Erratum: Cosmology of mass-varying neutrinos driven by quintessence: Theory and observations [Phys. Rev. D 73, 083515 (2006)]

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The geodesic equation (23) contains a typo and should read

$$P^0 \frac{dP^\rho}{d\tau} + \Gamma^\rho_{\alpha\beta} P^\alpha P^\beta = -m_\nu^2 \frac{d\ln m_\nu}{d\phi} \frac{\partial \phi}{\partial x_\rho}. \tag{1}$$

A subtle error occurred in Eq. (24), which should read

$$\frac{dq}{d\tau} = -\frac{1}{2} q \dot{h}_{ij} n_i n_j - a^2 \frac{m_\nu^2}{q} \frac{d\ln m_\nu}{d\phi} \frac{\partial \phi}{\partial x^i} \frac{\partial x^i}{d\tau}. \tag{2}$$

It follows that a scalar field dependent term should be included in the Boltzmann equation (26), giving

$$\frac{\partial \Psi}{\partial \tau} + i \frac{q}{\epsilon} (\mathbf{k}\cdot\mathbf{n})\Psi + \frac{d\ln f_0}{d\ln q}\left[\dot{\eta} - \frac{\dot{h}+6\dot{\eta}}{2}(\mathbf{k}\cdot\mathbf{n})^2\right] = i\frac{q}{\epsilon}(\mathbf{k}\cdot\mathbf{n}) k \frac{a^2 m_\nu^2}{q^2} \frac{d\ln m_\nu}{d\phi} \frac{d\ln f_0}{d\ln q} \delta\phi. \tag{3}$$

Therefore, the dipole equation for the neutrino hierarchy derived in [1] is subject to a change represented by a new term, once again dependent on the scalar field:

$$\dot{\Psi}_1 = \frac{1}{3}\frac{q}{\epsilon} k(\Psi_0 - 2\Psi_2) - \frac{1}{3}\frac{q}{\epsilon} k \frac{a^2 m_\nu^2}{q^2} \frac{d\ln m_\nu}{d\phi} \frac{d\ln f_0}{d\ln q} \delta\phi. \tag{4}$$

This modification will have an effect on the Integrated Sachs-Wolfe (ISW) effect, which is less pronounced than reported in our paper. The corrected evolution of the metric variables $\Phi + \Psi$ is shown in Fig. 1.

This will effect the anisotropies in the CMB, which are shown in Fig. 2.

On the other hand, we do not find changes to the matter power spectrum or the evolution of the neutrino density contrast at the scale given in Fig. 7 in our original paper. At smaller scales we register small differences in the neutrino and scalar field density contrasts, which leads to the mentioned changes in the ISW effect. Note that the background evolution reported in [2,3] is not affected.

We do not attempt to redo the comparison of our model with data, as the new WMAP 3-year data have been published since [4], and these models were analyzed in [5].

We are grateful to K. Ichicki for correspondence. The correct Eqs. (2)–(4) have been derived in [5].

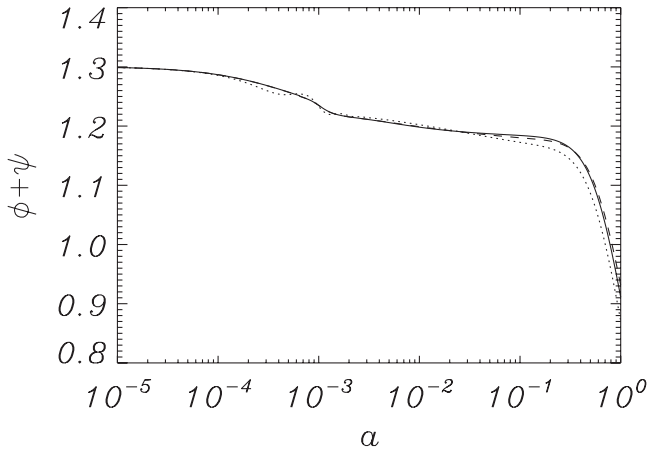

FIG. 1. Evolution of the metric variables $\Phi + \Psi$. Solid line: $\beta = 0$, $\lambda = 1$; short-dashed line: $\beta = 1$, $\lambda = 1$; dotted line: $\beta = -0.70$, $\lambda = 1$; long-dashed line: $\beta = 1$, $\lambda = 0.5$. The scale is $k = 10^{-3}$ Mpc^{-1}.

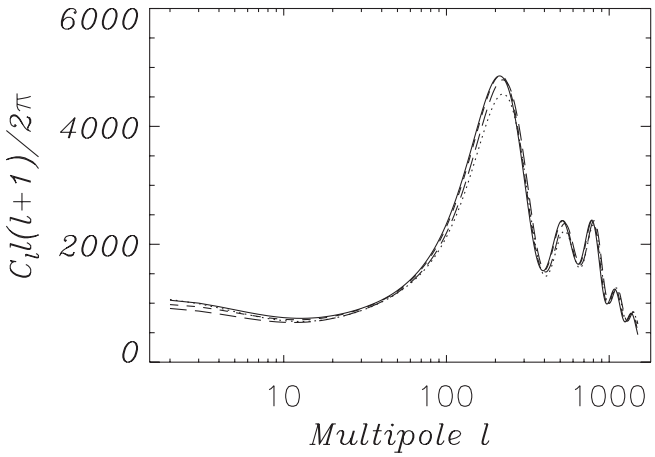

FIG. 2. The CMB anisotropy spectrum (unnormalized) for exponential coupling and potential. Solid line: $\beta = 0$, $\lambda = 1$; short-dashed line: $\beta = 1$, $\lambda = 1$; dotted line: $\beta = -0.79$, $\lambda = 1$; long-dashed line: $\beta = 1$, $\lambda = 0.5$.

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