In this thesis we consider a linear inverse problem $Ax \approx b$ with a smoothing operator A and a right-hand side vector b polluted by unknown noise. To find good approximation of x we can use large family of iterative regularization methods, which compute the approximate solution by projection onto a Krylov subspace of small dimension. Even though this projection has filtering property, the high frequency noise propagates to the Krylov basis, which causes semiconvergence of the methods. The knowledge of intensity of noise propagation is therefore necessary to find reasonably precise approximation of the solution.

In the thesis we study noise propagation in the Golub-Kahan iterative bidiagonalization and in the Lanczos algorithm, which construct the required Krylov subspace for LSQR and MINRES methods. For both methods, we analyze a noise-amplifying coefficient, for which we derive explicit formulas in both cases. For the Golub-Kahan bidiagonalization, this analysis summarizes the theory from multiple sources. Analysis for the Lanczos algorithm is original. For both methods, we derive explicit relations between noise-amplifying coefficients and residual norms. Several numerical experiments are presented to demonstrate properties of both algorithms. Impact of noise propagation on true errors and influence of finite-precision are also studied.