ESOC Station Network Status and Progress

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Abstract

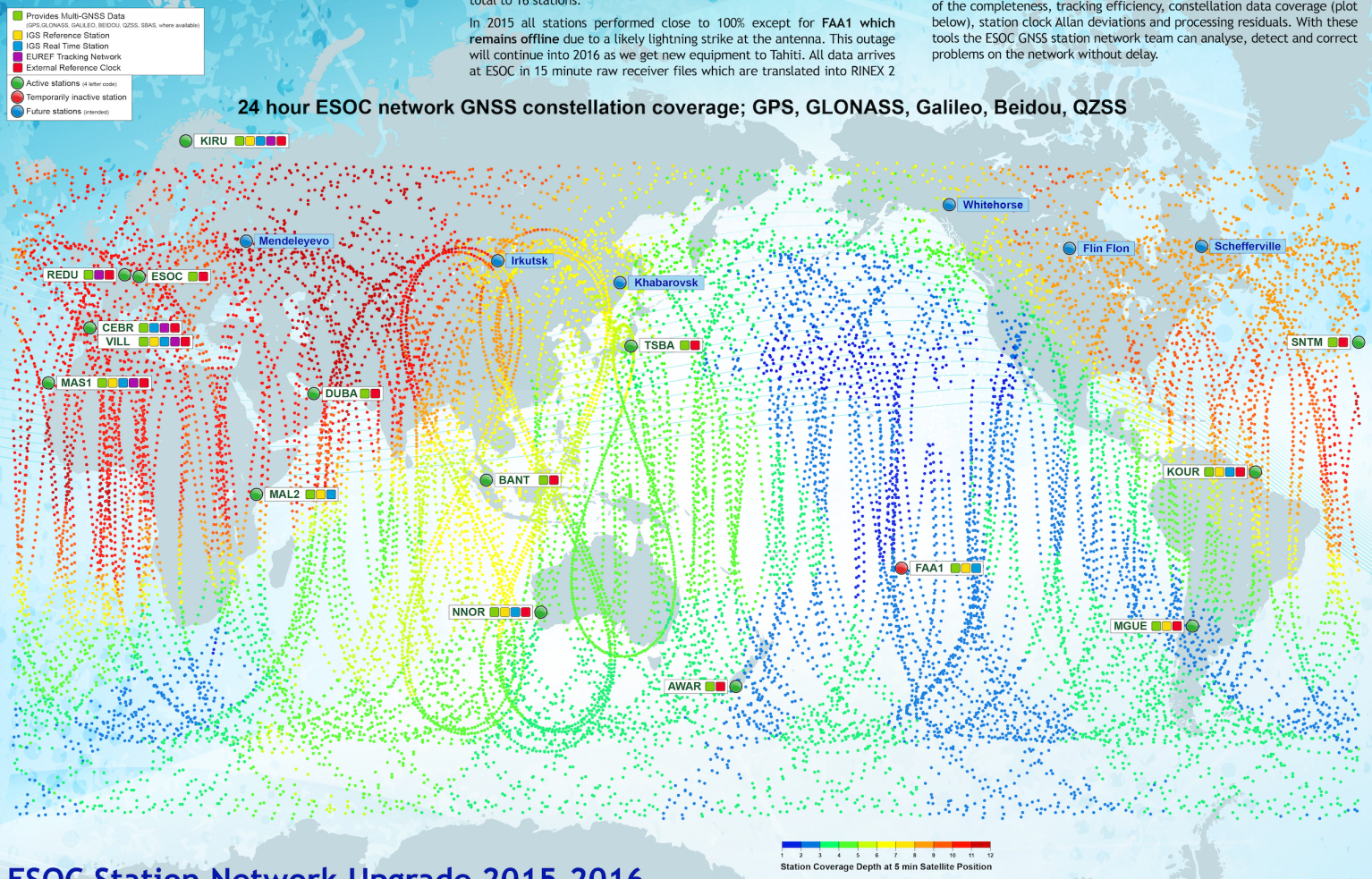
ESA/ESOC continues to maintain and improve a worldwide network of GNSS stations. This poster will cover the changes and the upcoming upgrades. The ESOC station network has completed the upgrade to full GNSS receivers and antennas over the last year, providing 15min, Hourly and Daily RINEX 2.11 and RINEX 3, as well as NBS (NavBits) to Eumetsat to support LEO satellite occultation processing, in an effort to continue to be a reliable provider of GNSS data for all the constellations. In addition, ESA/ESOC has advanced negotiations with several third parties in order to enhance its global coverage in the coming years.

ESA Station Network

The map below shows the ESA GNSS station network, which currently comprises 10 stations at ESA ESTRACK core/cooperation locations; Kourou (KOUR), Redu (REDU), Maspalomas (MAS1), Cebreros (CEBR), Villafranca (VILL), Kiruna (KIRU), Malargue (MGUE), New Norcia (NNOR), Malindi (MAL2) and Santa Maria (SNTM), another 5 stations are located in; Tahiti (FAA1), Dubai (DUBA), Banting, Malaysia (BANT), Tsukuba, Japan (TSBA) and Awarua, NZ (AWAR) in cooperation with various scientific and technical organizations as described below. Finally, a station is also operated and maintained at ESOC/ESA's own premises in Darmstadt, bringing the current total to 16 stations.

In 2015 all stations performed close to 100% except for **FAA1 which remains offline** due to a likely lightning strike at the antenna. This outage will continue into 2016 as we get new equipment to Tahiti. All data arrives at ESOC in 15 minute raw receiver files which are translated into RINEX 2 and RINEX 3 files and distributed according to the ESA/ESOC data policy. All the stations are processed as part of internal orbit and clock processes to ensure high quality and suitability to task apart from teqc QC data checks. Many of the ESOC stations also stream data in real-time as indicated in the map below as part of the IGS Real-Time project.

ESOC has been improving the automated monitoring and error detection tools while increasing the capability of handling more stations and differentiated data file flows as for RINEX 2 and RINEX 3, plus implementing a RINEX 3 long name software tool. Regular reports inform the ESOC team of the completeness, tracking efficiency, constellation data coverage (plot below), station clock Allan deviations and processing residuals. With these tools the ESOC GNSS station network team can analyse, detect and correct problems on the network without delay.



ESOC Station Network Upgrade 2015-2016

ESOC is committed to provide worldwide data for all GNSS constellations during this year as a result of having completed the upgrade of the equipment at all the current installations over the last year as well as focusing on the establishment of collaborations with third parties in order to install new stations at various new locations if agreements can be reached with the corresponding organizations.

Following the acquisition of a large number of Septentrio PolarRx4 receivers and Septentrio Chokering MC antennas plus 4 Leica AR25 rev.4 antennas in 2011-2012, the entire ESA GNSS network now operates these Septentrio receiver/antenna combinations, with the exception of MGUE, MAL2, MAS1 and FAA1 where the Leica antennas are used. The network was expanded with the new station AWAR (New Zealand) in the 2nd half of 2014, followed by DUBA (U.A.E.), BANT (Malaysia) and TSBA (Japan) in the 1st half of 2015. Finally, in November 2015 the current status of the network was completed with the new station ESOC. No data is publicly available for any of these newly installed stations.

The Septentrio receivers provide all the expected measurements for the GNSS constellations as available: GPS, GLONASS, Galileo, QZSS, Compass, SBAS, EGNOS, etc. and as of mid-2013, ESA/ESOC has been contributing with daily, hourly and high rate multi-GNSS RINEX 3 data to the MGEX campaign for 10 of its 16 stations. Also, since the beginning of 2013, ESA/ESOC has been providing NBS (NavBits) data from this same set of stations to Eumetsat to support LEO satellite occultation processing.

For 2016 worldwide coverage is planned to be enhanced considerably with negotiations with third parties in Russia and Canada ongoing.

New ESOC stations; AWAR, TSBA, BANT, DUBA, ESOC

ESOC has developed collaborations with Venture Southland in New Zealand to host station AWAR, with JAXA to host our station in Tsukuba (TSBA), with the National Space Agency of Malaysia for station BANT and with the EIAST for our Dubai station (DUBA). A new station connected to an H-maser has been installed in Darmstadt at ESOC's premises. Contacts are also under way with NRCan for 3 stations across Canada, and with Russian authorities for three stations across Russia, as depicted in the map above. These new and future stations provide the ESOC network with enhanced capabilities and increase worldwide coverage and robustness.

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 Septentrio receivers and antennas, providing measurements for all GNSS-constellations.

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