

$$\begin{aligned}
& -k_{10} \left( \chi_2(t) - \chi_{P2}(t) \right) + 2 M_{P2} \left( \cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left( L_0 + \eta_2(t) + \eta_{P2}(t) \right) \right) \\
& \left( \cos(\theta(t)) R'(t) + \cos(\theta(t) + \psi(t)) \sin(\alpha(t)) \left( L_0 + \eta_2(t) + \eta_{P2}(t) \right) \alpha'(t) - \right. \\
& \quad \left. R(t) \sin(\theta(t)) \theta'(t) + \cos(\alpha(t)) \sin(\theta(t) + \psi(t)) \left( L_0 + \eta_2(t) + \eta_{P2}(t) \right) \left( \theta'(t) + \psi'(t) \right) - \right. \\
& \quad \left. \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left( \eta_2'(t) + \eta_{P2}'(t) \right) \right) \chi_{P2}'(t) + \\
& \left( M_{P2} \left( \cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left( L_0 + \eta_2(t) + \eta_{P2}(t) \right) \right)^2 + i_{zp2} \right) \chi_{P2}''(t) = \\
& -c_{10} (\chi_2'(t) - \chi_{P2}'(t))
\end{aligned}$$