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Geodetic VLBI Intensive scheduling based on singular value decomposition

Judith Pietzner and Axel Nothnagel
University of Bonn, IGG, Bonn, Germany (pietzner@igg.uni-bonn.de)

The scheduling of Very Long Baseline Interferometry (VLBI) observing sessions is a crucial step to obtain reliable results with the best possible accuracy. At present, there is no clear strategy for the scheduling of VLBI Intensive sessions for the purpose of dUT1 determination. Here, a new approach for scheduling one hour long Intensive VLBI sessions is presented based on singular value decomposition (SVD).

The SVD is a tool that enables a detailed analysis of a matrix $\mathbf{X}$ by the decomposition into three matrices that contain the singular values as well as the left-singular vectors (a basis for data space of the matrix $\mathbf{X}$) and the right-singular vectors (a basis for model space of the matrix $\mathbf{X}$). Assuming a least-squares adjustment of the observations for a given schedule, the Jacobian matrix containing the partial derivatives of the functional model with respect to the unknown parameters can be built. The parameters that are usually estimated for an Intensive are: zenith wet delay at both stations, one relative clock offset and one rate as well as the phase of the Earth's rotation, $\Delta UT1$.

Here we present preliminary results of the scheduling strategy based on SVD. By performing SVDs of the Jacobian matrix, the geometrical concept of projections onto the model space and the data space is used to derive indicators of how precisely the model parameters are determined from the observations and how well the adjusted observations match the original ones. Thereby, a schedule is obtained that is – in sense of a least-squares adjustment – optimal for the parameters that are presumably estimated. Thus, this strategy might improve the determination of the phase of the Earth's rotation.