VLBI2010 Monte Carlo simulations at IGG Vienna

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Main goal of VLBI2010 is to design a new Very Long Baseline Interferometry (VLBI) system that will provide baseline length repeatabilities of less than 1mm for the longest baselines in the network. To support the design of a new geodetic VLBI system, VLBI2010, simulations are carried out at the Institute of Geodesy and Geophysics (IGG), Vienna. Main part of these simulations is a Monte Carlo simulator which produces artificial group delays by modeling the stochastic processes caused by station clocks, wet zenith delays and additional system errors. The limiting factor of the VLBI system is the influence of the wet zenith delay. Therefore, turbulence models using wind speed and wind direction information from numerical weather models are used in the Monte Carlo Simulator to simulate realistic wet zenith delays. The clocks are simulated with a random walk plus integrated random walk. The Monte Carlo simulator is implemented in a modified version of the VLBI analysis software package OCCAM. Because of limitations due to the huge number of observations in the OCCAM Gauß-Markov algorithm, the Kalman Filter approach of OCCAM was applied. Baseline length repeatabilities and rms values of station position residuals are compared for schedules with antennas of different slew speeds (from 1.5 °/sec to 12°/sec in azimuth and 0.7 °/sec to 3.1 °/sec in elevation). The investigation shows that there is hardly any improvement with antennas faster than 6°/sec in azimuth and 2.1°/sec in elevation. Different scheduling strategies, such as those achieving uniform sky coverage, are also tested.