Erratum to: The upperbound of the volume expansion rate in a Lorentzian manifold

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In the paper, we considered the following differential equation [1, pp. 7–8] along a geodesic γ in a Riemannian manifold

$$\theta' + \theta^2 + s^M - s(H_t) - \text{Ric}(\gamma', \gamma') = 0, \quad (1)$$

where $s(H_t)$ and s^M denote, respectively, the scalar curvature of level hypersurface H_t and M at the point $\gamma(t)$ and $\theta(t)$ is the mean curvature of H_t along $\gamma(t)$.

To calculate the upperbound of the volume expansion rate along a timelike geodesic γ in a Lorentzian manifold, we used the above differential Eq. (1). But we neglected the sign when we take the trace of the Gauss equation (p. 408). Taking the sign of an unit speed timelike geodesic into account, Eq. (1) must be corrected to

$$\theta' + \theta^2 + s^M - s(H_t) + 3\text{Ric}(\gamma', \gamma') = 0$$

throughout the paper. As a consequence, we must correct the sentence “For the case of the negative Ricci curvature” (p. 405 below Eq. 7) to “For the case of the positive Ricci curvature”.

I express my deep sorriness to the Scientific Community and Gen Relativ Gravit for such errors.

The online version of the original article can be found under doi:[10.1007/s10714-009-0860-4](https://doi.org/10.1007/s10714-009-0860-4).

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