Optimizing VLBI scheduling with VieSched++

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Creating an observing plan, the so-called schedule is an integral part of every Very Long Baseline Interferometry (VLBI) experiment. The schedule is basically a table which lists for each station which radio source should be observed during which time and how these observations should be recorded. A typical 24 hour long VLBI session contains roughly one thousand scans of multiple telescopes at a time observing a selection of about one hundred different sources. When a schedule is created, it is up to the scheduler to decide which sources should be observed. Therefore, the number of possible schedules is extremely high and can be exploited for optimization. Nowadays most geodetic VLBI sessions are scheduled using a software called sked, which is maintained and updated by NASA Goddard Space Flight Center.

The Department of Geodesy and Geoinformation at Technische Universität Wien recently developed a new scheduling tool called VieSched++ as part of the Vienna VLBI and Satellite Software (VieVS) but for a change written in C++. VieSched++ features an elaborate backward fill-in mode for optimizing the number of observations and runs multiple versions of the same schedule in a fast batch mode. Large scale Monte-Carlo simulations are then used for selecting the best schedule for the purpose of the session within this sample. To test the benefits of VieSched++, several official International VLBI Service for Geodesy and Astrometry (IVS) sessions were scheduled. Here, we will present our results with special a focus on session T2129. It is a session with 15 stations with the goal to provide high-quality station coordinates for the terrestrial reference frames. Scheduling this session is particularly demanding because almost all stations are located at the northern hemisphere in Europe or Asia and only two stations are located in the southern hemisphere. Especially including OHIGGINS in Antarctica in the remaining network is a serious challenge for the scheduling software due to its remote location and low sensitivity. However, Monte-Carlo simulations show that especially observations with OHIGGINS will improve the accuracy of the coordinates for all stations making observations with OHIGGINS a dominating factor for highest accuracy. By using VieSched++ and creating a schedule especially designed for this session it was possible to double the total number of observations compared to previous schedules while also providing a high number of observations with OHIGGINS. Therefore, we expect a significant improvement in the results of this session.