Erratum: Saturation of shape instabilities in single-bubble sonoluminescence [Phys. Rev. E 90, 013026 (2014)]

Mogens T. Levinsen

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Since publication of the original paper, I have noted an error in the derivation. Although the conclusions and main message of the original paper are still valid, an important coefficient in the main result was incorrect.

Within the approximations used in the paper, the boundary equation for the normal stresses to second order is

$$(p_1 - p_2)\left(1 + \frac{\epsilon^2 e^{-2i\phi}\Gamma(n+2)a_n(t)^2 Y_n^1(\theta,\phi)^2}{\Gamma(n)R(t)^2}\right) = \sigma\frac{2R(t)^2 + \epsilon(n^2+n-2)R(t)a_n(t)Y_n^0(\theta,\phi) - 2\epsilon^2(n^2+n-1)a_n(t)^2Y_n^0(\theta,\phi)^2}{R(t)^3}. \tag{1}$$

Within the approximation of a small disturbance this is equivalent to

$$(p_1 - p_2) = \sigma\frac{2R(t)^2 + \epsilon(n^2+n-2)R(t)a_n(t)Y_n^0(\theta,\phi) - 2\epsilon^2(n^2+n-1)a_n(t)^2Y_n^0(\theta,\phi)^2}{R(t)^3} \times\left(1 - \frac{\epsilon^2 e^{-2i\phi}\Gamma(n+2)a_n(t)^2 Y_n^1(\theta,\phi)^2}{\Gamma(n)R(t)^2}\right). \tag{2}$$

The second term in the last set of parentheses on the right hand side was forgotten in the derivation of Eq. (22). As this term already is a second order term, it only interacts with the zeroth order surface tension term Eq. (20) changing the second order part of this expression,

$$-2\sigma\epsilon^2 a_n(t)^2\frac{(n^2+n-1)Y_n^0(\theta,\phi)^2}{R(t)^3} \tag{3}$$

into

$$-2\sigma\epsilon^2 a_n(t)^2\frac{(n^2+n-1)Y_n^0(\theta,\phi)^2 + e^{-2i\phi}\Gamma(n+2)Y_n^1(\theta,\phi)^2/\Gamma(n)}{R(t)^3}. \tag{4}$$

Carrying through the calculations leading to the second order amplitude equation for $\ddot{a}_n(t)$ [Eq. (21)] using the truncated expansion $e^{-2i\phi}\Gamma(n+2)Y_n^1(\theta,\phi)^2 \sim d_n Y_n^0(\theta,\phi)$, we find that the term,

$$n^2(3n^2+3n-4)(n+1)^2\sigma c_n\Gamma(n), \tag{5}$$

in Eq. (22) should be replaced by

$$\sigma n^2(n+1)^2[(3n^2+3n-4)\Gamma(n)c_n + 2d_n]. \tag{6}$$

In the case of $n = 2$ [Eq. (24)], this corresponds to replacing 84σ with 120σ.

For the interactive case, leading to Eqs. (35) and (36), within the approximation used, there is no change in $\delta\ddot{a}_k(t)$.

The conclusions and main message of the original paper are still valid with the major effect of the correction being to lower the saturated values in the afterbounce region by approximately the ratio of 84/120 while leaving the R-T structures nearly unchanged. As the position and size of intervals where the excitations are observed are governed by the first order instability, nothing else is changed noticeably. This should in fact facilitate the observation of the instability as the bubble is less likely to burst.

There are misprints in Eqs. (30) and (31). $Y_k Y_n$ should be $Y_k^0(\theta,\phi)Y_n^0(\theta,\phi)$.

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