$$
\begin{aligned}
\frac{d\,[\text{boundNGFReceptor}]}{dt} &= \text{krbNGF} \times [\text{NGF}] \times [\text{freeNGFReceptor}] - \text{kruNGF} \times [\text{boundNGFReceptor}] \\
\frac{d\,[\text{NGF}]}{dt} &= -(\text{krbNGF} \times [\text{NGF}] \times [\text{freeNGFReceptor}]) + \text{kruNGF} \times [\text{boundNGFReceptor}] \\
\frac{d\,[\text{freeNGFReceptor}]}{dt} &= -(\text{krbNGF} \times [\text{NGF}] \times [\text{freeNGFReceptor}]) + \text{kruNGF} \times [\text{boundNGFReceptor}] \\
\frac{d\,[\text{MekActive}]}{dt} &= \frac{\text{kpRaf1} \times [\text{Raf1Active}] \times [\text{MekInactive}]}{[\text{MekInactive}] + \text{KmpRaf1}} + \frac{\text{kpBRaf} \times [\text{BRafActive}] \times [\text{MekInactive}]}{[\text{MekInactive}] + \text{KmpBRaf}} - \frac{\text{kdMek} \times [\text{PP2AActive}] \times}{[\text{MekActive}] + \text{Km}} \\
\frac{d\,[\text{C3GInactive}]}{dt} &= -\left(\frac{\text{kC3GNGF} \times [\text{boundNGFReceptor}] \times [\text{C3GInactive}]}{[\text{C3GInactive}] + \text{KmC3GNGF}}\right) \\
\frac{d\,[\text{AktActive}]}{dt} &= \frac{\text{kAkt} \times [\text{PI3KActive}] \times [\text{AktInactive}]}{[\text{AktInactive}] + \text{KmAkt}} \\
\frac{d\,[\text{AktInactive}]}{dt} &= -\left(\frac{\text{kAkt} \times [\text{PI3KActive}] \times [\text{AktInactive}]}{[\text{AktInactive}] + \text{KmAkt}}\right) \\
\frac{d\,[\text{EGF}]}{dt} &= -(\text{krbEGF} \times [\text{EGF}] \times [\text{freeEGFReceptor}]) + \text{kruEGF} \times [\text{boundEGFReceptor}] \\
\frac{d\,[\text{PP2AActive}]}{dt} &= 0 \\
\frac{d\,[\text{SosActive}]}{dt} &= \frac{\text{kEGF} \times [\text{boundEGFReceptor}] \times [\text{SosInactive}]}{[\text{SosInactive}] + \text{KmEGF}} + \frac{\text{kNGF} \times [\text{boundNGFReceptor}] \times [\text{SosInactive}]}{[\text{SosInactive}] + \text{KmNGF}} - \frac{\text{kdSos} \times [\text{P9}}{[\text{Sos}} \\
\frac{d\,[\text{P90RskInactive}]}{dt} &= -\left(\frac{\text{kpP90Rsk} \times [\text{ErkActive}] \times [\text{P90RskInactive}]}{[\text{P90RskInactive}] + \text{KmpP90Rsk}}\right) \\
\frac{d\,[\text{boundEGFReceptor}]}{dt} &= \text{krbEGF} \times [\text{EGF}] \times [\text{freeEGFReceptor}] - \text{kruEGF} \times [\text{boundEGFReceptor}] \\
\frac{d\,[\text{Raf1Active}]}{dt} &= \frac{\text{kRasToRaf1} \times [\text{RasActive}] \times [\text{Raf1Inactive}]}{[\text{Raf1Inactive}] + \text{KmRasToRaf1}} - \frac{\text{kdRaf1} \times [\text{Raf1PPtase}] \times [\text{Raf1Active}]}{[\text{Raf1Active}] + \text{KmdRaf1}} - \frac{\text{kdRaf1ByAkt} \times [\text{Akt}}{[\text{Raf1Active}] +} \\
\frac{d\,[\text{SosInactive}]}{dt} &= -\left(\frac{\text{kEGF} \times [\text{boundEGFReceptor}] \times [\text{SosInactive}]}{[\text{SosInactive}] + \text{KmEGF}}\right) - \frac{\text{kNGF} \times [\text{boundNGFReceptor}] \times [\text{SosInactive}]}{[\text{SosInactive}] + \text{KmNGF}} + \frac{\text{kdSos}}{} \\
\frac{d\,[\text{freeEGFReceptor}]}{dt} &= -(\text{krbEGF} \times [\text{EGF}] \times [\text{freeEGFReceptor}]) + \text{kruEGF} \times [\text{boundEGFReceptor}]
\end{aligned}
$$

$$\frac{d\,[\text{Raf1PPtase}]}{dt} = 0$$

$$\frac{d\,[\text{Rap1Active}]}{dt} = \frac{\text{kC3G} \times [\text{C3GActive}] \times [\text{Rap1Inactive}]}{[\text{Rap1Inactive}] + \text{KmC3G}} - \frac{\text{kRapGap} \times [\text{RapGapActive}] \times [\text{Rap1Active}]}{[\text{Rap1Active}] + \text{KmRapGap}}$$

$$\frac{d\,[\text{MekInactive}]}{dt} = -\left(\frac{\text{kpRaf1} \times [\text{Raf1Active}] \times [\text{MekInactive}]}{[\text{MekInactive}] + \text{KmpRaf1}}\right) - \frac{\text{kpBRaf} \times [\text{BRafActive}] \times [\text{MekInactive}]}{[\text{MekInactive}] + \text{KmpBRaf}} + \frac{\text{kdMek} \times [\text{PP2AAct}}{[\text{MekActive}]}$$

$$\frac{d\,[\text{P90RskActive}]}{dt} = \frac{\text{kpP90Rsk} \times [\text{ErkActive}] \times [\text{P90RskInactive}]}{[\text{P90RskInactive}] + \text{KmpP90Rsk}}$$

$$\frac{d\,[\text{PI3KActive}]}{dt} = \frac{\text{kPI3K} \times [\text{boundEGFReceptor}] \times [\text{PI3KInactive}]}{[\text{PI3KInactive}] + \text{KmPI3K}} + \frac{\text{kPI3KRas} \times [\text{RasActive}] \times [\text{PI3KInactive}]}{[\text{PI3KInactive}] + \text{KmPI3KRas}}$$

$$\frac{d\,[\text{RasGapActive}]}{dt} = 0$$

$$\frac{d\,[\text{BRafActive}]}{dt} = \frac{\text{kRap1ToBRaf} \times [\text{Rap1Active}] \times [\text{BRafInactive}]}{[\text{BRafInactive}] + \text{KmRap1ToBRaf}} - \frac{\text{kdBRaf} \times [\text{Raf1PPtase}] \times [\text{BRafActive}]}{[\text{BRafActive}] + \text{KmdBRaf}}$$

$$\frac{d\,[\text{PI3KInactive}]}{dt} = -\left(\frac{\text{kPI3K} \times [\text{boundEGFReceptor}] \times [\text{PI3KInactive}]}{[\text{PI3KInactive}] + \text{KmPI3K}}\right) - \frac{\text{kPI3KRas} \times [\text{RasActive}] \times [\text{PI3KInactive}]}{[\text{PI3KInactive}] + \text{KmPI3KRas}}$$

$$\frac{d\,[\text{Rap1Inactive}]}{dt} = -\left(\frac{\text{kC3G} \times [\text{C3GActive}] \times [\text{Rap1Inactive}]}{[\text{Rap1Inactive}] + \text{KmC3G}}\right) + \frac{\text{kRapGap} \times [\text{RapGapActive}] \times [\text{Rap1Active}]}{[\text{Rap1Active}] + \text{KmRapGap}}$$

$$\frac{d\,[\text{ErkActive}]}{dt} = \frac{\text{kpMekCytoplasmic} \times [\text{MekActive}] \times [\text{ErkInactive}]}{[\text{ErkInactive}] + \text{KmpMekCytoplasmic}} - \frac{\text{kdErk} \times [\text{PP2AActive}] \times [\text{ErkActive}]}{[\text{ErkActive}] + \text{KmdErk}}$$

$$\frac{d\,[\text{ErkInactive}]}{dt} = -\left(\frac{\text{kpMekCytoplasmic} \times [\text{MekActive}] \times [\text{ErkInactive}]}{[\text{ErkInactive}] + \text{KmpMekCytoplasmic}}\right) + \frac{\text{kdErk} \times [\text{PP2AActive}] \times [\text{ErkActive}]}{[\text{ErkActive}] + \text{KmdErk}}$$

$$\frac{d\,[\text{RapGapActive}]}{dt} = 0$$

$$\frac{d\,[\text{Raf1Inactive}]}{dt} = -\left(\frac{\text{kRasToRaf1} \times [\text{RasActive}] \times [\text{Raf1Inactive}]}{[\text{Raf1Inactive}] + \text{KmRasToRaf1}}\right) + \frac{\text{kdRaf1} \times [\text{Raf1PPtase}] \times [\text{Raf1Active}]}{[\text{Raf1Active}] + \text{KmdRaf1}} + \frac{\text{kdRaf1ByAkt} \times}{[\text{Raf1Activ}}$$

$$\frac{d\,[\text{BRafInactive}]}{dt} = -\left(\frac{\text{kRap1ToBRaf} \times [\text{Rap1Active}] \times [\text{BRafInactive}]}{[\text{BRafInactive}] + \text{KmRap1ToBRaf}}\right) + \frac{\text{kdBRaf} \times [\text{Raf1PPtase}] \times [\text{BRafActive}]}{[\text{BRafActive}] + \text{KmdBRaf}}$$

$$\frac{d\,[\text{RasActive}]}{dt} = \frac{\text{kSos} \times [\text{SosActive}] \times [\text{RasInactive}]}{[\text{RasInactive}] + \text{KmSos}} - \frac{\text{kRasGap} \times [\text{RasGapActive}] \times [\text{RasActive}]}{[\text{RasActive}] + \text{KmRasGap}}$$

$$\frac{d\,[\text{RasInactive}]}{dt} = -\left(\frac{\text{kSos} \times [\text{SosActive}] \times [\text{RasInactive}]}{[\text{RasInactive}] + \text{KmSos}}\right) + \frac{\text{kRasGap} \times [\text{RasGapActive}] \times [\text{RasActive}]}{[\text{RasActive}] + \text{KmRasGap}}$$

$$\frac{d\,[\text{C3GActive}]}{dt} = \frac{\text{kC3GNGF} \times [\text{boundNGFReceptor}] \times [\text{C3GInactive}]}{[\text{C3GInactive}] + \text{KmC3GNGF}}$$