General postprocessing for higher order hybrid temporal discretizations applied to transient Stokes problems

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We consider a hybrid temporal discretization of the time-dependent generalized Stokes problem, using a continuous Galerkin-Petrov method for the velocity and a discontinuous approximation for the pressure. The spatial discretization is based on inf-sup stable finite element pairs for velocity and pressure. A cascadic interpolation of the right-hand side of the generalized Stokes problem allows to apply a sequence of postprocessing steps to successively improve the temporal behavior of both the velocity and the pressure. This process yields two improvements: a higher order convergence rate and higher global smoothness. Moreover, if the spatial discretization is pressure-robust, this property is transferred to the post-processed solution.

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