



Sheetlines

The journal of
THE CHARLES CLOSE SOCIETY
for the Study of Ordnance Survey Maps

“Is Britain on the move?”

Mark Greaves

Sheetlines, 107 (December 2016, pp.2-3)

Stable URL:

<http://www.charlesclosesociety.org/files/Issue107page2.pdf>

*This article is provided for personal, non-commercial use only.
Please contact the Society regarding any other use of this work.*

Published by
THE CHARLES CLOSE SOCIETY
for the Study of Ordnance Survey Maps
www.CharlesCloseSociety.org

The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

Is Britain on the move?

Mark Greaves¹

Australia has recently announced a 1.8m shift in its mapping coordinates, to compensate for the country's 7.5cm shift north each year. Inevitably the question is why, and could the same thing happen here?

In Australia, the shift is to take into account the growing difference between maps (and the coordinate reference system they're based on) and the system used by satellite positioning (GPS). It's a fact that the world is constantly shifting on tectonic plates, but maps (and their users) like fixed coordinates that don't change. Before GPS, this was simple to achieve as most positioning and mapping was created from fixed ground points in a coordinate reference system tuned to a particular country. In Great Britain our fixed points included the very familiar trig pillars and we have a mapping coordinate reference system called OSGB36 National Grid which is fitted closely to our little bit of the Earth. Tectonic plate movements had little or no impact on the mapping coordinates or fixed points because they all moved "as one" and generally stayed the same shape.

GPS is a global system and requires a coordinate reference system that has a good average fit to the whole Earth, and also has to change to keep up with the shifting of tectonic plates – it is effectively 4D (3D + time). The GPS coordinate reference system is WGS84 and is perfect for GPS, but perhaps not ideal for large- or mid-scale mapping because it moves (albeit slowly). Also for WGS84 the fixed point is not trig pillars on the ground, but satellites in orbit at approximately 20,000km and travelling at approximately 14,000kmph!

The differences between regional systems, such as OSGB36 and WGS84 means that GPS-derived coordinates have to go through a mathematical operation, known as a transformation, in order to fit them correctly on the map. Australia's mapping system was updated in 1994, and fixed to the ground at that time, to be directly compatible with WGS84. However time and tectonic plate movement have taken their toll, and the mapping system and WGS84 have now drifted apart to a level that might be noticeable to a wider group of users other than geodesists and geologists. Hence everything now being dragged 1.8m to the north!

So, what's the position (forgive the pun) in Great Britain?

The situation for us (and most of Europe) is not so bad. Europe's GPS compatible datum, ETRS89, is fixed to the European tectonic plate at the time 1 January 1989 and moves by around 2.5cm each year. In theory, GPS-derived coordinates are now about 70cm away from where they should be in the ETRS89 system.

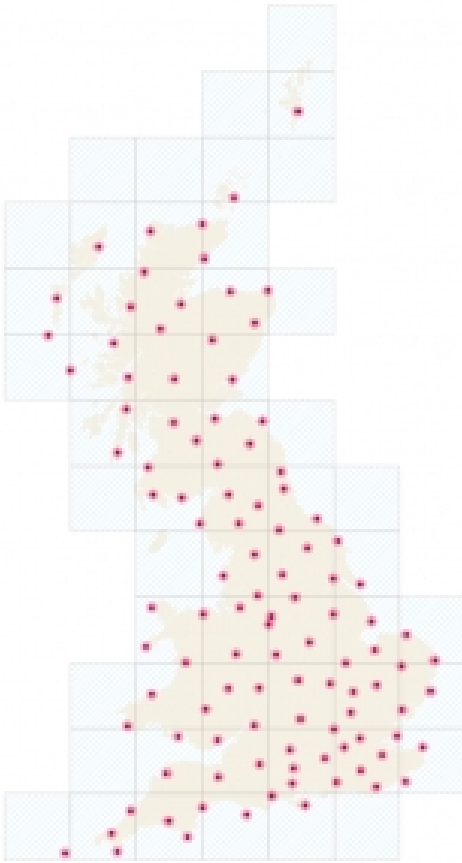
For most consumer users the 70cm difference is swamped by the accuracy limits of their receiver (phone, satnav etc) which are only accurate to within a few

¹ The author is Lead consultant - Geodesy at Ordnance Survey.

This article is reproduced by kind permission from the official OS blog of 2 August 2016.

<https://www.ordnancesurvey.co.uk/blog/author/mark-greaves/>

metres. So the difference is not noticeable if you're out walking, or driving around the country.



OS Net locations across Britain

For professional users, like OS surveyors, a correction service is used with the GPS to get centimetre-level accuracy. We use OS Net. This means they are automatically positioned in ETRS89 via the correction service so the 70cm drift is accounted for. A transformation is then used to get from ETRS89 to OSGB36 National Grid to be compatible with OS maps.

Clearly though, the problem of WGS84 drift relative to the mapping system is not unique to Australia and will eventually effect all countries. The drift happens at a constant rate but the increased use of GPS, plus other satellite positioning systems and the associated receivers becoming more accurate, means that the drift is likely to become more noticeable to more users.

What's the answer?

There are a number of options. Mapping in each country could stay on a "local" system such as OSGB36, then an additional transformation could be employed to first go from WGS84 to ETRS89 and then on to OSGB36. Or all mapping could be based on ETRS89 and simply keep the time evolving WGS84/ETRS89 transformation. Or, transform all mapping to a WGS84 compatible system (at a certain point in time) and have coordinate jumps every few decades to keep up with WGS84. This is not an ideal answer and it seems Australia are only doing this once before implementing another system in 2020.

An alternative might be to have a dynamic "4D" coordinate system that constantly evolves like WGS84 and users become used to all coordinates and map data having a time stamp plus the availability of a transformation to bring coordinates into a common time frame if so desired.

For now, Ordnance Survey, and other mapping agencies in Europe, are all planning for the future when this becomes an issue and will be considering, in consultation with users, the best way to deal with it.