

National Report of Great Britain 2022

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Abstract. Activities of Ordnance Survey, the national mapping agency of Great Britain. Also, activities from British Isles continuous GNSS Facility (BIGF) and Newcastle University

Keywords. Ordnance Survey, British Isles continuous GNSS Facility (BIGF), Newcastle University.

1 Ordnance Survey activities

1.1 National GNSS network

The OS Net[®] network contains 114 stations, runs on the Trimble Pivot Platform (TPP)[™] software and delivers RTK corrections via GSM and GPRS to approximately 200 Ordnance Survey surveyors. Public services are also available via Ordnance Survey commercial partners.

Commercial partners take the raw GNSS data streams from OS Net servers via NTRIP and use them to generate their own correction services.

There are now seven commercial partners offering RTK services in Great Britain: AXIO-NET, Hexagon, Premium Positioning, SoilEssentials, Swift Navigation, Topcon and Trimble. Current partner details can be found at :
<https://www.ordnancesurvey.co.uk/business-government/tools-support/os-net-tools>.

The Covid pandemic severely restricted station management and inspection activities but these are now resuming. Several failing (due to corrosion) antennas have now been replaced.

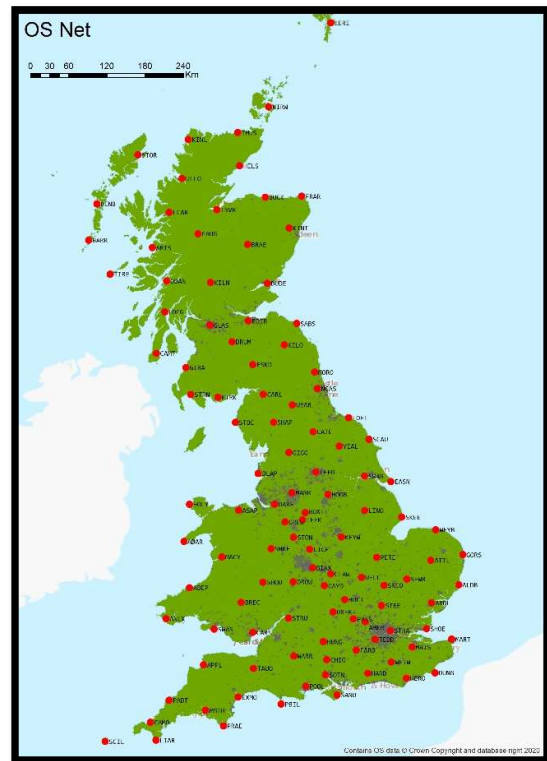


Fig. 1 OS Net GNSS Network

4G/5G back up communication links are still being trialled so as to ensure the highest availability of OS Net data.

1.2 EPN and EPOS data submissions

The current OS Net EPN submissions are hourly data from stations ADAR, ARIS, CHIO, DARE, INVR, LERI, PMTH, SCIL, SHOE, SNEO and SWAS; Unfortunately, another long-term (> 20 years) station KING at Kings Lynn has been lost.

All OS Net RINEX data is now v3 format containing GPS+GLO+GAL+BDS data.

Data from the entire OS Net network is also now submitted to the EPOS archive (<https://gnss-epos.eu/>) and all OS Net station log files are now managed and made available via the M3G facility (<https://gnss-metadata.eu/>). Historic OS Net data (back to year 2000) from the BIGF archive is now being copied to EPOS.

Stations DARE, INVR, HERT and SHOE provide also real time data. Real time data from any other OS Net station is not possible due to conflict with OS Net partner's commercial operations.

Non OS Net stations contributing hourly data to EPN are Natural Environment Research Council (NERC) stations HERS and HERT; Newcastle University station MORP and University of Nottingham station NEWL.

1.3 GNSS EVENT NOTIFICATION SERVICE (GENS)

GENS is an ESA sponsored project with support from the UK Space Agency under the NAVISP programme (<https://navisp.esa.int/project/details/116/show>).

The project is creating an initial national demonstration capability for GNSS event notification. The current project will deliver a pre-operational capability to manage GNSS threats and vulnerabilities for a wide variety of stakeholders, including critical infrastructure.

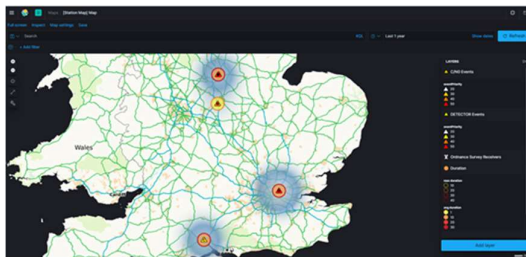


Fig. 2 GENS monitor of GNSS incidents. Image courtesy of CGI.

As the GENS project draws to a close at the end of May 2022 its aims have been fully met and, in some areas, have exceeded expectations. OS Net was successfully developed and deployed to enable streaming, storage and analysis of spectrum data from the Leica GR50, Septentrio PolaRx5 and

Trimble Alloy receivers. The spectrum data, integrated with OS Net RTCM data, and other nationally available sensors has enabled the generation of GNSS service threat, identification and response at national scale.

2 BIGF – British Isles continuous GNSS Facility

BIGF archives quality-assured RINEX data and creates derived products, based on a network of continuous GNSS stations sited throughout the British Isles. This network includes the OSNet stations of OSGB plus stations of Ordnance Survey Ireland and Ordnance Survey Northern Ireland. It also includes a number of 'scientific' stations established by: the UK Met Office; the University of Nottingham; the UK Environment Agency Thames Region; the Space Geodesy Facility at Herstmonceux; Newcastle University; and the University of Hertfordshire, with the University of Nottingham's contribution being carried out in collaboration with the National Oceanography Centre, Liverpool.



Fig. 3 The BIGF Network

Figure 3 shows the current network of around 150 continuous GNSS stations, which includes three stations (HERS, HERT, MORP) that are part of the IGS, and 20 stations (ADAR, ARIS, CHIO, DARE, ENIS, FOYL, HERS, HERT, INVR, LERI,

MLHD, MORP, NEWL, PMTH, SCIL, SHOE, SNEO, SWAS, TLL1, VLN1) that are part of the EPN. In addition, archived data from ten stations at tide gauges (ABER, DVTG, LWTG, LIVE, LOWE, NEWL, NSTG/NSLG, PMTG, SHEE, SWTG) are included in the IGS TIGA Project, and all current stations are included in the EUMETNET (Network of European Meteorological Services) GNSS water vapour programme (E-GVAP).

BIGF is operated from the University of Nottingham, and has been since 1998. From 2004 to 2018 it was funded as part of the Natural Environment Research Council (NERC) Services and Facilities portfolio. Then, in 2018 it was incorporated into British Geological Survey (BGS) core activities and is funded through UK Research and Innovation (UKRI). For more information, see www.bigf.ac.uk.

3 Newcastle University

Activities 2021 - 2022.

3.1 Techniques in Global Navigation Satellite Systems and Synthetic Aperture Radar

Koulali & Clarke (2020) presented a method for removing transient and seasonal artefacts in GNSS position time series, applied to Antarctica.

3.2 National and international geodetic networks

Newcastle University has continued to operate IGS sites 'MORP' (Morpeth, England) and 'ROTH' (Rothera, Antarctica) and TIGA site 'NSLG' (North Shields Tide Gauge, England). MORP and NSLG both contribute to the NERC 'BIG F' data repository www.bigf.ac.uk; the former is also part of the EUREF Permanent Network.

3.3 Glaciological and cryospheric geodetic applications

Koulali et al (2022) investigated the use of surface mass balance models at various resolutions to remove present-day elastic effects from GNSS position time series in Antarctica.

3.4 Geodetic measurement of tectonic processes

Yu et al (2021b), and Han et al (2022) presented geodetic studies of earthquake deformation in various worldwide locations.

3.5 Geodynamics and surface mass loading

Parker et al (2021) investigated hydrological loading models and geodetic observations in western Australia.

3.6 Geotechnical applications of geodesy

Chen et al (2021, 2022) applied InSAR techniques to the understanding of coal mining subsidence.

3.7 Atmospheric studies in geodesy

Yu et al (2021a) considered the ways in which network RTK GNSS infrastructure should be improved in order to reduce tropospheric errors.

3.8 Other geodetic applications

Abdalla et al (2021) provided a review of recent developments and future prospects in satellite radar altimetry over the oceans.

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