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Reference Frames for science and society and the fundamental contribution of Satellite Laser Ranging to the ITRF.

Continuous Earth observation is fundamental to quantifying and understanding changes that affect our Earth system. Global space geodesy is the key science that measures and quantify the Earth changes in space and time, and the only science that provides the standard reference, or the global terrestrial reference frame, against which these changes are properly referenced and quantified. One of the key requirements of a reference frame is the stability overtime of its defining parameters, at a level at least two times higher than the uncertainty of the measured quantities. The International Terrestrial Reference Frame (ITRF), developed over the past three decades, relies on the availability of continuous geodetic data and products of the four techniques (SLR, VLBI, GNSS, DORIS), but also core co-location sites where multiple geodetic instruments are operated. SLR is the unique technique that is used to define the long-term origin of the ITRF with respect to the Earth Center of Mass, and in combination with VLBI, its long-term scale. The long-term stability of these two ITRF defining parameters are highly critical for Earth science applications, so that any bias in these parameters would contaminate the geodetic observations that rely on the ITRF usage. After illustrating the importance of reference frames for science and society, the paper will critically address the fundamental contribution of satellite laser ranging to the ITRF, through the results of ITRF2014.