Erratum to “No Passing Zone (Redux): Horizon Chasing in Evaporating Black Holes via Ingoing Vaidya Coordinates”

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Article corrected: R. J. Beery III, *Reports in Advances of Physical Sciences* **9** (2025) 2550016, doi:10.1142/S2424942425500161.

Summary of correction

In Eq. (3) of the published article, the radial proper–time derivative was given with an incorrect sign. Starting from the ingoing Vaidya metric

$$ds^2 = -f\,dv^2 + 2\,dv\,dr + r^2 d\Omega^2, \qquad f := 1 - \frac{2M(v)}{r},$$

the timelike normalization reads

$$-f\left(\frac{dv}{d\tau}\right)^2 + 2\,\frac{dv}{d\tau}\,\frac{dr}{d\tau} = -1.$$

Defining $\lambda := dv/d\tau > 0$, the *correct* expression is

$$\frac{dr}{d\tau} = -\frac{1}{2\lambda} + \frac{f\,\lambda}{2}. \tag{1}$$

Let $\Delta := r - 2M(v)$. Using $d\Delta/d\tau = dr/d\tau - 2\,(dM/dv)\,\lambda$, we obtain

$$\frac{d\Delta}{d\tau} = -\frac{1}{2\lambda} + \frac{f\,\lambda}{2} - 2\,\frac{dM}{dv}\,\lambda. \tag{2}$$

Near the horizon $f \to 0$,

$$\frac{d\Delta}{d\tau} \approx -\frac{1}{2\lambda} - 2\,\frac{dM}{dv}\,\lambda. \tag{3}$$

For evaporation $dM/dv < 0$, Eq. (3) implies

$$\frac{d\Delta}{d\tau} > 0 \quad \Longleftrightarrow \quad 2\,|dM/dv|\,\lambda^2 > \tfrac{1}{2}. \tag{4}$$

Scope of impact

- The sign error affects Eq. (3) and statements that followed which claimed $d\Delta/d\tau > 0$ for all timelike trajectories. The corrected result is the conditional inequality (4).
- For large M with small $|dM/dv|$, the region where (4) holds is thin but nonzero close to the horizon. As M shrinks, the region widens.
- Section 5 (numerical example) should be interpreted or recomputed using (1) together with consistent initial data. For a particle released from rest at r_0, use $u^r = 0$ at the initial event which fixes $\lambda_0 = 1/\sqrt{f(r_0)}$ in ingoing Eddington–Finkelstein coordinates. The integration should evolve (v, r, λ) via the geodesic equations rather than eliminating λ algebraically.

Conclusions unchanged in spirit

The paper's qualitative message remains: there exist evaporation regimes where the apparent horizon recedes faster than timelike infall. The corrected equations refine the claim from unconditional to conditional and improve the accuracy of the near–horizon scaling statement.

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