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Monitoring for long-term and short-term site instabilities at the SGF, Herstmonceux

M. Wilkinson, R. Sherwood, T. Shoobridge, J. Rodriguez, and G. Appleby
NERC Space Geodesy Facility, Herstmonceux, United Kingdom (matwi@nerc.ac.uk)

New technical challenges placed on ground-based geodetic observatories by the scientific goals of IAG's GGOS initiative have led the Space Geodesy Facility (SGF) in Herstmonceux UK to carry out a programme of hardware upgrade and capability expansion. In recent years the SGF Satellite Laser Ranger has been upgraded to operate at kHz rates, and both IGS GNSS sites have had new receivers installed. An active hydrogen maser time and frequency source now drives the SLR event timer and the HERS Septentrio GNSS receiver. In 2006 the SGF commissioned and permanently installed an FG-5 absolute gravimeter and a programme of research is underway to compare the gravity signals to the geodetic results from analyses of the SLR and GNSS observations. Co-location of these independent geodetic techniques brings to the facility an added significance and responsibility in the formation of the International Terrestrial Reference Frame. Consequently, inter-technique site-ties, which are made every few years by site survey to a precision of a few mm, are crucially important. If, however, the site itself is to some degree 'unstable' this would not only impact on the measurements from each technique but also introduce errors in to the published site-ties.

In order to monitor potential instability at the site, two independent measurement programmes are carried out. A campaign of digital leveling began in 2010 to measure at intervals of a few weeks the relative heights of each technique monument. From the nearly two years of data accumulated to date, well-defined annual height variations of magnitude $\pm$ 0.5mm have been discovered between certain monuments. Of particular interest is the steel tower holding the HERS GNSS site which has a lower and an upper leveling monument. Additional short campaigns of digital levelling at hourly intervals were carried out to investigate potential sub-daily motions in association with measurements of tower temperatures at different points on the structure.

Daily GPS solutions using the GAMIT software for the short baseline between the HERS and HERT GNSS sites reveal an annual variation at the few mm level. To investigate further any short-term variations of this baseline, high rate GPS analysis was carried out using the TRACK software.

The results to date from these two measurement and analysis programmes will be discussed in this poster.