1 Introduction

The International Terrestrial Reference Frame (ITRF) origin is determined exclusively from LAGEOS-1 and 2 Satellite Laser Ranging (SLR) data despite the unbalanced network of ground stations. We present kinematic geocentre motion estimates obtained by homogeneous reprocessing of SLR observations from seven satellites. The effect of the network configuration on the solution is also investigated.

2 Data and Network

Normal point (NP) data are provided by the two International Laser Ranging Service (ILRS) data centres and spans a period of 13 years (2000–2013). Table 1 lists selected orbital and technical characteristics of the geocentric satellites included in the study.

Two sets of weekly solutions are derived for the multi-satellite combination using different network configurations, namely the full network comprising 80 interminently operating tracking stations and a reduced network of 20 core stations (Figure 1). The latter are chosen based on performance, observational history and location in order to improve the network geometry without drastically reducing the number of sites and measurements.

3 Analysis Strategy

A translational geocentre offset is estimated weekly along with an Earth orientation parameters (EOPs), geopotential coefficients and satellite-specific orbital parameters. Station positions are fixed to their Satellite Laser Ranging Frame 2008 (SLRF2008) values. The procedure is termed the kinematic approach (Kang et al., 2009). Table 2 describes the solution parameterisation.

4 Kinematic Estimates

A model comprising an offset, a trend and sinnoids with annual and semi-annual frequencies is fitted to the geocentre motion time series using the maximum likelihood estimation (MLE) algorithm implemented in CATS (Williams, 2008) with the results shown in Figure 2. The stochastic model consists of white noise and flicker noise.

5 Annual Signal Comparison

The annual amplitude of the axial geocentre coordinate is larger than past estimates, but agrees with them at the two sigma level (Table 3). Table 3: Comparison of SLR annual geocentre motion estimates from various studies. The amplitude A and phase  are followed by: (IERS2010) (A) or (IERS2008) (B), where A is in cm and  is in years. Quoted uncertainties are 1σ.

6 Conclusions

- The kinematic approach is robust. Changes in the network configuration resulting from ignoring low-performing stations only marginally affect geocentre motion estimates at the annual frequency. Appropriate station weighting is important for quality results.
- The impact of the network effect is most significant on the X component of the geocentre vector.
- The time evolution of the station distribution along the X-axis appears to exhibit seasonal variations in the full network. This behaviour is partly due to low-performing stations as it is attenuated when using a core network.