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**Methods for the solution of very large flow-control problems that bypass open-loop model reduction**[1] PAOLO LUCHINI, Università di Salerno, THOMAS BEWLEY, University of California San Diego — The numerical discretization of the Navier-Stokes equations may easily lead to millions, or hundreds of millions, degrees of freedom. For the optimal control of such a problem, one is faced with either the solution of the full Riccati equation, numerically intractable for large systems, or with openloop model reduction, which may fail to capture the dynamics of interest. Here we present recent developments in our group about a third alternative: the Riccati-less solution of the unreduced optimal flow-control problem. These include a minimal-energy control algorithm based on the unstable eigenvectors alone, an iterative algorithm for the feedback kernel when the control is of much lower dimension than the state, and an iterative procedure for the leading eigenvalues and eigenvectors of the direct-adjoint Hamiltonian matrix that bypasses the solution of the Riccati equation.

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