Bernardi, C.; **Maday, Y.**; **Métivet, B.**

Calcul de la pression dans la résolution spectrale du problème de Stokes. (Computation of the pressure in the spectral approximation of the Stokes problem). (French) Zbl 0642.76037

Rech. Aérosp. 1987, No. 1, 1-21 (1987).

The authors analyse different spectral methods to treat the Stokes problem of creeping flows in a square or cube (subjected to periodicity or Dirichlet or mixed boundary conditions) in a unifying manner by means of Brezzi's and Raviarts' theory of mixed approximation. For the methods of spectral Galerkin as well as spectral collocation, compatible discrete spaces have been theoretically constructed and optimal convergence results have been obtained for any kind of the boundary conditions as above. Numerical test computations are not included. It is worth mentioning that the theory of mixed approximation is actually not required at least in the simplest case of the periodicity condition. Concerning this, see the second author and *A. Quarterioni*, SIAM J. Numer. Anal. 19, 761-780 (1982; Zbl 0503.76035) or *W. Borchers*, "Eine Fourier-Spektralmethode für das Stokes-Resolventenproblem" (to appear in Numer. Math.), where even the additional error due to evaluating the Fourier coefficients by the trapezoidal rule has been estimated.

Reviewer: F.-K.Hebeker

MSC:

76D07	Stokes and related (Oseen, etc.) flows
35Q30	Navier-Stokes equations
65N30	Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
65N35	Spectral, collocation and related methods for boundary value problems involving PDEs
65N15	Error bounds for boundary value problems involving PDEs

Keywords:

error analysis; Stokes problem; creeping flows; mixed boundary conditions; theory of mixed approximation; spectral collocation; optimal convergence results; Fourier coefficients