$$\dot{p}_3 = \tau\alpha_p \left[\beta_p \left(\gamma_p \left(g_m - p_1\right) + \frac{\left(\dot{g}_m - \dot{p}_1\right)}{\tau}\right) + \frac{\left(\ddot{g} - \ddot{p}_1\right)}{\tau^2}\right] + \tau A f(z),$$