

$$\begin{aligned}
& -k_{10} \left(\zeta_8(t) - \zeta_9(t) \right) + k_{10} \left(\zeta_9(t) - \zeta_{10}(t) \right) + \\
& 2 m_0 \left(\cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) \right) \right) \zeta_9'(t) \\
& \left(\cos(\theta(t)) R'(t) + \cos(\theta(t) + \psi(t)) \sin(\alpha(t)) \left(\frac{7 L_0}{10} + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) \right) \alpha'(t) - \right. \\
& \quad \left. R(t) \sin(\theta(t)) \theta'(t) + \cos(\alpha(t)) \sin(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) \right) \right. \\
& \quad \left. \left(\theta'(t) + \psi'(t) \right) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left(\eta_6'(t) + \eta_7'(t) + \eta_8'(t) + \eta_9'(t) \right) \right) + \\
& \left(m_0 \left(\cos(\theta(t)) R(t) - \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_6(t) + \eta_7(t) + \eta_8(t) + \eta_9(t) \right) \right) \right)^2 + i_{\text{xm}9} \Big) \\
& \zeta_9''(t) = c_{10} (\zeta_8'(t) - \zeta_9'(t)) - c_{10} (\zeta_9'(t) - \zeta_{10}'(t))
\end{aligned}$$