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A novel, semilagrangian, coarse solver for the Parareal technique and its application to 2D fluid drift-wave (BETA) and 5D gyrokinetic (GENE), turbulence simulations J.M. REYNOLDS-BARREDO, Univ. Carlos III de Madrid, D.E. NEWMAN, Univ. of Alaska Fairbanks, R. SANCHEZ, Univ. Carlos III de Madrid, FRANK JENKO, Max-Planck-Institut fur Plasmaphysik EURATOM-IPP — Parareal is a new parallelization technique that focuses on the time coordinate in order to parallelize it and allows us to use more processors than conventional parallelization techniques would. Parareal is based on an iterative process with two stages in every one of the iterations: In a first predictor stage, a fast coarse time propagator gives an approximated solution for all time. In a second stage, an accurate time propagator is used in order to correct the solution. The key of the success in the application of the algorithm to an specific problem depends on choosing an adequate coarse solver. In this work, we apply Parareal to convection dominated problems. In particular, to a 2D fluid drift wave case using the BETA code and in a 5D gyrokinetic simulation using the GENE code. Here, a new and promising coarse solver based on semilagrangian time advance is proposed and tested on both kind of simulations. The advantage of the semilagrangian solver is that it can be split into a piece that can run in parallel (the computation of the interpolation coefficients) and a piece that is computed serially (the application of the coefficients over the convected field). The second piece is the time limiting part (due to its sequential character) but can be computed much faster than the fine solver.

David Newman
Univ. of Alaska Fairbanks

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