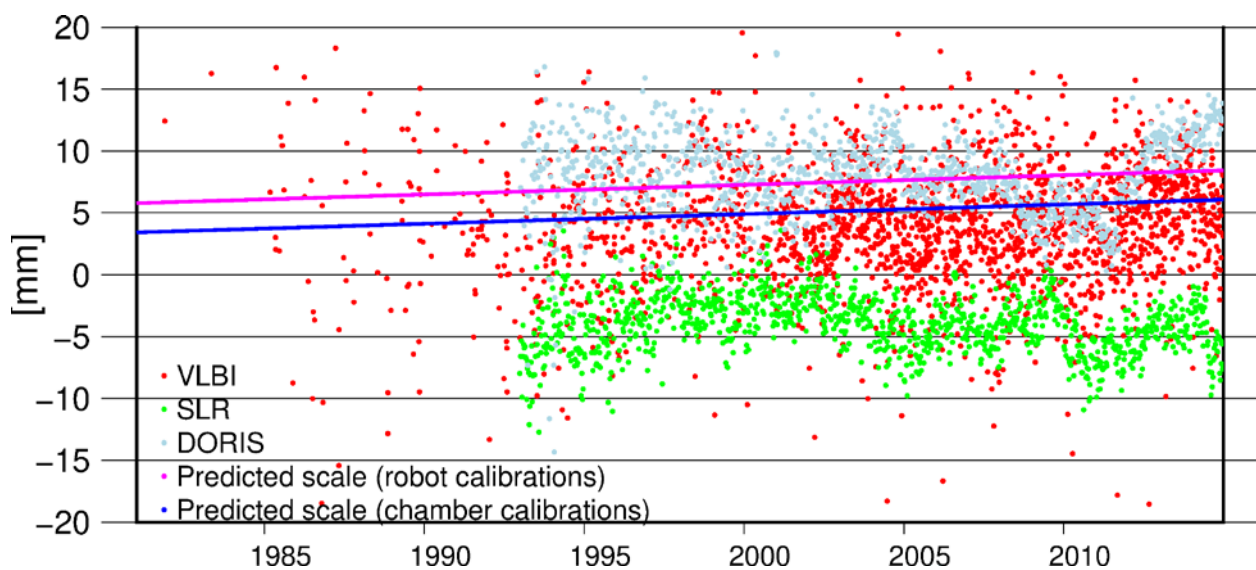


Scale of Global Reference Frames from Galileo Data

The Astronomical Institute of the University of Bern (AIUB) is part of the Center of Orbit Determination in Europe (CODE). CODE processes and analyses observational data from a world-wide distributed network of GNSS stations. The stations are operated by many institutions and are publically accessible through the International GNSS Service (IGS). Observing and monitoring individual points (stations) over more than a quarter of a century allows to make conclusions on the Earth's constitution. One of the important task for global reference frames is do determine its scale. Galileo can play a critical for the scale determination.

The AIUB is a charter member of the IGS which sets itself the target to freely provide to the public the foundations of Geodesy based on satellite navigation. In 2011 the first satellites of the European Satellite Navigation System Galileo were launched, completing its full constellation with 24 satellites by 2019. As the first global navigation satellite operator the European GNSS Agency (GSA) published metadata of the navigation satellites comprising among others chamber calibrations of the satellite's antennas. In cooperation with the Institute for Geodesy and Geo-Information of the University of Bonn as well as Geo++, the Society for Satellite-based Geodetic and Navigational Technologies mbH, which provide corresponding chamber and robotic calibrations of Galileo receiver antennas, we were able to analyse the adequacy of calibrated ground- and satellite-based antennas for the determination of the scale of the global reference frame for the Earth and to publish the results. This study reveals that GNSS can in fact be used to determine the scales of global coordinate systems when the antenna calibrations are available for the ground and space segment. Up to now only GPS and GLONASS were used for the determination of the International Terrestrial Reference Frame (ITRF). Due to the lack of their satellite antenna calibrations GNSS could not contribute to the scale determination. When realizing the previous ITRF the scale was determined by using Satellite Laser Ranging (SLR) and Very Long Baseline Interferometry (VLBI). Thanks to the Galileo satellites GNSS could now provide for the first time an important and independent contribution to the determination of the scale for realizing a new reference frame.



Villiger, A., R. Dach, S. Schaer, L. Prange, F. Zimmermann, H. Kuhlmann, G. Wübbena, M. Schmitz, G. Beutler, A. Jäggi; 2020: GNSS scale determination using calibrated receiver and Galileo satellite antenna patterns. *Journal of Geodesy*, 94, 93 (2020) DOI 10.1007/s00190-020-01417-0