Erratum: Horava-Lifshitz gravity and Gödel universe
[Phys. Rev. D 84, 047702 (2011)]

C. Furtado, J. R. Nascimento, A. Yu. Petrov, and A. F. Santos

The correct form of the expansion of the energy-momentum tensor (25) for the signature of the metric used by us is

$$T_{\mu\nu} = \rho u_\mu u_\nu - p(g_{\mu\nu} - u_\mu u_\nu) + u_\mu q_\nu + u_\nu q_\mu + \Pi_{\mu\nu}, \tag{1}$$

that is, the sign of the pressure is opposite to that one used by us. Therefore, the correct expression for the pressure (26) looks like

$$p = -\tfrac{1}{3}T_{\mu\nu}h^{\mu\nu}. \tag{2}$$

As a result, its expression in terms of the parameters of the action given by Eq. (27) also changes the sign being

$$p = -\frac{1}{a^2}\left(\Theta - \frac{7}{2}\alpha\right). \tag{3}$$

Thus, the phantom matter arises if $\Theta - \frac{7}{2}\alpha > 0$, otherwise the pressure is positive. Further, in Eq. (28), the sign of the pressure is also changed; we have

$$p = \frac{1}{a^2\kappa^2}\left[7 + \frac{\kappa^4\mu^2}{8}\left(\frac{1-2\lambda}{1-3\lambda}\right)\right]. \tag{4}$$

Thus, if we introduce the parameter $\Delta = \frac{\kappa^4\mu^2}{8}(\frac{1-2\lambda}{1-3\lambda})$, the pressure is positive at $\Delta > -7$. Therefore, the definition of the intervals characterizing the properties of the matter will change: we have the ghosts with positive pressure at $-7 < \Delta < 2$, and ghosts with negative pressure at $\Delta < -7$, with at $\Delta > 2$, the usual matter is compatible with the equations of motion. Equation (29) is hence unnecessary.

The only modification of the conclusions is that the matter compatible with the equations of motion in the case of the small cosmological constant can be usual for the certain interval of values of the parameters of the theory. The same modification is applied to the abstract as well. We stress that all other conclusions, observations, and results of the paper remain unchanged.