

Graham Appleby, Peter Dunn, Toshimichi Otsubo, José Rodríguez

### **Accuracy of adopted centre of mass corrections for the Etalon geodetic satellites**

Modern SLR systems are in principle capable of providing ranges with an accuracy and precision approaching the millimetre level. However, this capability can only be effectively utilised if centre-of-mass (CoM) models are available to compute the relevant CoM corrections with comparable levels of accuracy. CoM values depend on the target characteristics, the detection hardware, the intensity of the detected pulses, and the post-processing data reduction strategy. Station- and time-dependent CoM corrections are available for the geodetic targets used by the ILRS for its contribution to the realisation of the ITRF. These values are based on theoretical considerations, empirical determination of the satellite optical response functions, and knowledge of the tracking technology and observation policy employed. We have computed reference frame solutions using SLR observations to the LAGEOS and Etalon satellites for the period 1996-2014, estimating range errors along with station coordinates. We find unexplained, cm-level positive biases for the Etalon satellites in the case of many stations operating at high energy return levels. This, along with analysis of the range bias time series of stations that have undergone transitions through different modes of operation, provide evidence suggesting that the current CoM values for some systems is inadequate. We discuss the factors limiting the accuracy of the current CoM modelling and discuss some improvements, relevant not only for the specific Etalon case discussed here, but also for the upcoming LARES CoM correction tables.