National Report of Great Britain

P. CRUDDACE[1] & M. GREAVES[1]

1. Introduction

The main focus of development within national geodesy during the past year has been in both the consolidation and development of the GPS and geodetic reference frame and utilities in the country. The Ordnance Survey's (Great Britain's national mapping agency) National GPS Network is the infrastructure which gives access to the national coordinate systems in Great Britain - ETRS89, OSGB36 National Grid and Ordnance Datum Newlyn (ODN). This report outlines these changes, the approach adopted to deliver access to the infrastructure and gives an overview of the future direction.

2. Current GPS and Geodetic Infrastructure

Since the mid 1990's, the Ordnance Survey (OS) has established a primary network of coordinated 'passive' GPS stations, as well as permanent 'active' stations, throughout GB. 2000 saw the completion of this network, although stations will be changed and updated in the future. The OSGM91 and OSTN97 geoid and transformation models enable ETRS89 to OSGB and ODN conversion respectively.

Active stations

The OS active GPS network consists of 30 permanently installed geodetic quality GPS receivers throughout Great Britain, figure 1 shows their distribution. Two of these stations are actually owned and operated by the Isle of Man Government and a further nine by the General Lighthouse Authority. Most locations in Great Britain are within 75 km of at least one active station, and several serve major urban areas. All of the active stations record dual-frequency GPS data 24 hours a day at 1Hz, although at present only data every 15 seconds is automatically piped to the central server in Southampton. One-hour packets of data from each active station are sent via ISDN lines every hour for internal and external access approximately 18 minutes after the end of each hourly period, for post processing applications. The availability of 1Hz data is planned during 2001.

Fig. 1: Distribution of Ordnance Survey's active stations.

The OS is looking to establish a sub-set of its' active stations as permanent EUREF stations in 2001.

The active network stations are monitored daily to ensure the quality of the raw GPS data and the resultant coordinates. This is carried out using the Bernese software in a weekly semi-automatic process once the precise orbits are available. Figure 2 shows the time-series of a station on the Isle of Wight, showing the definite need for this monitoring! Here the station, established on a lighthouse, has started to move with a velocity of 16cm / year in a southerly direction. This is believed to be caused by saturation of the ground as a result of heavy rains in October / November 2000.

Passive stations

OS now has a network of over 1,000 passive GPS stations throughout Great Britain. The passive GPS stations are a series of ground marks in accessible locations and the precise ETRS89 coordinates of all of them are monitored and re-measured on a five-year cycle. A typical location in Great Britain will have several of these passive stations within 20–30 km. The National GPS Network website, detailed below, includes a searchable database of all passive stations, including precise geodetic coordinates, station metadata, maintenance and monitoring details, and – increasingly – photographs, location sketches and access information.

[1] Ordnance Survey, Romsey Road, Southampton, UK. SO16 4GU.
Tel: +44 (0)23 8079 2663 Fax: +44 (0)23 8079 2687 Email: pcruddace@ordsvy.gov.uk & mgreaves@ordsvy.gov.uk

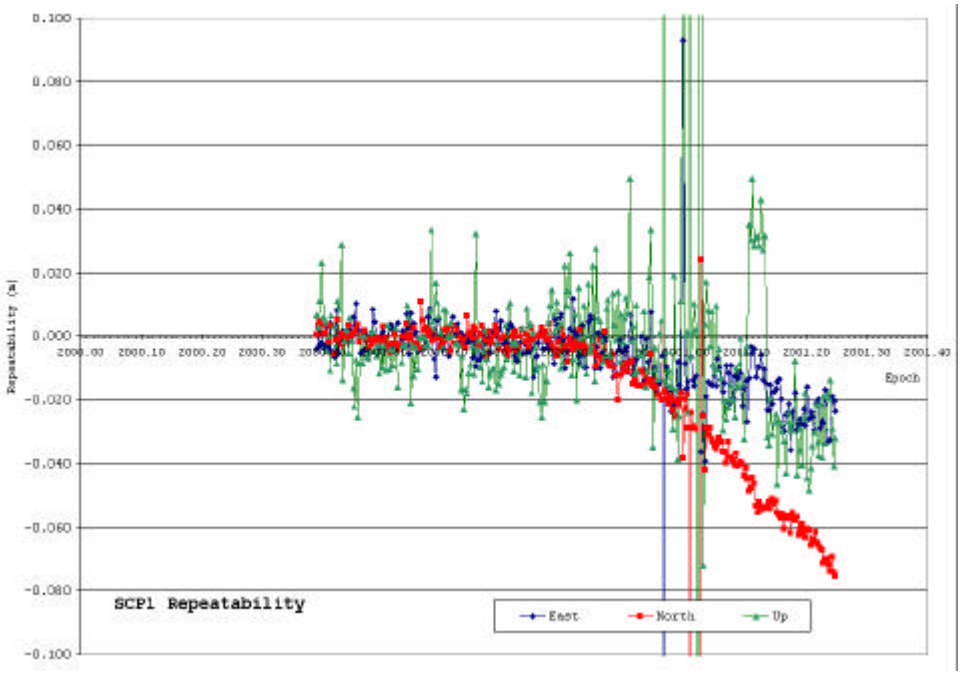

Fig. 2: Time series of the active station St. Catherine's Point on the Isle of Wight. The southerly movement is at a rate of 16cm /year.

OSTN97 and OSGM91

The transformation model (OSTN97) and geoid model (OSGM91) provide the linkage between ETRS89 coordinates and OSGB36 / ODN respectively. These models are being updated, detailed below.

3. Access to the Reference Frame and GPS Data

The National GPS Network website (www.gps.gov.uk) was established in 2000 to provide both internal as well as public access to the GPS infrastructure in GB. It is already a huge success with, as of May 2001, over 3,200 registered users and an average of 295 individual users per day. The decision has been made to offer these services free of charge to ensure compatibility and interoperability for all GPS users in GB. The website offers four key services:

- access to the active GPS network RINEX data server;
- the passive GPS station database;
- an online coordinate converter; and
- an information resource.

4. Ongoing Geodetic Projects

There is an ongoing series of geodetic and GPS based projects at OS, these are to improve the fundamental national reference frame and for internal investigations. Current projects include;

- The development of a new national geoid model, in conjunction with Ordnance Survey Northern Ireland and Ordnance Survey Ireland. This model aims to increase the current accuracy from 10cm (95%) to 1-2cm (95%) across land areas.
- The development of a new transformation model, the 'Definitive Transformation', see Greaves and Cruddace (2001) - *this volume*.
- The continued development of the OS GPS network website.
- The GPS pilot project is investigating the rollout of GPS equipment to the ~500 OS field surveyors.
- The OS is investigating the possibility of establishing a nation-wide RTK correction service.