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Abstracts of Papers to Appear in Future Issues

A METHOD OF SELF-PURSUED BOUNDARY VALUE ON A BODY AND THE MAGNUS EFFECT CALCULATED WITH THIS METHOD. Fumio Yoshino, Tatsuo Hayashi, and Ryoji Waka, *Tottori University, Tottori, JAPAN.*

When the Navier–Stokes equations formulated in terms of stream function Ψ and vorticity ζ are numerically solved, we encounter the problem of determining the value of Ψ on a body in an external flow. Although this problem is especially important in cases with a shear flow, an unsteady flow, or a flow around a rotating circular cylinder, there are no efficient methods available which do not use empirical factors. The authors here propose a method of automatically determining the value of Ψ on a body with an arbitrary profile, without using any empirical factors (named the SPB method), and apply this method to the case of a rotating circular cylinder in a uniform shear flow. A comparison of the results by the SPB method with those by the method of fixing the value of Ψ on a body and by the conventional empirical method showed that the SPB method is very efficient and is applicable to both steady and unsteady flows. Of course, the method always satisfies the condition of single valuedness of the pressure term of the equation of motion. Through applying the SPB method to the case of a rotating circular cylinder in a uniform shear flow, the aerodynamic forces acting on the cylinder were obtained and the lift force was found to decrease as the velocity gradient of the shear flow increases when the rotational speed of the cylinder was kept constant.

COMPUTATION OF MHD EQUILIBRIUM OF TOKAMAK PLASMA (Review Article). Tatsuoki Takeda and Shinji Tokuda, *Japan Atomic Energy Research Institute, Ibaraki-Ken, JAPAN.*

Computation of the MHD equilibrium of a tokamak plasma is reviewed as comprehensively as possible. The basic equation of this problem is the Grad–Shafranov equation. General remarks on this equation and relating issues are, first, summarized with historical survey of the MHD equilibrium solution, where some mathematical discussions on the numerical analysis of the problem are also presented. Distinguishing features of this problem are seen in treatment of the boundary condition and constraining conditions and we describe them in a rather detailed manner. In the main part of this review paper we present a concrete description on the numerical procedures of the MHD equilibrium solvers which are classified into two groups, that is, the real space solvers and the inverse equilibrium solvers. We also describe topics on more general equilibrium models, that is, the equilibrium with steady flow, anisotropic equilibria, equilibria with specified current sources, and equilibrium evolution. Brief comments on three-dimensional equilibrium solvers are also presented. As for application of the MHD equilibrium solvers we present only a small part, that is, beta limit optimization, design of external coils, analysis of positional instability, and analysis of experimentally obtained data from electromagnetic measurement. It is concluded that among various kinds of numerical solution methods we can usually find most adequate ones for the present problem.

HIGH ACCURACY SOLUTIONS OF INCOMPRESSIBLE NAVIER–STOKES EQUATIONS. Murli M. Gupta, *George Washington University, Washington, District of Columbia, USA.*

In recent years we have developed high accuracy finite difference approximations for partial differential equations of elliptic type, with particular emphasis on the convection–diffusion equation. These approximations are of compact type, have a local truncation error of fourth order, and allow the use

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