

National Report of Great Britain, 2006

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1 Introduction

National geodetic activity in the past year has included:

- the ongoing development and expansion of Ordnance Survey's OS Net™ RTK GPS network;
- distribution of national RTK corrections from OS Net data via licensed Ordnance Survey partners;
- the ongoing submission of data to the EPN and the submission of raw data to the EUREF-IP project, plus contributions to EUVN_DA and ECGN;
- the continued development of the BIGF, British Isles GPS archive Facility by the Institute of Engineering Surveying & Space Geodesy (IESSG) at the University of Nottingham;
- further work on the new gravimeter at Herstmonceux.

2 National GPS network

The Ordnance Survey National GPS Active Network (www.ordnancesurvey.co.uk/gps) has seen an increase to 55 of the number stations available. This is due to switching the data flow to come from the OS Net RTK network data store. This has also made the data flow more reliable. The data rate of the RINEX data available from the network has been changed to a consistent 30 second rate across the entire network to bring it into line with the majority of other European networks.

3 Network RTK GPS developments

Ordnance Survey's national RTK GPS network – now known as OS Net – has continued to expand and now covers the majority of GB. There are currently (7th June 2006) 91 stations in the network. To increase the coverage and improve error modelling some stations from Ireland and Northern Ireland will be added soon. See Figure 1 for a map of the current (as at 7th June 2006) and planned network. Expansion to cover the whole of GB is planned to be completed subject to financial approval. The full network is planned to consist of approximately 110 stations.

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OS Net June 2006

- ★ = OS Net station with public RINEX data
- ★ = OS Net station
- = Proposed OS Net station
- = Non OS Net station with public RINEX data

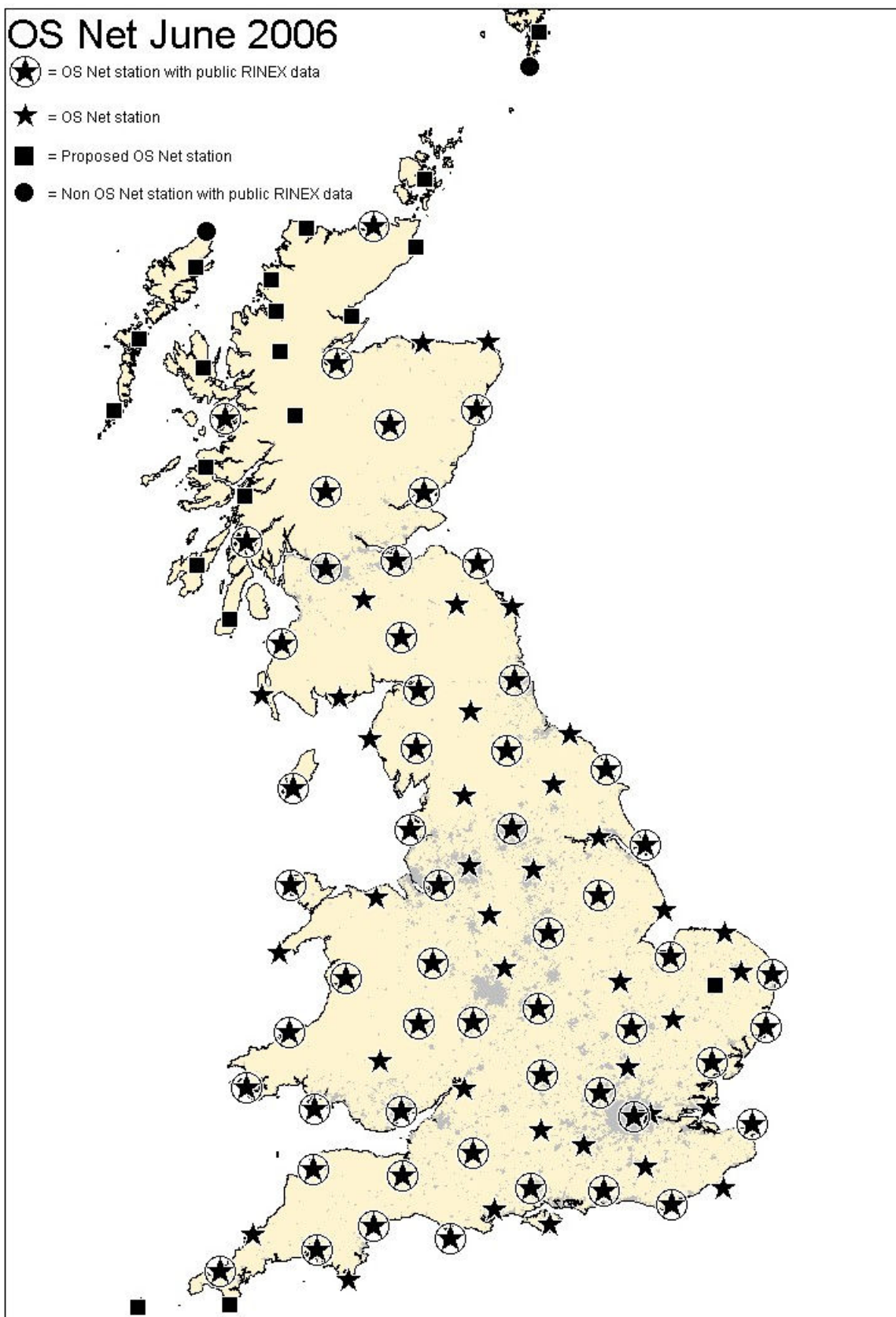


Figure 1. OS Net RTK GPS network.

The network is managed via the GPSNet™ software from Trimble and delivers RTK corrections via GSM and GPRS. The correction data is used by approximately 130 Ordnance Survey surveyors. Public services are now available via Ordnance Survey commercial partners. There are currently two partners – Leica (SmartNet service) and Trimble (VRS Now™ service). Partners take the raw GPS data streams from OS Net servers via NTRIP and use them to generate their own correction services.

4 EUREF related activities

4.1 EPN / EUREF-IP data submissions

Current EPN submissions from GB are hourly data from HERS, HERT and MORP plus 24 hour files from DARE, INVE, NEWL and NPLD.

Raw GPS data from DARE and INVE now also goes to the EUREF-IP project. This is in addition to the RTK data from HERT.

4.2 EUVN_DA / ECGN

A joint response from Ordnance Survey and the British Geological Survey (BGS) has been recently submitted under EUVN_DA action A for approximately 170 sites across Great Britain with GPS and gravity data. The gravity data was a mixture of measured values and predicted values obtained using BGS software. Thanks are due to Martina Sacher of Bundesamt für Kartographie und Geodäsie (BKG) who used this information to create a new transformation between Ordnance Datum Newlyn (ODN, the GB national height system) and the UELN, and also for computing the geopotential heights for these points.

ECGN meta-data forms for the stations at Newlyn (NEWL) and Herstmonceux (HERS) have been submitted by the IESSG (Institute of Engineering Surveying and Space Geodesy) at the University of Nottingham. Data for NEWL and HERS are available to ECGN through the EPN.

5 BIGF British Isles GPS archive Facility

The British Isles GPS archive Facility (BIGF) is operated from the IESSG, with funding from the UK Natural Environment Research Council (NERC), until at least 2009. Figure 2 shows the current network.

BIGF is the long-term national archive for GPS data, from a continuously recording network of (currently) 123 stations sited throughout mainland UK. This network comprises 95 Ordnance Survey of Great Britain active stations, 3 Ordnance Survey Northern Ireland active stations and 25 scientific stations. The scientific stations have been established by various agencies and organisations, who are: Defra; the Environment Agency; the Met Office; the National Physical Laboratory; NERC Proudman Oceanographic Laboratory; NERC Space Geodesy Facility; the University of Newcastle upon Tyne and the IESSG. Data are provided and transmitted free-of-charge to the archive by these collaborators, with whom long-term agreements to supply are in place.

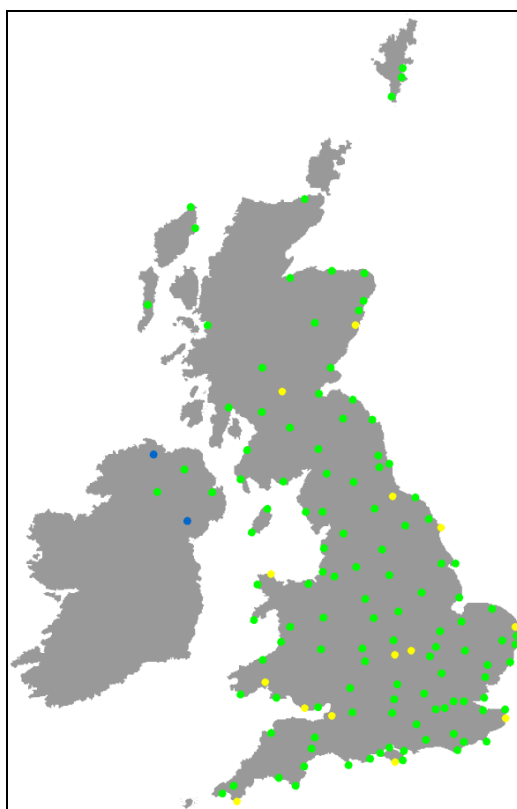


Figure 2. The BIGF Network, May 2006. Green = active, yellow = historical data available, blue = planned data

Cumulative demand on the archive since its inception in 1998 has exceeded 500,000 site days by 2006. More importantly the number of scientists annually making use of the archive increased from 4 to more than 150 over the same period. This growing user base has elevated BIGF's profile in the scientific community, increasing the possibilities for infiltration of new scientific fields, the enabling of new applications, and cross-fertilisation and collaboration between experts in satellite positioning technology and experts in other disciplines.

During this period there has been a steady net growth in the BIGF network to the current live complement of 123 stations (a further 17 have ceased operation but data are preserved in the archive). The current status of the network is shown on the map in Figure 2.

In 2005/6 there were seven major users of BIGF data:

- Rutherford Appleton Laboratory researching the impact of space weather on communications and navigation systems.

- the Met Office for research into near real-time estimation of atmospheric water vapour content.

- the IESSG for research on vertical land movements at tide gauges, as part of UK-funded work being carried out in collaboration with NERC Proudman Oceanographic Laboratory, and EC-funded work being carried out as part of the European Sea Level Service (ESEAS).

- the University of Newcastle upon Tyne for research into ocean tide loading, funded by the RICS.

- the Geodetic Observatory Pecny (GOPE) in the Czech Republic, for research on near real-time tropospheric water vapour estimations as part of EC COST Action 716.

- the Geodetic Institute of the Norwegian Mapping Authority, for research into the of GPS humidity measurements in meteorology, the TOUGH project, funded by the EC under Framework 5.

- the University of Bath for research into real-time ionospheric imaging, funded by PPARC.

Other research supported by archive data in 2005/6 included, amongst many others:

Commercialisation of GAVA - Geospatial Acquisition, Visualisation and Analysis, a new tool for field-based scientists, funded by NERC.

Comparison of the ranging behaviour and habitat use of male and female red deer in the Eastern Highlands of Scotland, differential correction of GPS data from animal tracking collars.

Convective storm initiation.

Development of plant communities on restored salt marshes.

Modelling forest landscape dynamics in Glen Affric, Scotland.

Monitoring seismic hazard in the Mediterranean using GPS.

Rescue archaeology.

Riverine related flood defence, post flood and siltation surveys.

Sounding the atmosphere using the signals emitted by geodesic satellites.

Spatial and temporal aspects of foraging and elimination behaviour on semi-natural pasture.

Towards unification of the vertical datum in the UK.

Use of GPS ground station data in the determination of aircraft pressure error corrections for helicopters.

The long-term nature and increasing spatial density of the BIGF network lends itself to take on a facilitative role as an environmental laboratory, enabling the more incisive determination of spatially dependent environmental variables, and isolation of lower frequency components of parameters such as ocean tide loading and vertical land movement. The availability of three new active stations established by the Ordnance Survey of Northern Ireland increasing the spatial extent and utility of the archive, which is of particular importance to meteorological scientists.

Seven of the stations are part of the IGS and EPN (DARE, HERS, HERT, INVE, MORP, NEWL and NPLD) and four CGPS@TG stations contribute to the IGS TIGA Pilot Project (ABER, NEWL, NSTG and SHEE).

BIGF has a website at <http://www.bigf.ac.uk> providing detail of the archive's history, archive users, and the current network. Data can be requested using an online form at this site.

6 Gravity observations

In Spring 2005 SGF took delivery of an FG5 absolute gravimeter for permanent installation at Herstmonceux. This is a joint programme with Proudman Oceanographic Laboratory (POL) and will strengthen UK work in this field as well as providing what is hoped will be a stable series of gravity measurements to complement the high precision SLR and GNSS measurements from Herstmonceux. For instance, a small secular trend has been discovered in the Herstmonceux height series determined from analysis of 14 years of laser range data that may be a post-glacial rebound signal; a long series of gravity measurements will strengthen the interpretation.

During the summer of 2005 some familiarization tests were carried out and a few problems ironed out on the instrument whilst it was housed in one of the offices at Herstmonceux, pending permanent installation in a refurbished basement area. The refurbishment, linked to a general site-wide upgrade, was completed during April 2006 and commissioning and subsequent operation of the FG5 will begin immediately.