



VLBI: A Fascinating Technique for Geodesy and Astrometry (Vening Meinesz Medal Lecture)

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Since the 1970s Very Long Baseline Interferometry (VLBI) has proven to be a main space geodetic technique by determining precise coordinates on the Earth, by monitoring the variable Earth rotation and orientation with highest precision, and by deriving many other parameters of the Earth system. VLBI provides an important linkage to astronomy through, for instance, the determination of very precise coordinates of extragalactic radio sources. It even contributes to determining parameters of relativistic or cosmological models. After a short review of the history of geodetic VLBI and a summary of recent results, the presentation will deal with future perspectives of this fascinating technique. The International VLBI Service for Geodesy and Astrometry (IVS) is well on its way to fully defining a next generation VLBI system, called VLBI2010. The goals of the new system are to achieve 1-mm position and 0.1-mm/year velocity accuracy over a 24-hour observing session. Continuous observations shall be carried out in the future, that is observing 24 hours per day seven days per week, with initial results to be delivered within 24 hours after taking the data. Special sessions, e.g. for monitoring the Earth rotation parameters, should even provide the results in near real time. These goals require a completely new technical and conceptual design of VLBI measurements. Based on extensive simulation studies, strategies have been developed by the IVS to significantly improve its product accuracy through the use of a network of small (~ 12 -m) fast-slewing antennas. A new method for generating high precision delay measurements and improved methods for handling biases related to system electronics, deformations of the antenna structures, and radio source structure have been developed. Furthermore, as of December 2010, the construction of twelve new VLBI2010 sites has already been funded, with good perspectives for one dozen more antennas, which will improve the geographical distribution of geodetic VLBI sites on Earth and provide an important step towards a global VLBI2010 network.