Abstract Submitted
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Encapsulated formulation of the selective frequency damping method[1] BASTIEN JORDI, COLIN COTTER, SPENCER SHERWIN, Imperial College London — We present an alternative "encapsulated" formulation of the selective frequency damping (SFD) method. This (time-discrete) formulation makes use of splitting methods, which means that it can be wrapped around an existing time-stepping code as a "black box." Hence the implementation of a steady-state solver is very easy because the existing unsteady solver does not need to be modified. It is simply called each time-step and a linear operator (modelling a feedback control and a low-pass time filter) is applied to its outcome. The method is first applied to a scalar problem in order to analyse its stability and highlight the roles of the control coefficient and the filter width in the convergence (or not) towards the steady-state. Then we show that by knowing the most unstable eigenmode of a fluid flow, we can guarantee convergence of the SFD method towards the steady-state solution. Finally, we discuss the possibility of coupling the SFD method with an Arnoldi method. The goal is to approximate the eigenmodes of an unstable flow and then to adjust the parameters of the SFD method to ensure convergence towards the steady-state. We are currently using this approach to obtain a steady-state solution of co-rotating Batchelor vortices and we present our latest results.

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