21. November 2017 – Geodesy in the Drop Tower

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Very long baseline interferometry for geodetic applications

Abstract
Astronomers and geodesists have been cooperating already for quite a long time for common purposes such as positioning and navigation. This applies even more so today with the only difference that now radio telescopes are employed for establishing highly precise terrestrial and celestial reference frames and for monitoring Earth rotation and tectonic activities. The technique for this is very long baseline interferometry (VLBI) initially invented to increase the resolution of maps of extra-galactic objects such as quasars and radio galaxies. It was realized quickly that this technique could also be applied to geodetic applications. Here, the delay in the arrival time of the radiation of these objects at two distant radio telescopes is employed as a measuring quantity and with many of them accumulated over a day, the geodetic parameters of interest can be deduced. The precision of the results is highly dependent on the bandwidth for recording the signals and on the agility of the radio telescopes for sampling the atmosphere in a rapid sequence.

Over the past several years the International VLBI Service for Geodesy and Astrometry (IVS) has been engaged in an effort to modernize all aspects of geodetic VLBI from observing systems and processes to correlation and analysis. The goals of the next generation system are to achieve: 1-mm position accuracy on global scales, continuous measurements of time series of station positions and Earth orientation parameters, and turnaround time to initial geodetic results of less than 24 hours. Strategies for achieving these goals include an increase in the number of observations per day, careful attention to reducing systematic errors, automation of operations and analysis, and increased use of eVLBI, a process whereby data are transmitted from antennas to the correlator electronically. This presentation will explain a variety of geodetic and astrometric aspects of VLBI, present some results, and describe the status of the VLBI Global Observing System (VGOS) with its future path of development.