

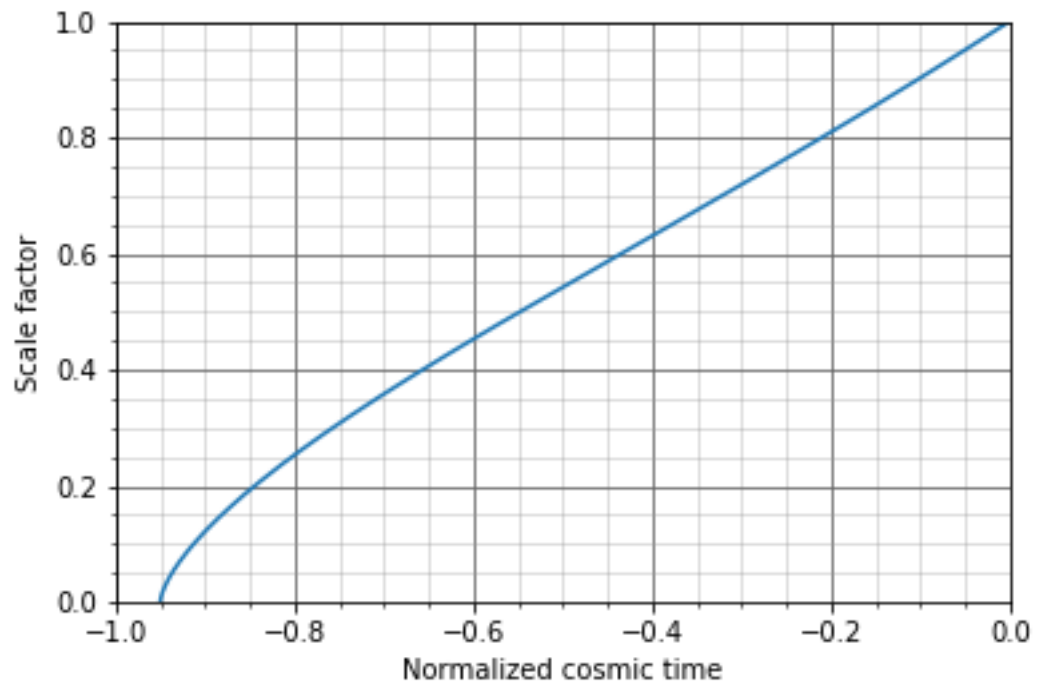
## Equations différentielles utilisées

$$t' = H_0 * t, \quad k = 0 \Rightarrow \Omega_K = 0$$

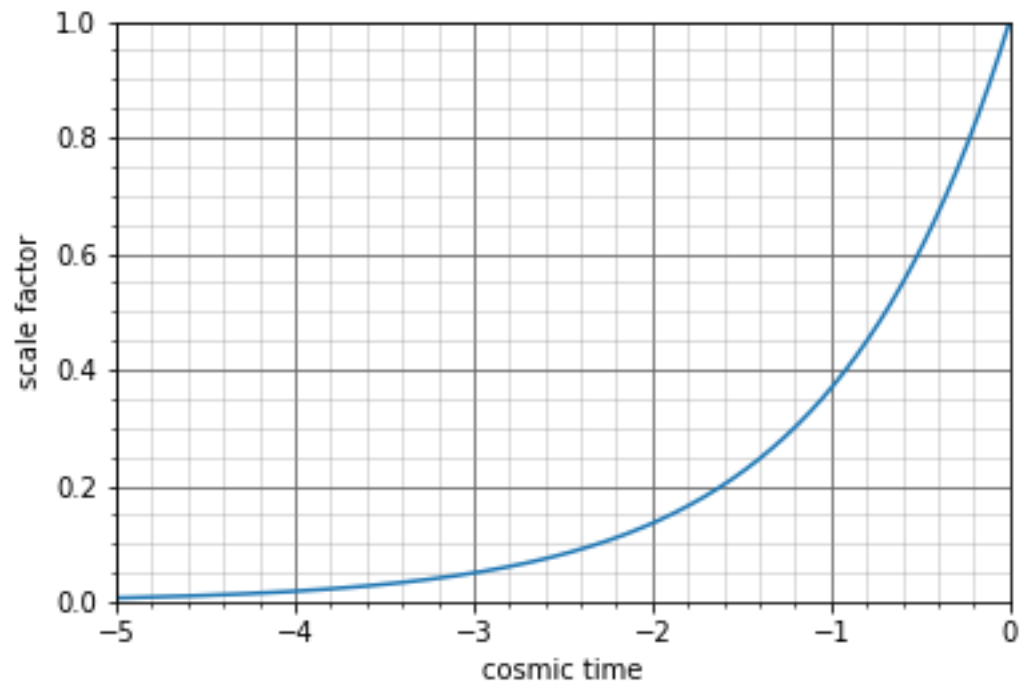
$$a(t_0) = 1, \quad t_0 = 0 = \text{now}$$

$$da/dt' = \sqrt{\Omega_\Lambda * a^2 + \Omega_{m0}/a + \Omega_{ro}/a^2}$$

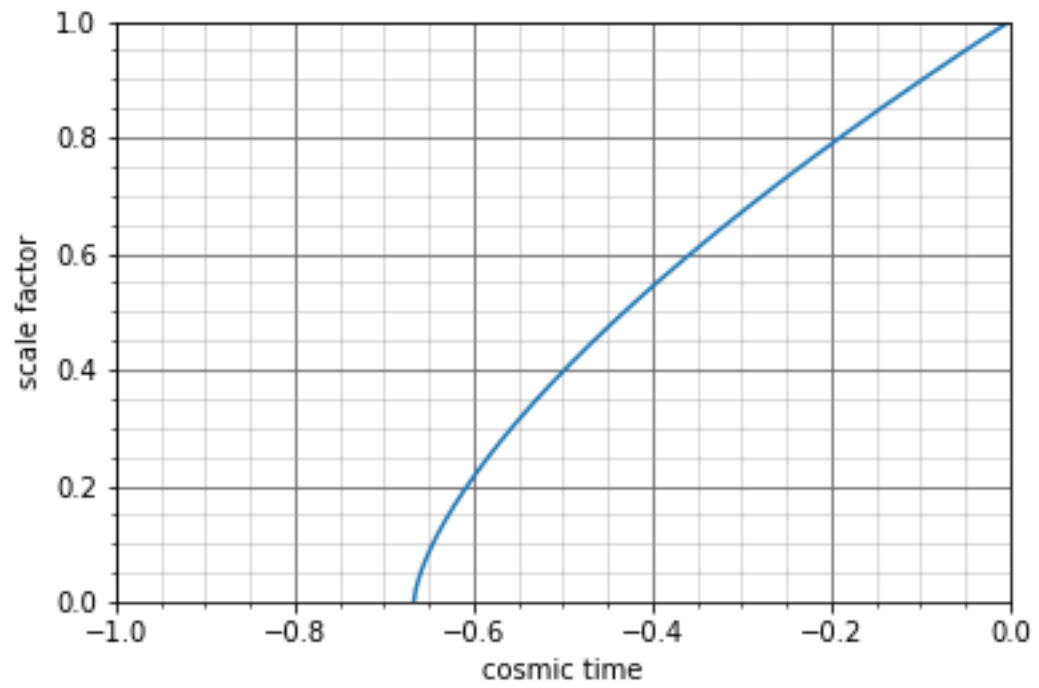
UNIVERS  $\Lambda$ CDM



## UNIVERS DE SITTER

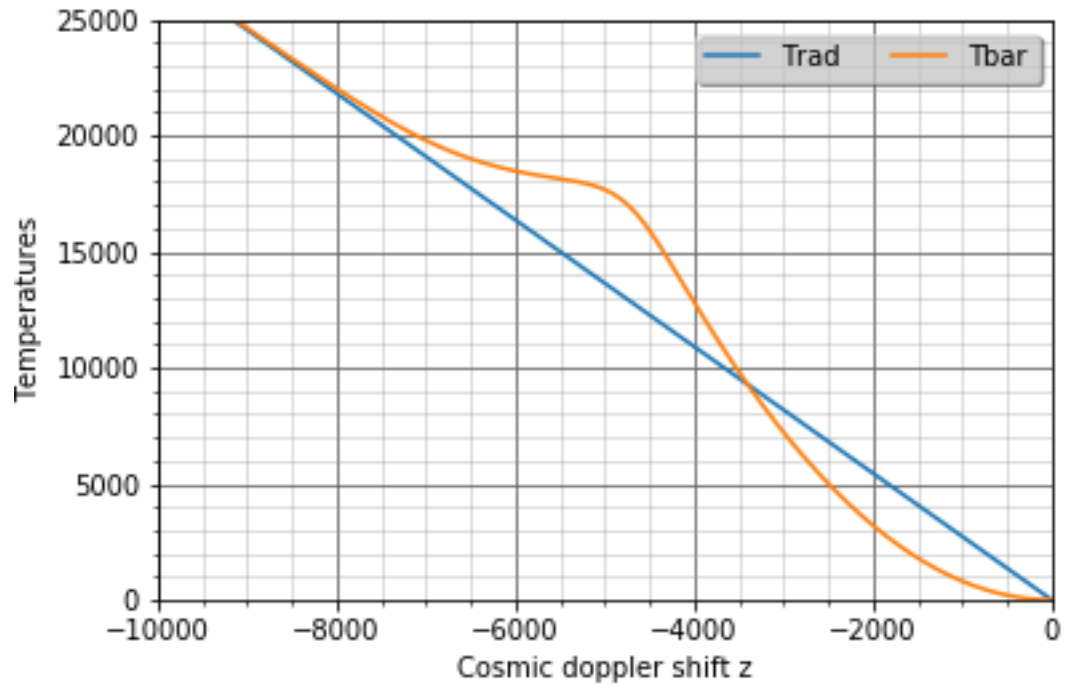


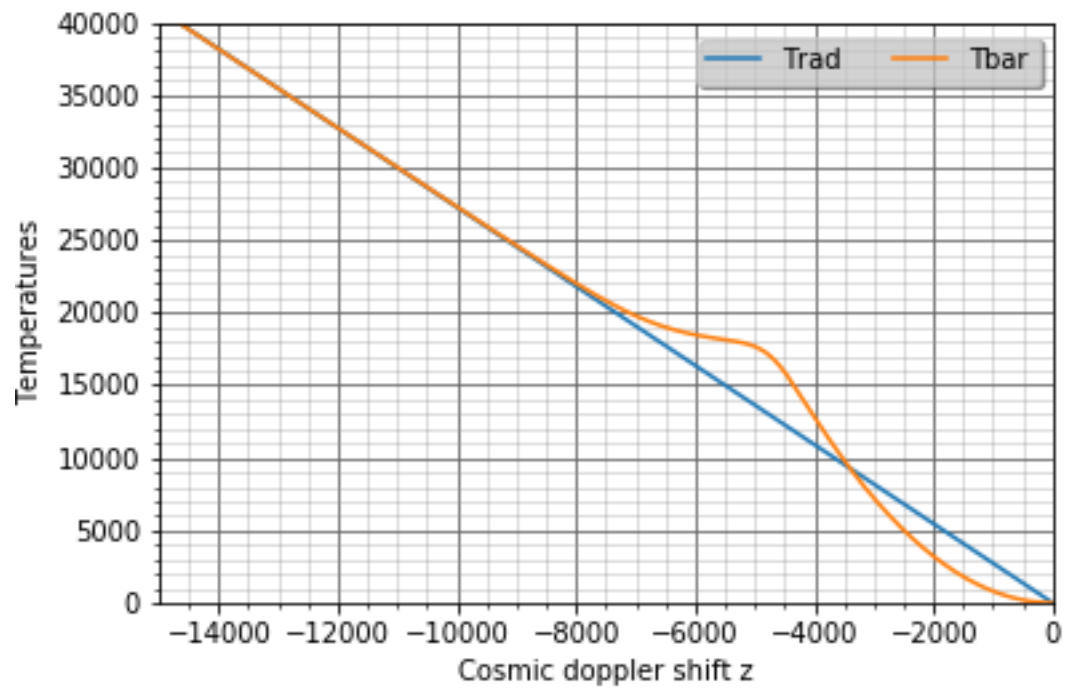
## UNIVERS EINSTEIN DE SITTER



$$dT_{bar}/dt' = -2\frac{da}{dt'}\frac{1}{a}T_{bar} - \frac{8\sigma_T a}{3m_e c H_0} T_{rad_0}^4 (T_{rad_0}/a - T_{bar})^{\frac{1}{4}} x_e(T_I/T_{bar})$$

$$T_I = 13.6ev/k_b$$





$$x_e(x) = 1 - \operatorname{erf}(\sqrt{x}) + 2 * \sqrt{x} * \exp(-x) / \sqrt{\pi}$$

