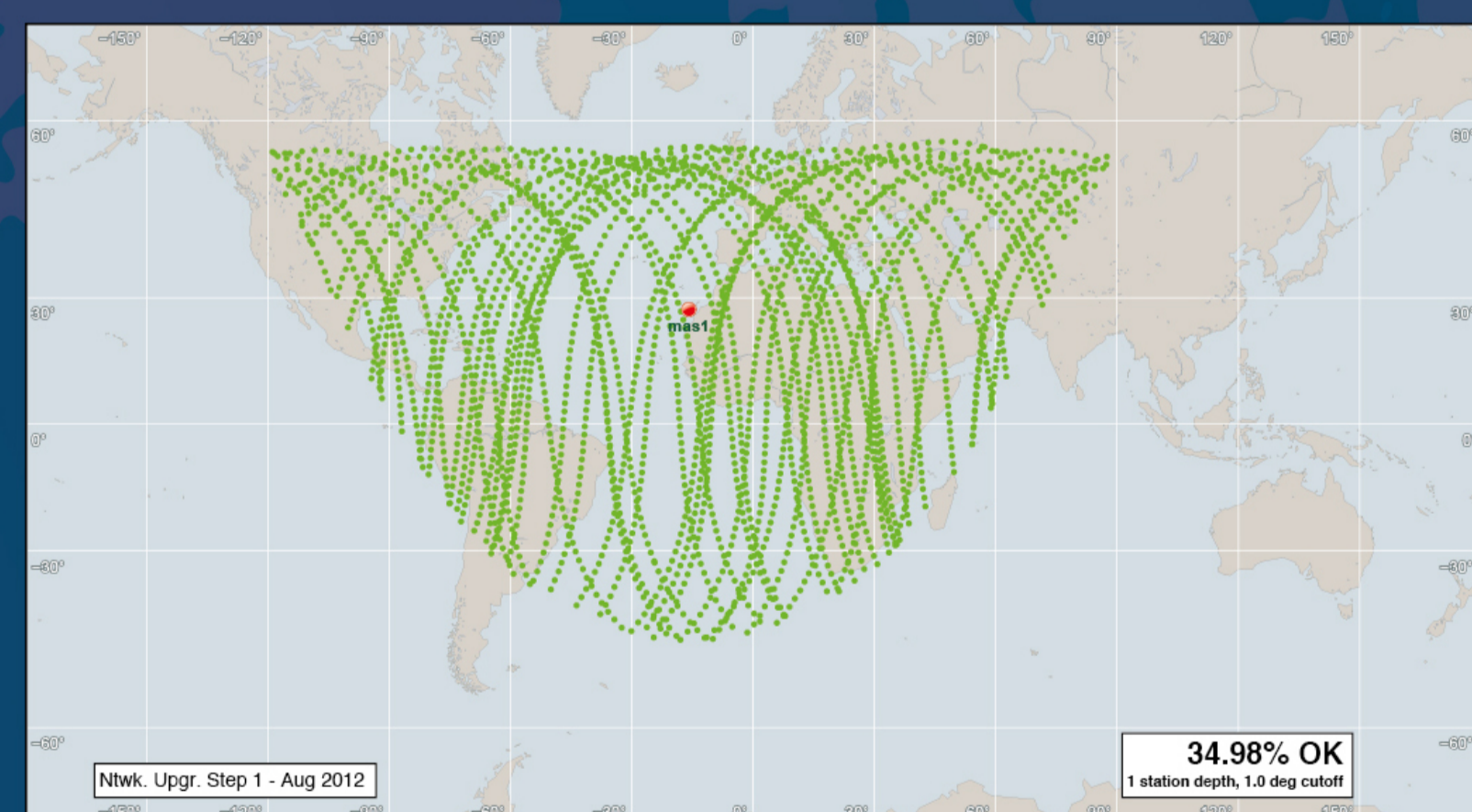
## ESOC Station Network Upgrade 2012-2013

ESOC is committed to provide 100% worldwide coverage data for all GNSS constellations during this year by upgrading the equipment in at least 5 installations by the next Fall (see deployment maps below). The final aim is to upgrade all the current ESOC stations, and possibly even to install new stations up to the end of 2013 in places like Japan, Russia and Canada when hosting agreements are reached with the corresponding organizations.

ESOC has acquired a number of Septentrio PolarRx4 receivers (pictured) and Septentrio Choke Ring MC antennas (pictured) plus a small number of Leica AR25 rev.4 antennas (pictured as installed recently in MAS1). The receivers and antennas have been under test at ESOC for a number of months while all the configuration details have been sorted. Since the new receivers are internet enabled the procedures to operate the receivers from within ESOC

is significantly different (removing the usual station PC), as well as the data transfer handling (transferring raw binary files), data streams routing back to ESOC in RTCM instead of RTIGS, Rinex 2 and Rinex 3 data file production, etc.

The new receivers will provide all the expected measurements for all the GNSS constellations: GPS, GLONASS, Galileo, QZSS, Compass, SBAS, EGNOS, etc. For 2012 worldwide coverage will be provided by upgrading a selected number of stations in the following order; MAS1, KOUR, NNOR (or PERT), FAA1 and KIRU as shown in the coverage plots below this will ensure 100% full GNSS coverage by the fall of 2012. During the rest of 2012 and 2013 the entire ESOC station network will be upgraded.

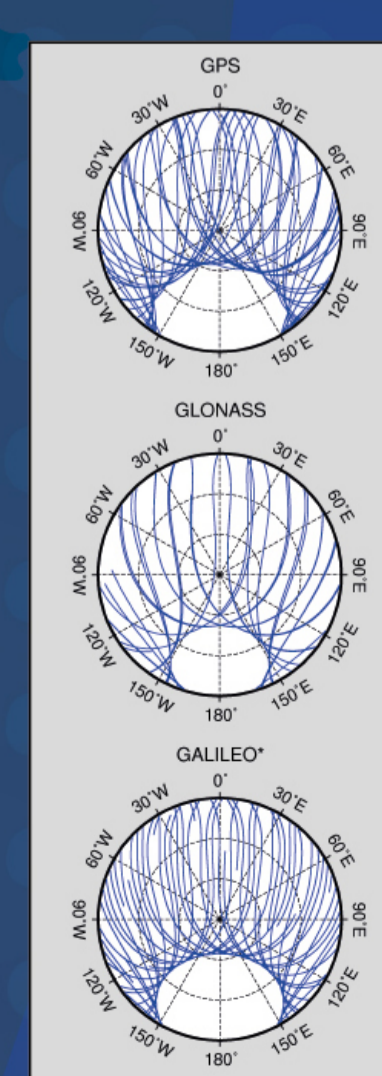


## New ESA/ESOC station in Argentina - MGUE

ESA has installed its third Deep Space tracking site (DS3) close to the town of Malargüe, Argentina. This station together with New Norcia (Australia) and Cebreros (Spain) provide ESA its much needed deep space tracking capabilities for current and future space missions. As part of each of these satellite tracking stations the ESOC Navigation Support Office installs a high performance permanent GNSS station to support long term station coordinates and velocities and all other GNSS projects, as needed.

This latest ESOC GNSS station is now online with the name MGUE and will be fully operational in the next few weeks. A Leica AR25 rev.4 has been installed in an isolated part of the station complex as shown in the picture below. No mayor obstacles or structures impede the open sky view in all directions, except for the tall lightning arrester we were forced to install close to the antenna, as the area is known for strong electrical storms.

The new station MGUE has a Javad Delta G3T receiver that will enable the station to track the GPS, GLONASS, Galileo, SBAS and EGNOS. The theoretical coverage from this location of the three worldwide GNSS constellations is expected to be as shown in the figure below.



## Conclusions

ESA/ESOC is fully engaged in supporting the modernization of GNSS data formats and data transfers through our involvement in the RINEX Working Group and the IGS Infrastructure Committee. ESOC remains involved and committed to support the Rinex 3 data format and to the new Multi Signal Message RTCM real-time format, and in the upgraded ESOC station network we look forward to provide the upgraded data formats as part of the MGEX and the Real-Time pilot project.

The ESA/ESOC Navigation Support Office is also committed to providing the highest quality GNSS data by maintaining, improving and expanding the existing station network with modern receivers from Septentrio that will provide measurements for all GNSS constellations.