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A spectral multi domain decomposition method for computing the 2D backward facing step flow ARJUN JAGANNATHAN, MANHAR DHANAK, RANJITH MOHAN, Florida Atlantic University — A Chebyshev spectral domain decomposition method is developed for computing the characteristics of the 2D incompressible backward facing step flow at low to moderate Reynolds numbers. A step to channel height of 1:2 and an inlet channel of length twenty times the step height are chosen for the study. A total of five sub domains is used and an influence matrix technique is employed for carrying out the domain decomposition. The unsteady 2D Navier Stokes equations are solved in the vorticity-streamfunction formulation with an explicit second order Adams Bashforth time marching scheme. At the inlet, a parabolic velocity profile is initialized and the outflow boundary is located sufficiently far away from the step so that for the particular Reynolds numbers studied, the parabolic velocity profile is retrieved at the outlet. A non-reflecting boundary condition (cf. Jin and Braza, 1993) wherein we set the elliptic $(\partial^2/\partial x^2)$ terms in the governing equations to zero at the outflow boundary is found to work well for this purpose. Detailed steady state results for Reynolds numbers in the range 100 to 800 are presented and compared with other numerical and experimental results found in the literature.

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