

$$\begin{aligned}
& -k_{10} (\chi_{10}(t) - \chi_{P2}(t)) + 2 M_{P2} \\
& (\cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) (L_0 + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) + \eta_{10}(t) + \eta_{P2}(t))) \\
& (\cos(\theta(t)) R'(t) + \cos(\theta(t) + \psi(t)) \sin(\alpha(t)) \\
& (L_0 + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) + \eta_{10}(t) + \eta_{P2}(t)) \alpha'(t) - R(t) \sin(\theta(t)) \theta'(t) + \\
& \cos(\alpha(t)) \sin(\theta(t) + \psi(t)) (L_0 + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) + \eta_{10}(t) + \eta_{P2}(t)) (\theta'(t) + \psi'(t)) - \\
& \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) (\eta_6'(t) + \eta_7'(t) + \eta_8'(t) + \eta_9'(t) + \eta_{10}'(t) + \eta_{P2}'(t))) \chi_{P2}'(t) + \\
& \left(M_{P2} (\cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) (L_0 + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) + \right. \\
& \left. \eta_{10}(t) + \eta_{P2}(t)))^2 + i_{zp2} \right) \chi_{P2}''(t) = -c_{10} (\chi_{10}'(t) - \chi_{P2}'(t))
\end{aligned}$$