$$
\begin{aligned}
\frac{du}{dt} &= e + (u - \theta_v)(u_u - u)vg_{fi} \\
&\quad + wsg_{si} - g_{so}(u) \\
\frac{ds}{dt} &= \frac{g_{s2}}{(1 + e^{-2k(u-us)})} - g_{s2}s \\
\frac{dv}{dt} &= -g_v^+ \cdot v \\
\frac{dw}{dt} &= -g_w^+ \cdot w
\end{aligned}
$$