Acta Mech 226, 3563–3564 (2015)
DOI 10.1007/s00707-015-1442-z

ERRATUM

Patrick D. Weidman

Erratum to: Offset rotating plates in a uniformly rotating fluid

Published online: 28 August 2015

Erratum to: Acta Mech 226, 1123–1131 (2015)
DOI 10.1007/s00707-014-1239-5

We correct an error in the original paper concerning the angle of the locus of centers of rotation between two plates co-rotating at angular velocity Ω in a system uniformly rotating at angular velocity ω. Without background rotation, Berker [1] noted that the curve describing the centers of rotation projected on the horizontal mid-plane forms 45° logarithmic spirals and Weidman [2] erroneously stated that the same holds true with background rotation.

In [2], the problem is governed by the Reynolds number $R = h^2\Omega/\nu$ and the Coriolis parameter $\sigma = \omega/\Omega$. A careful analysis shows that the spirals are of constant angle, but they are not logarithmic spirals. We define the spiral angle ψ as the angle made when the locus of centers crosses a circle. This angle may be calculated from the slope $\mathrm{d}f/\mathrm{d}g$ where $f(\eta, \beta)$ and $g(\eta, \beta)$ are the solutions given in Eqs. (2.4) and (2.5) of [2] where $\alpha = \sqrt{R/2}$ is replaced by $\beta = \sqrt{(1 + 2\sigma)R/2}$. Evaluation of this slope gives the pleasingly simple formula for the spiral angles

$$\psi(R, \sigma) = \frac{\sinh\beta + \sin\beta}{\sinh\beta - \sin\beta}. \tag{1}$$

A sample plot of the Reynolds number variation of the spiral angles at the selected values $\sigma = \{-0.4, -0.35, -0.2, 0.2\}$ is given in Fig. 1. Also included is the limiting 45° angle achieved as $\sigma \to \infty$.

The online version of the original article can be found under doi:10.1007/s00707-014-1239-5.

P. D. Weidman (✉)
Department of Mechanical Engineering, University of Colorado, Boulder, CO 80309-0427, USA
E-mail: weidman@colorado.edu

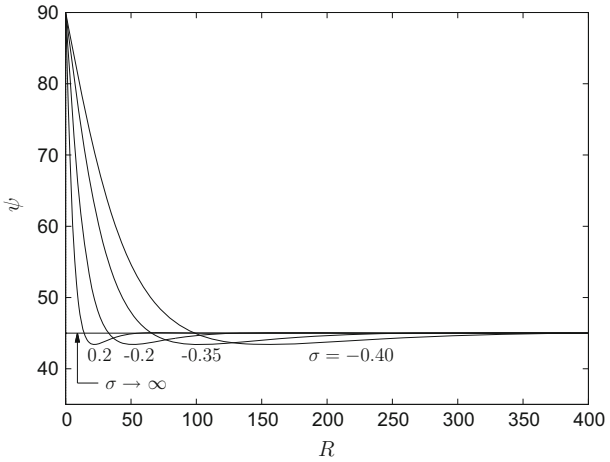

Fig. 1 Reynolds number variation of the angle ψ formed by the locus of centers calculated at the indicated values of σ. The limiting angle as $\sigma \to \infty$ is 45°

References

1. Berker, R.: Intégration des équations du mouvement d'un fluide visqueux incompressible. In: Flügge, S. (ed.) Encyclopedia of Physics, vol. VIII/2, pp. 1–384. Springer, Berlin (1963)
2. Weidman, P.D.: Offset rotating plates in a uniformly rotating fluid. Acta Mech. **226**, 1123–1131 (2015)