

# On the use of limited memory preconditioners for geosciences and aerodynamic shape optimization

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Geosciences and engineering problems require solving optimization problems with a large amount of data and expensive simulations, which requires specific attention to the computational cost of the overall process. The solution of these optimization problems requires solving a sequence of large linear systems. When the linear systems in the sequence are close by, it is possible to reduce the computational cost by using the historical data thanks to the limited memory preconditioner (LMP) framework. The aim of preconditioning techniques is to transform a linear system into a new equivalent system with a more favorable eigenvalues distribution. This helps to accelerate the convergence rate, thereby reduces the number of iterations. In this talk, we will first explain the idea behind the LMPs and then provide examples from geosciences especially the use of LMPs in the operational weather forecasting and the aerodynamics shape optimization.