MR1001236 (90g:35127) 35Q10 (76D99)

Deuring, Paul; **von Wahl, Wolf**

Das lineare Stokes-System in R^3. II. Das Außenraumproblem. (German) [The linear Stokes system in R^3. II. The problem of the exterior domain]

Bayreuth. Math. Schr. No. 28 (1989), 1–109.

This work is the continuation of Part I [same journal No. 27 (1988); MR0973249 (90c:35162)]. The following results are carefully established. The problem $-\nu\cdot\Delta\overrightarrow{u}+\nabla\pi=\overrightarrow{f}$, div $\overrightarrow{u}=0$ in $\mathbf{R}^3\setminus\overline{\Omega}$, $\overrightarrow{u}|_{\partial\Omega}=\overrightarrow{a}$ has a unique solution. The data are: the constant ν, the bounded domain $\Omega\subset\mathbf{R}^3$ ($\partial\Omega$ being $C^{2,\gamma}$), $\overrightarrow{f}\in L_1(\mathbf{R}^3\setminus\overline{\Omega})^3\cap L_p(\mathbf{R}^3\setminus\overline{\Omega})$ and $\overrightarrow{a}\in W^{2-1/p,p}(\partial\Omega)^3$, where $\frac{3}{2}<p<\infty$; the unknowns are u and π; $u\in L_s(\mathbf{R}^3\setminus\overline{\Omega})^3$ if $3<s<\infty$; π, the first and second derivatives of $\overrightarrow{u}$ belong to L_p. The proof of that theorem uses potentials and an integral equation. Moreover, the Helmholtz decomposition and, having chosen $a=0$ and $p=2$, arguments of that proof lead to the definition of a “Stokes operator” and to its properties; that operator is selfadjoint, which will later be applied to the linear Navier-Stokes system.

Reviewed by *Jean Leray*