Geophysical Research Abstracts
Vol. 19, EGU2017-14650-1, 2017
EGU General Assembly 2017

Temporal variability and coloured noise of SLR translations with respect to the ITRF2014 origin

Anna Riddell (1,2), Matt King (1), Christopher Watson (1), Roelof Rietbroek (3), Yu Sun (4), and Riccardo Riva (4)

(1) University of Tasmania, Hobart, Australia , (2) Geoscience Australia, Canberra, Australia, (3) University of Bonn, Bonn, Germany, (4) Delft University of Technology, Delft, Netherlands

Inferring large-scale environmental change, such as of sea-level change, glacial isostatic adjustment or ice sheet volume change (i.e. from altimetry), requires a geodetic reference frame stable to $\sim$0.1 mm/yr. Since 1988, each iterative improvement in the precision of the International Terrestrial Reference Frame (ITRF) has enabled significant advancement of scientific and technical research in the Earth sciences. We demonstrate the occurrence of coloured noise in the translation components between the SLR network and the long-term ITRF2014 origin from 1993.0 to 2015.0 with power law spectral indices close to -1, where white-noise-only linear trend uncertainties are underestimated by a factor of five in contrast to power-law linear trend uncertainties. The observed geocentre motion is expected to be influenced by the SLR observing network, known as the "network effect". Temporal translations in the SLR network may not necessarily average out over long time periods and therefore have the potential to shift the computed reference frame origin from the true long term centre of mass. Comparison with geophysical loading models demonstrates that the variability cannot be fully accounted for by surface mass transport such as changes in atmospheric, hydrologic or glacial loading. Our results demonstrate that the proportion of variance explained by geophysical surface loading is less than 50% in each translational component. Evidence of temporal variability in both the SLR amplitude and trend of the annual signal suggest that a different coloured noise model be considered in place of, or as an extension of, the traditional linear and white-noise-only model to represent the long-term average centre of mass.