relevant to the design of off-shore structures. There is a bias, however, towards the understanding of the complex problems that arise when the effects of viscosity are important and when loading is in the so-called drag/inertia regime. Nearly a third of the book is devoted to eight review papers that discuss wave environment as well as wave-induced forces. Research into wave-current interactions and the mechanics of breaking waves is reviewed and methods for calculating wave forces on large structures using diffraction theory are described. Forces measured on cylinders in planar oscillatory flow as well as in waves are presented and the role played by coherent vortex shedding is discussed. Analytical methods that are available, or are being developed, to calculate oscillatory flows past cylinders with vortex formation are also described. Other important aspects of the problem reviewed are the probabilistic approach to wave loading on structures in the sea and the flow-induced oscillation of underwater cables. The reviews are supplemented by a further 40 papers and together provide a useful contribution to the understanding of wave-induced forces.

CORRIGENDUM

Potential/complex-lamellar velocity decomposition and its relevance to turbulence

By RONALD L. PANTON

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There is an error in the above paper. There the velocity field is split into two parts employing a seldom used decomposition. One is a potential part, denoted by $\boldsymbol{\alpha}$, and the other is a complex-lamellar part, denoted by $\boldsymbol{\beta}$:

$$\mathbf{v} = \boldsymbol{\alpha}+\boldsymbol{\beta} \tag{1}$$

where

$$\boldsymbol{\alpha} = \nabla\phi \tag{2}$$

and

$$\beta.(\nabla\times\boldsymbol{\beta}) = 0. \tag{3}$$

Since $\boldsymbol{\alpha}$ is an irrotational vector, the vorticity $\boldsymbol{\omega}$ can depend only on the complex-lamellar part:

$$\boldsymbol{\omega} = \nabla\times\mathbf{v} = \nabla\times\boldsymbol{\beta}. \tag{4}$$

Equation (3) constitutes the definition of a complex-lamellar vector, i.e. a vector which is perpendicular to its own curl. This means that $\boldsymbol{\beta}$ will be perpendicular to the vorticity $\boldsymbol{\omega}$. In addition to the equations above, a further condition or restriction is required to make the decomposition unique. It is on this point that the paper is in error. To be specific, §4 of the paper contains a discussion of various local conditions which might be used to make the decomposition unique. In fact, it is not possible to apply a local condition at every point in the flow; this would overdetermine the decomposition.

The type of extra conditions which are allowed may be illustrated by casting $\boldsymbol{\beta}$ in terms of potentials and using a simple geometric illustration. The complex-lamellar component may be expressed in terms of two potential surfaces such that

$$\boldsymbol{\beta} = \psi\nabla\chi. \tag{5}$$

It turns out (as discussed in the paper) that surfaces where ψ and χ are constant are surfaces which contain the vortex lines. Thus, the intersection of a ψ and a χ

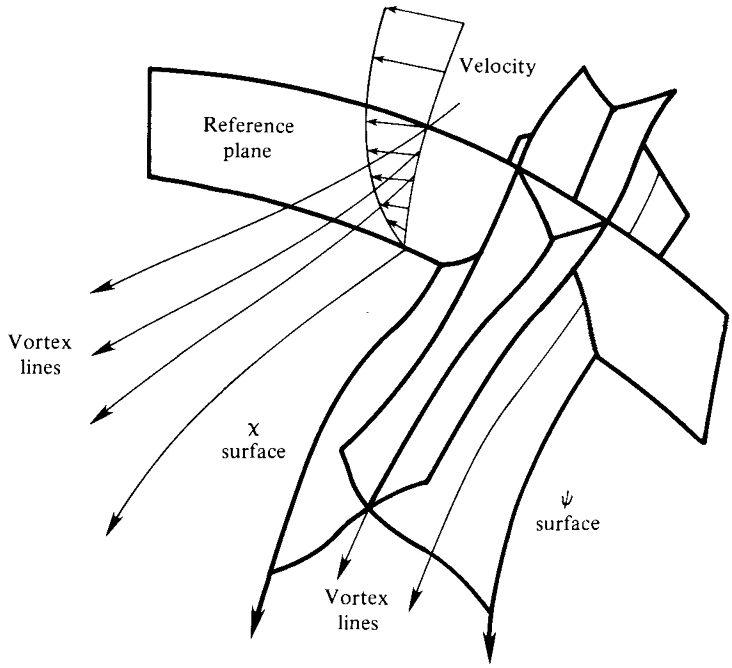

FIGURE 1. All vortex lines intersect the reference plane. Choosing χ and ψ lines on the reference plane determines the χ and ψ surfaces throughout the flow.

surface defines a vortex line. Now we consider a definite flow which is three-dimensional and, at a certain instant in time, has vortex lines as depicted in figure 1.

Assume that the flow velocity field, and hence the vorticity field, are completely known, and that a decomposition of the form (1) is to be made. First, a reference plane is chosen in such a way that all the vortex lines penetrate the plane only at points; that is the plane does not contain a finite length of any vortex line. This means that the reference plane is independent of the ψ and χ surfaces and that they must intersect the reference plane. There are an infinite number of ways two independent sets of surfaces may be chosen so that their intersections yield a given set of vortex lines. An appropriate uniqueness condition would be to fix the ψ and χ surfaces where they interesect the reference plane. For instance, any local condition on the reference plane might be employed to find a set of χ surfaces, then the corresponding ψ surfaces are fixed by the known vorticity and the equation

$$\boldsymbol{\omega} = \nabla \times \boldsymbol{\beta} = \nabla\psi \times \nabla\chi. \tag{6}$$

Once ψ and χ are determined on the reference plane, the surfaces are fixed throughout the flow as they must follow the same set of vortex lines as they move away from the reference plane. Thus, in a three-dimensional flow it is not possible to impose a local restriction to determine a unique set of ψ and χ surfaces. Once such a set is determined on a reference plane, the surfaces are essentially fixed for the entire flow field.

In the case of a flow which is two-dimensional, the reference plane may be taken as the plane of the flow and a local uniqueness requirement is allowable. For a three-dimensional flow a local uniqueness condition is too restrictive.

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