

$$\begin{aligned}
& -k_{10} (\chi_1(t) - \chi_2(t)) + k_{10} (\chi_2(t) - \chi_3(t)) + \\
& 2 m_0 \left(\cos(\theta(t)) R(t) + \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_2(t) + \eta_3(t) + \eta_4(t) + \eta_5(t) \right) \right) \\
& \left(\cos(\theta(t)) R'(t) - \cos(\theta(t) + \psi(t)) \sin(\alpha(t)) \left(\frac{7 L_0}{10} + \eta_2(t) + \eta_3(t) + \eta_4(t) + \eta_5(t) \right) \alpha'(t) - \right. \\
& \quad \left. R(t) \sin(\theta(t)) \theta'(t) - \cos(\alpha(t)) \sin(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_2(t) + \eta_3(t) + \eta_4(t) + \eta_5(t) \right) \right. \\
& \quad \left. (\theta'(t) + \psi'(t)) + \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) (\eta_2'(t) + \eta_3'(t) + \eta_4'(t) + \eta_5'(t)) \right) \chi_2'(t) + \\
& \left(m_0 \left(\cos(\theta(t)) R(t) + \cos(\alpha(t)) \cos(\theta(t) + \psi(t)) \left(\frac{7 L_0}{10} + \eta_2(t) + \eta_3(t) + \eta_4(t) + \eta_5(t) \right) \right) \right)^2 + i_{zm2} \Big) \\
& \chi_2''(t) = c_{10} (\chi_1'(t) - \chi_2'(t)) - c_{10} (\chi_2'(t) - \chi_3'(t))
\end{aligned}$$