J. Plasma Physics (1989), *vol.* 42, *part* 3, *pp.* 531–532
Printed in Great Britain

CORRIGENDUM

Drift-kinetic stability analysis of z-pinches
J. Plasma Phys. vol. **41**, 1989, p. 45

By H. O. Åkerstedt
Department of Technology, Uppsala University, Box 534, S-751 21 Uppsala, Sweden

(Received 30 October 1989)

We report here some corrections to the above paper.

First there are some minor typographical errors. In (6a) and (8a) the term

$$\tfrac{3}{4}\gamma_4 \frac{p}{r^2}\hat{\xi}_r$$

should be replaced by

$$\tfrac{3}{2}\gamma_4 \frac{p}{r^2}\hat{\xi}_r$$

and the term

$$\gamma_3 \frac{p'}{r}\hat{\xi}_z$$

should be replaced by

$$\gamma_3 \frac{p'}{r}\hat{\xi}_r.$$

There are also two terms missing in the derivation of (6a). These result from the fact that the second-order angular drift frequency $\omega_D^{(2)}$ in

$$\omega_D = \omega_D^{(1)} + \omega_D^{(2)} = \frac{v_\varphi}{r} + 2\frac{v_\varphi}{r^2}\frac{v_\perp}{\Omega_0}\cos\phi$$

also yields a contribution of the same order as the other terms in (6a). One should therefore add to the right-hand side of (6a) and (8a) the terms

$$-2p\gamma_3'\frac{p}{r}\hat{\xi}_r - 2p\gamma_1'(\hat{\xi}_r' + ik\,\hat{\xi}_z).$$

Consequently, the quantities A_1 and C should be modified to

$$A_1 = \left(\gamma_3\frac{p}{r} - \gamma_1\frac{p}{r} - 2\frac{B^2}{r}\right)\left(\rho\omega^2 - \frac{m^2B^2}{r^2}\right) - (\gamma_1 p + B^2)\left(\rho'\omega^2 - 2\frac{m^2BB'}{r^2} + 2\frac{m^2B^2}{r^3}\right),$$

$$C = (\gamma_1 p + B^2)\left(-\rho\omega^2 2\gamma_3\frac{p}{r^2} - \gamma_3'\frac{p}{r} - 2\frac{BB'}{r} + \frac{m^2B^2}{r^2}\right)$$
$$- \left(\gamma_3\frac{p}{r} + p' + BB'\right)\left(-\gamma_1\frac{p}{r} + \gamma_3\frac{p}{r} - 2\frac{B^2}{r}\right).$$

These changes do not lead to any modifications in the analysis of the $m = 0$ mode, since then $\gamma_3' = 0$ and $\gamma_1' = 0$. For the $m = 1$ mode, however, the analysis does have to be modified. First of all, the boundary-layer equation becomes somewhat different. It now reads

$$\xi_z'' + \frac{1}{\eta}\xi_z' + \left(g_0 - \frac{1}{\eta^2}\right)\xi_z = 0,$$

the regular solution of which is $\xi_z = J_1(g_0^{\frac{1}{2}}\eta)$, $g_0 = g(0)$.

For the constant-current-density case there is only one turning point if $g_0 < 0$ ($\mathrm{Im}(\omega) > \omega_A$), and no turning point for $g_0 > 0$ ($\mathrm{Im}(\omega) < \omega_A$). In the limit of large k the turning point moves towards the boundary, meaning that the mode becomes more and more localized at the boundary. The growth rate in this limit becomes $\mathrm{Im}(\omega) = 3^{\frac{1}{2}}\omega_A$, i.e. the same as for perpendicular MHD.

For the Bennett profile we now find only one turning point $r_t(\omega)$ (previously two turning points were found), so that the mode is localized at $r < r_t(\omega)$. The dispersion relation (31) should then be replaced by

$$k\int_0^{r_t(\omega)} g^{\frac{1}{2}}\, dr = n\pi.$$

In the limit of large k, $r_t(\omega) \to 0$, meaning that the mode becomes localized at the axis. In this limit the growth rate can be found by solving $g(0) = 0$, giving $\mathrm{Im}(\omega) \approx 1{\cdot}4\omega_A$, which should be compared with the growth rate found from perpendicular MHD, $\mathrm{Im}(\omega_{\mathrm{MHD}}) \approx 2{\cdot}4\omega_{\mathrm{A}}$. The drift-kinetic model thus gives, for the Bennett profile, a reduction in growth rate, but the reduction is not as large as was reported earlier.