S1 Appendix. Notation, equations, and parameters

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S1-S4 Tables list input parameters that describe the physical processes and coagulation reactions we consider listed in S5-S12 Tables. Z_i and E_i refer to zymogen i and enzyme i in solution. A superscript 'm' indicates a membrane-bound versions of these proteins (e.g., E_7^m refers to the TF:VIIa complex and E_5^m refers to Factor Va bound to the platelet surface). Concentrations are denoted in a similar way but with lower-case z and e. A complex of Z_i and E_j is denoted $Z_i : E_j$ and its concentration is denoted $[Z_i : E_j]$. Special symbols are used for the platelet-bound 'tenase' VIIIa:IXa and 'prothrombinase' Va:Xa complexes, TEN = VIIIa:IXa and PRO= Va:Xa, and $[TEN]$ and $[PRO]$ denote their respective concentrations. The special symbol $TFPIa$ is used for the fluid-phase complex TFPI:Xa, and $[TFPIa]$ denotes its concentration. The inhibitors are denoted APC and $TFPI$ and their concentrations are denoted $[APC]$ and $[TFPI]$.

The concentrations of unactivated, subendothelial bound, and activated but not subendothelial bound platelets are denoted PL, PL_s^a, and PL_a^v, respectively. Platelet binding sites for coagulation proteins are denoted P_i or P_i^*. The former refers to binding sites for the zymogen i or for zymogen and enzyme i. The latter refers to binding sites only for enzyme i. The number of P_i or P_i^* binding sites is denoted N_i or N_i^*. The concentration p_i or p_i^* of each of these binding sites is needed in the model equations. It is obtained by multiplying the corresponding N_i or N_i^*, respectively, by the concentration of activated platelets $PL_s^a + PL_v^a$.

Further discussion of model assumptions and parameter estimation can be found in [1, 2].

$$
\begin{aligned}
[TF]^{\text{avail}} &= [TF] - z_7^m - e_7^m - [Z_7^m : E_{10}] - [Z_7^m : E_2] - [Z_{10} : E_7^m] \\
&\quad -[Z_9 : E_7^m] - [TPFI : E_{10} : E_7^m] - [Z_7^m : E_9] \\
p_{PLAS}^{\text{avail}} &= p_{PLAS} - [PL_a^s] \\
p_5^{\text{avail}} &= p_5 - z_5^m - e_5^m - [Z_5^m : E_{10}^m] - [Z_5^m : E_2^m] \\
&\quad -[APC : E_5^m] - [PRO] - [Z_2^m : PRO] \\
p_8^{\text{avail}} &= p_8 - z_8^m - e_8^m - [TEN] - [Z_8^m : E_{10}^m] - [Z_8^m : E_2^m] \\
&\quad -[Z_{10}^m : TEN] - [APC : E_8^m] - [TEN^*] - [Z_{10}^m : TEN^*] \\
p_9^{\text{avail}} &= p_9 - z_9^m - e_9^m - [TEN] - [Z_{10}^m : TEN] \\
&\quad -[Z_9^m : E_{11}^{h,m}] - [Z_9^m : E_{11}^{m*}] \\
p_9^{*,\text{avail}} &= p_9^* - e_9^{m*} - [TEN^*] - [Z_{10}^m : TEN^*] \\
p_{10}^{\text{avail}} &= p_{10} - z_{10}^m - e_{10}^m - [Z_5^m : E_{10}^m] - [Z_8^m : E_{10}^m] \\
&\quad -[PRO] - [Z_2^m : PRO] - [Z_{10}^m : TEN] - [Z_{10}^m : TEN^*]
\end{aligned}
$$

$$
\begin{aligned}
p_2^{\text{avail}} &= p_2 - z_2^m - [Z_2^m : PRO] \\
p_2^{*,\text{avail}} &= p_2^* - e_2^m - [Z_5^m : E_2^m] - [Z_8^m : E_2^m] - [Z_{11}^m : E_2^m] - [E_{11}^{h,m*} : E_2^m] \\
p_{11}^{\text{avail}} &= p_{11} - z_{11}^m - e_{11}^{h,m} - [Z_9^m : E_{11}^{h,m}] - [Z_{11}^m : E_2^m] \\
p_{11}^{*,\text{avail}} &= p_{11}^* - e_{11}^{h,m*} - e_{11}^{m*} - [Z_9^m : E_{11}^{m*}] - [E_{11}^{h,m*} : E_2^m] \\
[TM]^{\text{avail}} &= ([TM] - [TM : E_2^{ec}] - [TM : E_2^{ec} : APC])
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ z_7 &= k_{\text{flow}}(z_7^{\text{up}} - z_7) - k_7^{\text{on}} z_7 [TF]^{\text{avail}} + k_7^{\text{off}} z_7^m - \ k^{+}_{z_7:e_2} z_7 e_2 \\
&\quad + k^{-}_{z_7:e_2}[Z_7 : E_2] - \ k^{+}_{z_7:e_{10}} z_7 e_{10} + k^{-}_{z_7:e_{10}}[Z_7 : E_{10}]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ e_7 &= k_{\text{flow}}(e_7^{\text{up}} - e_7) - k_7^{\text{on}} e_7 [TF]^{\text{avail}} + k_7^{\text{off}} e_7^m \\
&\quad + k^{\text{cat}}_{z_7:e_2}[Z_7 : E_2] + k^{\text{cat}}_{z_7:e_{10}}[Z_7 : E_{10}]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ z_7^m &= k_7^{\text{on}} z_7 [TF]^{\text{avail}} - k_7^{\text{off}} z_7^m - k^{+}_{z_7^m:e_{10}} z_7^m e_{10} + k^{-}_{z_7^m:e_{10}}[Z_7^m : E_{10}] \\
&\quad - k^{+}_{z_7^m:e_2} z_7^m e_2 + k^{-}_{z_7^m:e_2}[Z_7^m : E_2] - z_7^m \frac{d}{dt}\ [PL_a^s] \frac{1}{p_{PLAS}^{\text{avail}}}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ e_7^m &= k_7^{\text{on}} e_7 [TF]^{\text{avail}} - k_7^{\text{off}} e_7^m \\
&\quad - k^{+}_{TPFI:e_{10}:E_7^m} e_7^m [TFPI : E_{10}] + k^{-}_{TPFI:e_{10}:E_7^m}[TPFI : E_{10} : E_7^m] \\
&\quad + k^{\text{cat}}_{z_7^m:e_{10}}[Z_7^m : E_{10}] + k^{\text{cat}}_{z_7^m:e_2}[Z_7^m : E_2] \\
&\quad + (k^{\text{cat}}_{z_{10}:e_7^m} + k^{-}_{z_{10}:e_7^m})[Z_{10} : E_7^m] - k^{+}_{z_{10}:e_7^m} z_{10} e_7^m \\
&\quad + (k^{\text{cat}}_{z_9:e_7^m} + k^{-}_{z_9:e_7^m})[Z_9 : E_7^m] - k^{+}_{z_9:e_7^m} z_9 e_7^m - e_7^m \frac{d}{dt}\ [PL_a^s] \frac{1}{p_{PLAS}^{\text{avail}}}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ z_{10} &= k_{\text{flow}}(z_{10}^{\text{up}} - z_{10}) - k_{10}^{\text{on}} z_{10}\ p_{10}^{\text{avail}} + k_{10}^{\text{off}} z_{10}^m - k^{+}_{z_{10}:e_7^m} z_{10} e_7^m \\
&\quad + k^{-}_{z_{10}:e_7^m}[Z_{10} : E_7^m]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ e_{10} &= k_{\text{flow}}(e_{10}^{\text{up}} - e_{10}) - k_{\text{diff}}(e_{10} - e_{10}^{ec}) - k_{10}^{\text{on}} e_{10}\ p_{10}^{\text{avail}} + k_{10}^{\text{off}} e_{10}^m \\
&\quad + k^{\text{cat}}_{z_{10}:e_7^m}[Z_{10} : E_7^m] + (k^{\text{cat}}_{z_7:e_{10}} + k^{-}_{z_7:e_{10}})[Z_7 : E_{10}] - k^{+}_{z7:e10} z_7 e_{10} \\
&\quad + (k^{\text{cat}}_{z_7^m:e_{10}} + k^{-}_{z_7^m:e_{10}})[Z_7^m : E_{10}] - k^{+}_{z_m^7:e_{10}} z_7^m e_{10} \\
&\quad - k^{+}_{TFPI:e_{10}} e_{10}[TFPI] + k^{-}_{TFPI:e_{10}}[TFPI : E_{10}] - k^{\text{in}}_{AT:e_{10}} e_{10}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ z_{10}^m &= k_{10}^{\text{on}} z_{10}\ p_{10}^{\text{avail}} - k_{10}^{\text{off}} z_{10}^m - k^{+}_{z_{10}^m:ten} z_{10}^m [TEN] + k^{-}_{z_{10}:ten}[Z_{10}^m : TEN] \\
&\quad - k^{+}_{z_{10}^m:ten} z_{10}^m [TEN^*] + k^{-}_{z_{10}:ten}[Z_{10}^m : TEN^*]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\ e_{10}^m &= k_{10}^{\text{on}} e_{10}\ p_{10}^{\text{avail}} - k_{10}^{\text{off}} e_{10}^m + k^{\text{cat}}_{z_{10}^m:ten}[Z_{10}^m : TEN] \\
&\quad + (k^{\text{cat}}_{z_5^m:e_{10}^m} + k^{-}_{z_5^m:e_{10}^m})[Z_5^m : E_{10}^m] - k^{+}_{z_5^m:e_{10}^m} z_5^m e_{10}^m \\
&\quad + (k^{\text{cat}}_{z_8^m:e_{10}^m} + k^{-}_{z_8^m:e_{10}^m})[Z_8^m : E_{10}^m] - k^{+}_{z_8^m:e_{10}^m} z_8^m e_{10}^m \\
&\quad + k^{-}_{e_5^m:e_{10}^m}[PRO] - k^{+}_{e_5^m:e_{10}^m} e_{10}^m e_5^m + k^{\text{cat}}_{z_{10}^m:ten}[Z_{10}^m : TEN^*]
\end{aligned}
$$

$$\frac{d}{dt}\ z_5 = k_{\text{flow}}(z_5^{\text{up}} - z_5) - k_5^{\text{on}} z_5\ p_5^{\text{avail}} + k_5^{\text{off}} z_5^m - k^+_{z_5:e_2} z_5 e_2 + k^-_{z_5:e_2}[Z_5 : E_2]$$
$$+n_5\Big(k^+_{\text{adh}}\ p^{\text{avail}}_{PLAS} + k^{\text{act}}_{\text{plt}}\Big([PL_a^v] + [PL_a^s]\Big) + k^{\text{act}}_{\text{e2}}\frac{e_2}{(e_2 + 0.001)}\Big)[PL]$$

$$\frac{d}{dt}\ e_5 = k_{\text{flow}}(e_5^{\text{up}} - e_5) - k_5^{\text{on}} e_5\ p_5^{\text{avail}} + k_5^{\text{off}} e_5^m$$
$$+k^{\text{cat}}_{z_5:e_2}[Z_5 : E_2] + k^-_{e5:APC}[APC : E_5] - k^+_{e5:APC}[APC]e_5$$

$$\frac{d}{dt}\ z_5^m = k_5^{\text{on}} z_5\ p_5^{\text{avail}} - k_5^{\text{off}} z_5^m - k^+_{z_5^m:e_{10}^m} z_5^m e_{10}^m + k^-_{z_5^m:e_{10}^m}[Z_5^m : E_{10}^m]$$
$$-k^+_{z_5^m:e_2^m} z_5^m e_2^m + k^-_{z_5^m:e_2^m}[Z_5^m : E_2^m]$$

$$\frac{d}{dt}\ e_5^m = k_5^{\text{on}} e_5\ p_5^{\text{avail}} - k_5^{\text{off}} e_5^m + k^{\text{cat}}_{z_5^m:e_{10}^m}[Z_5^m : E_{10}^m] + k^{\text{cat}}_{z_5^m:e_2^m}[Z_5^m : E_2^m]$$
$$+k^-_{e_5^m:APC}[APC : E_5^m] - k^+_{e_5^m:APC}[APC]e_5^m$$
$$-k^+_{e_5^m:e_{10}^m} e_5^m e_{10}^m + k^-_{e_5^m:e_{10}^m}[PRO]$$

$$\frac{d}{dt}\ z_8 = k_{\text{flow}}(z_8^{\text{up}} - z_8) - k_8^{\text{on}} z_8\ p_8^{\text{avail}} + k_8^{\text{off}} z_8^m - k^+_{z_8:e_2} z_8 e_2 + k^-_{z_8:e_2}[Z_8 : E_2]$$

$$\frac{d}{dt}\ e_8 = k_{\text{flow}}(e_8^{\text{up}} - e_8) - k_8^{\text{on}} e_8\ p_8^{\text{avail}} + k_8^{\text{off}} e_8^m + k^{\text{cat}}_{z_8:e_2}[Z_8 : E_2] - 0.005 e_8$$
$$+k^-_{e_8:APC}[APC : E_8] - k^+_{e_8:APC}[APC]e_8$$

$$\frac{d}{dt}\ z_8^m = k_8^{\text{on}} z_8\ p_8^{\text{avail}} - k_8^{\text{off}} z_8^m - k^+_{z_8^m:e_{10}^m} z_8^m e_{10}^m + k^-_{z_8^m:e_{10}^m}[Z_8^m : E_{10}^m]$$
$$-k^+_{z_8^m:e_2^m} z_8^m e_2^m + k^-_{z_8^m:e_2^m}[Z_8^m : E_2^m]$$

$$\frac{d}{dt}\ e_8^m = k_8^{\text{on}} e_8\ p_8^{\text{avail}} - k_8^{\text{off}} e_8^m + k^{\text{cat}}_{z_8^m:e_{10}^m}[Z_8^m : E_{10}^m] + k^{\text{cat}}_{z_8^m:e_2^m}[Z_8^m : E_2^m]$$
$$-k^+_{e_8^m:APC}[APC]e_8^m + k^-_{e_8^m:APC}[APC : E_8^m] - 0.005 e_8^m$$
$$-k^+_{e_8^m:e_9^m} e_9^m e_8^m + k^-_{e_8^m:e_9^m}[TEN] - k^+_{e_8^m:e_9^m} e_8^m e_9^{m*} + k^-_{e_8^m:e_9^m}[TEN^*]$$

$$
\begin{aligned}
\frac{d}{dt}\, z_9 &= k_{\text{flow}}(z_9^{\text{up}} - z_9) - k_9^{\text{on}}\; p_9^{\text{avail}} z_9 + k_9^{\text{off}} z_9^m - k^+_{z_9:e_7^m} z_9 e_7^m + k^-_{z_9:e_7^m}[Z_9 : E_7^m] \\
&\quad - k^+_{z_9:e_{11}^h} z_9 e_{11}^h + k^-_{z_9:e_{11}^h}[Z_9 : E_{11}^h] - k^+_{z_9:e_{11}} z_9 e_{11} + k^-_{z_9:e_{11}}[Z_9 : E_{11}]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\, e_9 &= k_{\text{flow}}(e_9^{\text{up}} - e_9) - k_{\text{diff}}(e_9 - e_9^{ec}) - k_9^{\text{on}}\; p_9^{\text{avail}} e_9 + k_9^{\text{off}} e_9^m + k^{\text{cat}}_{z_9:e_7^m}[Z_9 : E_7^m] \\
&\quad - k^{\text{in}}_{AT:e_9} e_9 + (k^{\text{cat}}_{z7:e9} + k^-_{z_7:e_9})[Z_7 : E_9] - k^+_{z_7:e_9} z_7 e_9 \\
&\quad + (k^{\text{cat}}_{z_7^m:e_9} + k^-_{z_7^m:e_9})[Z_7^m : E_9] - k^+_{z_7^m:e_9} z_7^m e_9 \\
&\quad - k_9^{\text{on}}\; p_9^{*,\text{avail}} e_9 + k_9^{\text{off}} e_9^{m*} + k^{\text{cat}}_{z_9:e_{11}^h}[Z_9 : E_{11}^h] + k^{\text{cat}}_{z_9:e_{11}}[Z_9 : E_{11}]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\, z_9^m &= k_9^{\text{on}}\; p_9^{\text{avail}} z_9 - k_9^{\text{off}} z_9^m - k^+_{z_9^m:e_{11}^{h,m}} z_9^m e_{11}^{h,m} + k^-_{z_9^m:e_{11}^{h,m}}[Z_9^m : E_{11}^{h,m}] \\
&\quad - k^+_{z_9^m:e_{11}^{m*}} z_9^m e_{11}^{m*} + k^-_{z_9^m:e_{11}^{m*}}[Z_9^m : E_{11}^{m*}]
\end{aligned}
$$

$$
\begin{aligned}
\frac{d}{dt}\, e_9^m &= k_9^{\text{on}}\; p_9^{\text{avail}} e_9 - k_9^{\text{off}} e_9^m + k^-_{e_8^m:e_9^m}[TEN] - k^+_{e_8^m:e_9^m} e_8^m e_9^m \\
&\quad + k^{\text{cat}}_{z_9^m:e_{11}^{h,m}}[Z_9^m : E_{11}^{h,m}] + k^{\text{cat}}_{z_9^m:e_{11}^{m*}}[Z_9^m : E_{11}^{m*}]
\end{aligned}
$$

$$
\frac{d}{dt}\, z_2 = k_{\text{flow}}(z_2^{\text{up}} - z_2) - k_2^{\text{on}}\; p_2^{\text{avail}} z_2 + k_2^{\text{off}} z_2^m
$$

$$
\begin{aligned}
\frac{d}{dt}\, e_2 &= k_{\text{flow}}(e_2^{\text{up}} - e_2) - k_{\text{diff}}(e_2 - e_2^{ec}) + k^{\text{cat}}_{z2m:PRO}[Z_2^m : PRO] \\
&\quad - k_{2*}^{\text{on}}\; p_2^{*,\text{avail}} e_2 + k_{2*}^{\text{off}} e_2^m - k^{\text{in}}_{AT:e_2} e_2 \\
&\quad + (k^{\text{cat}}_{z_5:e_2} + k^-_{z_5:e_2})[Z_5 : E_2] - k^+_{z_5:e_2} z_5 e_2 \\
&\quad + (k^{\text{cat}}_{z_8:e_2} + k^-_{z_8:e_2})[Z_8 : E_2] - k^+_{z_8:e_2} z_8 e_2 \\
&\quad + (k^{\text{cat}}_{z_7:e_2} + k^-_{z_7:e_2})[Z_7 : E_2] - k^+_{z_7:e_2} z_7 e_2 \\
&\quad + (k^{\text{cat}}_{z_7^m:e_2} + k^-_{z_7^m:e_2})[Z_7^m : E_2] - k^+_{z_7^m:e_2} z_7^m e_2 \\
&\quad - k^+_{z_{11}:e_2} z_{11} e_2 + (k^-_{z_{11}:e_2} + k^{\text{cat}}_{z_{11}:e_2})[Z_{11} : E_2] \\
&\quad - k^+_{e_{11}^h:e_2} e_{11}^h e_2 + (k^-_{e_{11}^h:e_2} + k^{\text{cat}}_{e_{11}^h:e_2})[E_{11}^h : E_2]
\end{aligned}
$$

$$
\frac{d}{dt}\, z_2^m = k_2^{\text{on}}\; p_2^{\text{avail}} z_2 - k_2^{\text{off}} z_2^m - k^+_{z_2^m:PRO} z_2^m PRO + k^-_{z_2^m:PRO}[Z_z^m : PRO]
$$

$$
\begin{aligned}
\frac{d}{dt}\, e_2^m &= k_{2*}^{\text{on}}\; p_2^{\text{avail}} e_2 - k_{2*}^{\text{off}} e_2^m + (k^{\text{cat}}_{z_5^m:e_2^m} + k^-_{z_5^m:e_2^m})[Z_5^m : E_2^m] - k^+_{z_5^m:e_2^m} z_5^m e_2^m \\
&\quad + (k^{\text{cat}}_{z_8^m:e_2^m} + k^-_{z_8^m:e_2^m})[Z_8^m : E_2^m] - k^+_{z_8^m:e_2^m} z_8^m e_2^m \\
&\quad - k^+_{z_{11}^m:e_2^m} z_{11}^m e_2^m + (k^-_{z_{11}^m:e_2^m} + k^{\text{cat}}_{z_{11}^m:e_2^m})[Z_{11}^m : E_2^m] \\
&\quad - k^+_{e_{11}^{h,m*}:e_2^m} e_{11}^{h,m*} e_2^m + (k^-_{e_{11}^{h,m*}:e_2^m} + k^{\text{cat}}_{e_{11}^{h,m*}:e_2^m})[E_{11}^{h,m*} : E_2^m]
\end{aligned}
$$

$$\frac{d}{dt}\,[TEN] = -k^{-}_{e_8^m:e_9^m}[TEN] + k^{+}_{e_8^m:e_9^m} e_8^m e_9^m + (k^{\text{cat}}_{z_{10}^m:TEN} + k^{-}_{z_{10}:TEN})[Z_{10}^m : TEN] - k^{+}_{z_{10}^m:TEN} z_{10}^m [TEN]$$

$$\frac{d}{dt}\,[PRO] = -k^{-}_{e_5^m:e_{10}^m}[PRO] + k^{+}_{e_5^m:e_{10}^m} e_{10}^m e_5^m + (k^{\text{cat}}_{z_2^m:PRO} + k^{-}_{z_2^m:PRO})[Z_2^m : PRO] - k^{+}_{z_2^m:PRO} z_2^m [PRO]$$

$$\frac{d}{dt}\,[PL_a^s] = k^{+}_{\text{adh}}\; p^{\text{avail}}_{PLAS}[PL] - k^{-}_{\text{adh}}[PL_a^s] + k^{+}_{\text{adh}}[PL_a^v]\; p^{\text{avail}}_{PLAS}$$

$$\frac{d}{dt}\,[PL] = k^{p}_{\text{flow}}\Big([PL]^{\text{up}} - [PL]\Big) - \Big(k^{+}_{\text{adh}}\; p^{\text{avail}}_{PLAS} + k^{\text{act}}_{\text{plt}}\Big([PL_a^v] + [PL_a^s]\Big) + k^{\text{act}}_{\text{e2}}\frac{e_2}{e_2 + 0.001}\Big)[PL]$$

$$\frac{d}{dt}\,[PL_a^v] = k^{-}_{\text{adh}}[PL_a^s] - k^{+}_{\text{adh}}[PL_a^v]\; p^{\text{avail}}_{PLAS} + \Big(k^{\text{act}}_{\text{plt}}\Big([PL_a^v] + [PL_a^s]\Big) + k^{\text{act}}_{\text{e2}}\frac{e_2}{e_2 + 0.001}\Big)[PL]$$

$$\frac{d}{dt}\,[TFPI] = k_{\text{flow}}([TPFI]^{\text{up}} - [TFPI]) - k^{+}_{TFPI:e_{10}} e_{10}[TFPI] + k^{-}_{TFPI:e_{10}}[TFPI : Xa]$$

$$\frac{d}{dt}\,[TFPI : E_{10}] = -k_{\text{flow}}[TFPI : E_{10}] + k^{+}_{TFPI:e_{10}} e_{10}[TFPI] - k^{-}_{TFPI:e_{10}}[TFPI : E_{10}] + k^{-}_{TFPI:e_{10}:e_7^m}[TFPI : E_{10} : E_7^m] - k^{+}_{TFPI:e_{10}:e_7^m} e_7^m [TFPI : E_{10}]$$

$$\frac{d}{dt}\,[TFPI : E_{10} : E_7^m] = -k^{-}_{TFPI:e_{10}:e_7^m}[TFPI : E_{10} : E_7^m] + k^{+}_{TFPI:e_{10}:e_7^m} e_7^m [TFPI : E_{10}] - [TFPI : E_{10} : E_7^m]\frac{d}{dt}\,[PL_a^s]\frac{1}{p^{\text{avail}}_{PLAS}}$$

$$\frac{d}{dt}\,[APC] = k_{\text{flow}}\Big([APC]^{\text{up}} - [APC]\Big) - k_{\text{diff}}\Big([APC] - [APC^{ec}]\Big)$$
$$+(k^{\text{cat}}_{e_5^m:APC} + k^{-}_{e_5^m:APC})[APC:E_5^m] - k^{+}_{e_5^m:APC}\; e_5^m[APC]$$
$$+(k^{\text{cat}}_{e_8^m:APC} + k^{-}_{e_8^m:APC})[APC:E_8^m] - k^{+}_{e_8^m:APC}\; e_8^m[APC]$$
$$+(k^{\text{cat}}_{e_5:APC} + k^{-}_{e_5:APC})[APC:E_5] - k^{+}_{e_5:APC}\; e_5[APC]$$
$$+(k^{\text{cat}}_{e_8:APC} + k^{-}_{e_8:APC})[APC:E_8] - k^{+}_{e_8:APC}\; e_8[APC]$$

$$\frac{d}{dt}\,[APC:E_8^m] = k^{+}_{e_8^m:APC}\; e_8^m[APC] - (k^{\text{cat}}_{e_8^m:APC} + k^{-}_{e_8^m:APC})[APC:E_8^m]$$

$$\frac{d}{dt}\,[APC:E_5^m] = k^{+}_{e_5^m:APC}\; e_5^m[APC] - (k^{\text{cat}}_{e_5^m:APC} + k^{-}_{e_5^m:APC})[APC:E_5^m]$$

$$\frac{d}{dt}\,[APC:E_5] = k^{+}_{e_5:APC}\; e_5[APC] - (k^{\text{cat}}_{e_5:APC} + k^{-}_{e_5:APC})[APC:E_5]$$

$$\frac{d}{dt}\,[APC:E_8] = k^{+}_{e_8:APC}\; e_8[APC] - (k^{\text{cat}}_{e_8:APC} + k^{-}_{e_8:APC})[APC:E_8]$$

$$\frac{d}{dt}\,[Z_7:E_2] = k_{\text{flow}}\Big([Z_7:E_2]^{\text{up}} - [Z_7:E_2]\Big) + k^{+}_{z_7:e_2} z_7 e_2$$
$$-(k^{\text{cat}}_{z_7:e_2} + k^{-}_{z_7:e_2})[Z_7:E_2]$$

$$\frac{d}{dt}\,[Z_7:E_{10}] = k_{\text{flow}}\Big([Z_7:E_{10}]^{\text{up}} - [Z_7:E_{10}]\Big) + k^{+}_{z_7:e_{10}} z_7 e_{10}$$
$$-(k^{\text{cat}}_{z_7:e_{10}} + k^{-}_{z_7:e_{10}})[Z_7:E_{10}]$$

$$\frac{d}{dt}\,[Z_7^m:E_{10}] = k^{+}_{z_7^m:e_{10}} z_7^m e_{10} - (k^{\text{cat}}_{z_7^m:e_{10}} + k^{-}_{z_7^m:e_{10}})[Z_7^m:E_{10}]$$
$$-[Z_7^m:E_{10}]\frac{d}{dt}\,[PL_a^s]\frac{1}{p^{\text{avail}}_{PLAS}}$$

$$\frac{d}{dt}\,[Z_7^m:E_2] = k^{+}_{z_7^m:e_2} z_7^m e_2 - (k^{\text{cat}}_{z_7^m:e_2} + k^{-}_{z_7^m:e_2})[Z_7^m:E_2]$$
$$-[Z_7^m:E_2]\frac{d}{dt}\,[PL_a^s]\frac{1}{p^{\text{avail}}_{PLAS}}$$

$$\frac{d}{dt}\,[Z_{10}:E_7^m] = k^{+}_{z_{10}:e_7^m} z_{10} e_7^m - (k^{\text{cat}}_{z_{10}:e_7^m} + k^{-}_{z_{10}:e_7^m})[Z_{10}:E_7^m]$$
$$-[Z_{10}:E_7^m]\frac{d}{dt}\,[PL_a^s]\frac{1}{p^{\text{avail}}_{PLAS}}$$

$$\frac{d}{dt}\,[Z_{10}^m : TEN] = k^{+}_{z_{10}^m:TEN} z_{10}^m [TEN] - (k^{\text{cat}}_{z_{10}^m:TEN} + k^{-}_{z_{10}:TEN})[Z_{10}^m : TEN]$$

$$\frac{d}{dt}\,[Z_5 : E_2] = k_{\text{flow}}\Big([Z_5 : E_2]^{\text{up}} - [Z_5 : E_2]\Big) + k^{+}_{z_5:e_2} z_5 e_2 - (k^{\text{cat}}_{z_5:e_2} + k^{-}_{z_5:e_2})[Z_5 : E_2]$$

$$\frac{d}{dt}\,[Z_5^m : E_{10}^m] = k^{+}_{z_5^m:e_{10}^m} z_5^m e_{10}^m - (k^{\text{cat}}_{z_5^m:e_{10}^m} + k^{-}_{z_5^m:e_{10}^m})[Z_5^m : E_{10}^m]$$

$$\frac{d}{dt}\,[Z_5^m : E_2^m] = k^{+}_{z_5^m:e_2^m} z_5^m e_2^m - (k^{\text{cat}}_{z_5^m:e_2^m} + k^{-}_{z_5^m:e_2^m})[Z_5^m : E_2^m]$$

$$\frac{d}{dt}\,[Z_8^m : E_{10}^m] = k^{+}_{z_8^m:e_{10}^m} z_8^m e_{10}^m - (k^{\text{cat}}_{z_8^m:e_{10}^m} + k^{-}_{z_8^m:e_{10}^m})[Z_8^m : E_{10}^m]$$

$$\frac{d}{dt}\,[Z_8^m : E_2^m] = k^{+}_{z_8^m:e_2^m} z_8^m e_2^m - (k^{\text{cat}}_{z_8^m:e_2^m} + k^{-}_{z_8^m:e_2^m})[Z_8^m : E_2^m]$$

$$\frac{d}{dt}\,[Z_8 : E_2] = k_{\text{flow}}\Big([Z_8 : E_2]^{\text{up}} - [Z_8 : E_2]\Big) + k^{+}_{z_8:e_2} z_8 e_2 - (k^{\text{cat}}_{z_8:e_2} + k^{-}_{z_8:e_2})[Z_8 : E_2]$$

$$\frac{d}{dt}\,[Z_9 : E_7^m] = k^{+}_{z_9:e_7^m} z_9 e_7^m - (k^{\text{cat}}_{z_9:e_7^m} + k^{-}_{z_9:e_7^m})[Z_9 : E_7^m] - [Z_9 : E_7^m]\frac{d}{dt}\,[PL_a^s]\frac{1}{p_{PLAS}^{\text{avail}}}$$

$$\frac{d}{dt}\,[Z_2^m : PRO] = k^{+}_{z_2^m:PRO} z_2^m [PRO] - (k^{\text{cat}}_{z_2^m:PRO} + k^{-}_{z_2^m:PRO})[Z_2^m : PRO]$$

$$\frac{d}{dt}\,[TF] = -[TF]\frac{d}{dt}\,[PL_a^s]\frac{1}{p_{PLAS}^{\text{avail}}}$$

$$\frac{d}{dt}\,e_9^{m*} = k_9^{\text{on}}\,p_9^{*,\text{avail}} e_9 - k_9^{\text{off}} e_9^{m*} + k^{-}_{e_8^m:e_9^m}[TEN^*] - k^{+}_{e_8^m:e_9^m} e_8^m e_9^{m*}$$

$$\frac{d}{dt}\,[TEN^*] = -k^{-}_{e_8^m:e_9^m}[TEN^*] + k^{+}_{e_8^m:e_9^m} e_8^m e_9^{m*} + (k^{\text{cat}}_{z_{10}^m:TEN} + k^{-}_{z_{10}:TEN})[Z_{10}^m : TEN^*] - k^{+}_{z_{10}^m:TEN} z_{10}^m [TEN^*]$$

$$\frac{d}{dt}\,[Z_{10}^m : TEN^*] = k^{+}_{z_{10}^m:TEN} z_{10}^m [TEN^*] - (k^{\text{cat}}_{z_{10}^m:TEN} + k^{-}_{z_{10}:TEN})[Z_{10}^m : TEN^*]$$

$$\frac{d}{dt}\ e_2^{ec} = k_{\text{flow}}(e_2^{\text{up}} - e_2^{ec}) + k_{\text{diff}}(e_2 - e_2^{ec}) - -k_{AT:e_2}^{\text{in}} e_2^{ec} - k_{TM}^{\text{on}} e_2^{ec}[TM]^{\text{avail}} + k_{TM}^{\text{off}}[TM : E_2^{ec}]$$

$$\frac{d}{dt}\ [APC^{ec}] = k_{\text{flow}}\Big([APC]^{\text{up}} - [APC^{ec}]\Big) + k_{\text{diff}}([APC] - [APC^{ec}]) + k_{PC:TM:e_2^{ec}}^{\text{cat}}[TM : E_2^{ec} : APC]$$

$$\frac{d}{dt}\ [TM : E_2^{ec}] = k_{TM}^{\text{on}} e_2^{ec}[TM]^{\text{avail}} - k_{TM}^{\text{off}}[TM : E_2^{ec}] - k_{PC:TM:e_2^{ec}}^{+}[TM : E_2^{ec}] + (k_{PC:TM:e_2^{ec}}^{-} + k_{PC:TM:e_2^{ec}}^{\text{cat}})[TM : E_2^{ec} : APC]$$

$$\frac{d}{dt}\ [TM : E_2^{ec} : APC] = k_{PC:TM:e_2^{ec}}^{+}[TM : E_2^{ec}] - (k_{PC:TM:e_2^{ec}}^{-} + k_{PC:TM:e_2^{ec}}^{\text{cat}})[TM : E_2^{ec} : APC]$$

$$\frac{d}{dt}\ e_9^{ec} = k_{\text{flow}}(e_9^{\text{up}} - e_9^{ec}) + k_{\text{diff}}(e_9 - e_9^{ec}) - k_{AT:e_9}^{\text{in}} e_9^{ec}$$

$$\frac{d}{dt}\ e_{10}^{ec} = k_{\text{flow}}(e_{10}^{\text{up}} - e_{10}^{ec}) + k_{\text{diff}}(e_{10} - e_{10}^{ec}) - k_{AT:e_{10}}^{\text{in}} e_{10}^{ec}$$

$$\frac{d}{dt}\ z_{11} = k_{\text{flow}}(z_{11}^{\text{up}} - z_{11}) - k_{z_{11}}^{\text{on}} z_{11}\ p_{11}^{\text{avail}} + k_{z_{11}}^{\text{off}} z_{11}^{m} - k_{z_{11}:e_2}^{+} z_{11} e_2 + k_{z_{11}:e_2}^{-}[Z_{11} : E_2]$$

$$\frac{d}{dt}\ e_{11}^{h} = k_{\text{flow}}(e_{11}^{h,\text{up}} - e_{11}^{h}) - k_{e_{11}^{h}}^{\text{on}*} e_{11}^{h}\ p_{11}^{*,\text{avail}} + k_{e_{11}^{h}}^{\text{off}*} e_{11}^{h,m*} - k_{e_{11}^{h}}^{\text{on}} e_{11}^{h}\ p_{11}^{\text{avail}} + k_{e_{11}^{h}}^{\text{off}} e_{11}^{h,m} - k_{z_9:e_{11}^{h}}^{+} z_9 e_{11}^{h} + (k_{z_9:e_{11}^{h}}^{-} + k_{z_9:e_{11}^{h}}^{\text{cat}})[Z_9 : E_{11}^{h}] + k_{z_{11}:e_2}^{\text{cat}}[Z_{11} : E_2] - k_{e_{11}^{h}:e_2}^{+} e_{11}^{h} e_2 + k_{e_{11}^{h}:e_2}^{-}[E_{11}^{h} : E_2] - k_{AT:e_{11}}^{\text{in}} e_{11}^{h}$$

$$\frac{d}{dt}\ e_{11} = k_{\text{flow}}(e_{11}^{\text{up}} - e_{11}) - k_{e_{11}}^{\text{on}*} e_{11}\ p_{11}^{*,\text{avail}} + k_{e_{11}}^{\text{off}*} e_{11}^{m*} - k_{z_9:e_{11}}^{+} z_9 e_{11} + (k_{z_9:e_{11}}^{-} + k_{z_9:e_{11}}^{\text{cat}})[Z_9 : E_{11}] + k_{e_{11}^{h}:e_2}^{\text{cat}}[E_{11}^{h} : E_2] - k_{AT:e_{11}}^{\text{in}} e_{11}$$

$$\frac{d}{dt}\ z_{11}^m = k^{\rm on}_{z_{11}} z_{11}\ p_{11}^{\rm avail} - k^{\rm off}_{z_{11}} z_{11}^m - k^+_{z_{11}^m:e_2^m} z_{11}^m e_2^m + k^-_{z_{11}^m:e_2^m}[Z_{11}^m : E_2^m]$$

$$\begin{aligned}\frac{d}{dt}\ e_{11}^{h,m} &= k^{\rm on}_{e_{11}^h} e_{11}^h\ p_{11}^{\rm avail} - k^{\rm off}_{e_{11}^h} e_{11}^{h,m} + k^{\rm cat}_{z_{11}^m:e_2^m}[Z_{11}^m : E_2^m] \\ &\quad -k^+_{z_9^m:e_{11}^{h,m}} z_9^m e_{11}^{h,m} + (k^-_{z_9^m:e_{11}^{h,m}} + k^{\rm cat}_{z_9^m:e_{11}^{h,m}})[Z_9^m : E_{11}^{h,m}]\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}\ e_{11}^{h,m*} &= k^{\rm on*}_{e_{11}^h} e_{11}^h\ p_{11}^{*,\rm avail} - k^{\rm off*}_{e_{11}^h} e_{11}^{h,m*} \\ &\quad -k^+_{e_{11}^{h,m*}:e_2^m} e_{11}^{h,m*} e_2^m + k^-_{e_{11}^{h,m*}:e_2^m}[E_{11}^{h,m*} : E_2^m]\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}\ e_{11}^{m*} &= k^{\rm on*}_{e_{11}} e_{11}\ p_{11}^{*,\rm avail} - k^{\rm off*}_{e_{11}} e_{11}^{m*} + k^{\rm cat}_{e_{11}^{h,m*}:e_2^m}[E_{11}^{h,m*} : E_2^m] \\ &\quad -k^+_{z_9^m:e_{11}^{m*}} z_9^m e_{11}^{m*} + (k^-_{z_9^m:e_{11}^{m*}} + k^{\rm cat}_{z_9^m:e_{11}^{m*}})[Z_9^m : E_{11}^{m*}]\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}\ [Z_9 : E_{11}^h] &= k_{\rm flow}\Big([Z_9 : E_{11}^h]^{\rm up} - [Z_9 : E_{11}^h]\Big) + k^+_{z_9:e_{11}^h} z_9 e_{11}^h \\ &\quad -(k^-_{z_9:e_{11}^h} + k^{\rm cat}_{z_9:e_{11}^h})[Z_9 : E_{11}^h]\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}\ [Z_9 : E_{11}] &= k_{{\rm flow}\Big([{\rm Z_9:E_{11}}]^{\rm up} - [{\rm Z_9:E_{11}}]\Big)} + k^+_{z_9:e_{11}} z_9 e_{11} \\ &\quad -(k^-_{z_9:e_{11}} + k^{\rm cat}_{z_9:e_{11}})[Z_9 : E_{11}]\end{aligned}$$

$$\frac{d}{dt}\ [Z_9^m : E_{11}^{h,m}] = k^+_{z_9^m:e_{11}^{h,m}} z_9^m e_{11}^{h,m} - (k^-_{z_9^m:e_{11}^{h,m}} + k^{\rm cat}_{z_9^m:e_{11}^{h,m}})[Z_9^m : E_{11}^{h,m}]$$

$$\frac{d}{dt}\ [Z_9^m : E_{11}^{m*}] = k^+_{z_9^m:e_{11}^{m*}} z_9^m e_{11}^{m*} - (k^-_{z_9^m:e_{11}^{m*}} + k^{\rm cat}_{z_9^m:e_{11}^{m*}})[Z_9^m : E_{11}^{m*}]$$

$$\begin{aligned}\frac{d}{dt}\ [Z_{11} : E_2] &= k_{\rm flow}\Big([Z_{11} : E_2]^{\rm up} - [Z_{11} : E_2]\Big) \\ &\quad +k^+_{z_{11}:e_2} z_{11} e_2 - (k^-_{z_{11}:e_2} + k^{\rm cat}_{z_{11}:e_2})[Z_{11} : E_2]\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}\ [E_{11}^h : E_2] &= k_{\rm flow}\Big([E_{11}^h : E_2]^{\rm up} - [E_{11}^h : E_2]\Big) \\ &\quad +k^+_{e_{11}^h:e_2} e_{11}^h e_2 - (k^-_{e_{11}^h:e_2} + k^{\rm cat}_{e_{11}^h:e_2})[E_{11}^h : E_2]\end{aligned}$$

$$\frac{d}{dt}\ [Z_{11}^m : E_2^m] = k^+_{z_{11}^m:e_2^m} z_{11}^m e_2^m - (k^-_{z_{11}^m:e_2^m} + k^{\rm cat}_{z_{11}^m:e_2^m})[Z_{11}^m : E_2^m]$$

$$\frac{d}{dt}\ [E_{11}^{h,m*} : E_2^m] = k^+_{e_{11}^{h,m*}:e_2^m} e_{11}^{h,m*} e_2^m - (k^-_{e_{11}^{h,m*}:e_2^m} + k^{\rm cat}_{e_{11}^{h,m*}:e_2^m})[E_{11}^{h,m*} : E_2^m]$$

S1 Table. INITIAL PLASMA LEVELS. Descriptions, notation and labels for each parameter associated with initial plasma levels are listed. The value of each parameter is found in the corresponding table listed above.

Description	Notation	Label	Table
Prothrombin	z_2	Z_2	S5
Factor V	z_5	Z_5	S5
Factor VII	z_7	Z_7	S5
Factor VIII	z_8	Z_8	S5
Factor IX	z_9	Z_9	S5
Factor X	z_{10}	Z_{10}	S5
Factor XI	z_{11}	Z_{11}	S5
TFPI	[TFPI]	TFPI	S5
AT	$k^{in}_{AT:e_2}$, $k^{in}_{AT:e_9}$, $k^{in}_{AT:e_{10}}$, $k^{in}_{AT:e_{11}}$	AT	S11

S2 Table. PLATELET CHARACTERISTICS. Descriptions, notation and labels for each parameter associated with platelet characteristics are listed. The value of each parameter is found in the corresponding table listed above.

Description	Notation	Label	Table
Platelet count	PL^{up}	PLup	S5
Binding site number for II	N_2	N2	S5
Binding site number for IIa	N_2^*	N2*	S5
Binding site number for V/Va	N_5	N5	S5
Binding site number for VIII/VIIIa	N_8	N8	S5
Binding site number for IX	N_9	N9	S5
Binding site number for IXa	N_9^*	N9*	S5
Binding site number for X/Xa	N_{10}	N10	S5
Binding site number for XI	N_{11}	N11	S5
Binding site number for XIa	N_{11}^*	N11*	S5
Rate of unactivated platelets adhering to SE	k^{+}_{adh}	kadh	S12
Rate of activated platelets adhering to SE	$k^{+,*}_{adh}$	kadh1	S12
Rate of platelet activation by platelet in solution	k^{act}_{plt}	kact_{plt}	S12
Rate of platelet activation on SE	$k^{act,*}_{plt}$	kact*_{plt}	S12
Rate of platelet activation by thrombin	$k^{act}_{e_2}$	kact_{e2}	S7

S3 Table. KINETIC RATE CONSTANTS. Descriptions, notation and labels for each parameter associated with kinetic rate constants are listed. The value of each parameter is found in the corresponding table listed above.

Description	Notation	Label	Table
Rates of activation of TF:VII by fX	K_M	KZ7mE10M	S7
	$k^{cat}_{z^m_7:e_{10}}$	KZ7mE10CAT	S7
	$k^{-}_{z^m_7:e_{10}}$	KZ7mE10MI	S7
Rates of activation of fX by TF:VIIa	K_M	KZ10E7mM	S7
	$k^{cat}_{z_{10}:e^m_7}$	KZ10E7mCAT	S7
	$k^{-}_{z_{10}:e^m_7}$	KZ10E7mMI	S7
Rates of activation of fIX by TF:VIIa	K_M	KZ9E7mM	S7
	$k^{cat}_{z_9:e^m_7}$	KZ9E7mCAT	S7
	$k^{-}_{z_9:e^m_7}$	KZ9E7mMI	S7
Rates of binding of fVII/fVIIa to TF	k^{on}_7	K7ON	S7
	k^{off}_7	K7OFF	S8
Rates of activation of TF:VII by fXa	K_M	KZ7E10M	S8
	$k^{cat}_{z_7:e^m_{10}}$	KZ7E10CAT	S8
	$k^{-}_{z_7:e^m_{10}}$	KZ7E10MI	S8
Rates of activation of TF:VII by fIIa	K_M	KZ7E2M	S8
	$k^{cat}_{z_7:e_2}$	KZ7E2CAT	S8
	$k^{-}_{z_7:e_2}$	KZ7E2MI	S8
Rates of activation of TF:VII by fIXa	K_M	KZ7E9M	S8
	$k^{cat}_{z_7:e_9}$	KZ7E9CAT	S8
	$k^{-}_{z_7:e_9}$	KZ7E9MI	S8
Rates of activation of fV by fIIa	K_M	KZ5E2M	S8
	$k^{cat}_{z_5:e_2}$	KZ5E2CAT	S8
	$k^{-}_{z_5:e_2}$	KZ5E2MI	S8
Rates of activation of fVIII by fIIa	K_M	KZ8E2M	S8
	$k^{cat}_{z_8:e_2}$	KZ8E2CAT	S8
	$k^{-}_{z_8:e_2}$	KZ8E2MI	S8
Rates of activation of fIX by fXIa-fXIa	$k^{+}_{z_9:e_{11}}$	KZ9E11P	S8
	$k^{cat}_{z_9:e_{11}}$	KZ9E11CAT	S8
	$k^{-}_{z_9:e_{11}}$	KZ9E11MI	S8
Rates of activation of fIX by fXIa-fXI	$k^{+}_{z_9:e^h_{11}}$	KZ9E11P	S8
	$k^{cat}_{z_9:e^h_{11}}$	KZ9E11CAT	S8
	$k^{-}_{z_9:e^h_{11}}$	KZ9E11MI	S8
Rates of activation of fXI by fIIa	$k^{+}_{z_{11}:e_2}$	KZ11E2P	S8
	$k^{cat}_{z_{11}:e_2}$	KZ11E2CAT	S8
	$k^{-}_{z_{11}:e_2}$	KZ11E2MI	S9
Rates of binding of fX/fXa to plt. surface	k^{on}_{10}	K10ON	S9
	k^{off}_{10}	K10OFF	S9
Rates of binding of fV/fVa to plt. surface	k^{on}_5	K5ON	S9
	k^{off}_5	K5OFF	S9
Rates of binding of fVIII/fVIIIa to plt. surface	k^{on}_8	K8ON	S9
	k^{off}_8	K8OFF	S9
Rates of binding of fIX/fIXa to plt. surface	k^{on}_9	K9ON	S9
	k^{off}_9	K9OFF	S9
Rates of binding of fII/fIIa to plt. surface	k^{on}_2, $k^{on,*}_2$	K2ON, K2SON	S9
	k^{off}_2, $k^{off,*}_2$	K2OFF, K2SOFF	S9
Rates of binding of fXI/fXIa to plt. surface	k^{on}_{11}, $k^{on,*}_{11}$	K11ON, K11SON	S9
	k^{off}_{11}, $k^{off,*}_{11}$	K11OFF, K11SOFF	S10

S4 Table. KINETIC RATE CONSTANTS. Descriptions, notation and labels for each parameter associated with kinetic rate constants are listed. The value of each parameter is found in the corresponding table listed above.

Description	Notation	Label	Table
Rates of activation of fV by fXa on plt. surface	K_M	KZ5mE10mM	S10
	$k^{cat}_{z_5^m:e_{10}^m}$	KZ5mE10mCAT	S10
	$k^{-}_{z_5^m:e_{10}^m}$	KZ5mE10mMI	S10
Rates of activation of fV by fIIa on plt. surface	K_M	KZ5mE2mM	S10
	$k^{cat}_{z_5:e_2^m}$	KZ5mE2mCAT	S10
	$k^{-}_{z_5:e_2^m}$	KZ5mE2mMI	S10
Rates of activation of fVIII by fXa on plt. surface	K_M	KZ8ME10MM	S10
	$k^{cat}_{z_8:e_{10}^m}$	KZ8ME10MCAT	S10
	$k^{-}_{z_8:e_{10}^m}$	KZ8ME10MMI	S10
Rates of activation of fVIII by fIIa on plt. surface	K_M	KZ8ME2MM	S10
	$k^{cat}_{z_8:e_2^m}$	KZ8mE2mCAT	S10
	$k^{-}_{z_8:e_2^m}$	KZ8mE2mMI	S10
Rates of activation of fX by TEN on plt. surface	K_M	KZ10mTENM	S10
	$k^{cat}_{z_{10}^m:TEN}$	KZ10mTENCAT	S10
Rates of activation of fII by PRO on plt. surface	K_M	KZ2mPROM	S10
	$k^{cat}_{z_2^m:PRO}$	KZ2mPROCAT	S10
Rates of activation of fXI by fIIa on plt. surfaces	$k^{+}_{z_{11}^m:e_2^m}$	KZ11mE2mP	S10
	$k^{cat}_{z_{11}^m:e_2^m}$	KZ11mE2mCAT	S10
	$k^{-}_{z_{11}^m:e_2^m}$	KZ11mE2mMI	S10
Rates of activation of fIX by fXIa-fXIa on plt. surface	K_M	KZ9mE11mP	S10
	$k^{cat}_{z_9^m:e_{11}^m}$	KZ9mE11mCAT	S10
	$k^{-}_{z_9^m:e_2^m}$	KZ9mE11mMI	S10
Rates of formation of TEN on plt. surface	$k^{+}_{e_8^m:e_9^m}$	KE8mE9mP	S10
	$k^{-}_{e_8^m:e_9^m}$	KE8mE9mMI	S10
Rates of formation of PRO on plt. surface	$k^{+}_{e_5^m:e_{10}^m}$	KE5mE10mP	S10
	$k^{-}_{e_5^m:e_{10}^m}$	KE5mE10mMI	S10
Rates of inhibition of fXa by TFPI	$k^{+}_{tfpia:e_{10}}$	KTFPI_E10_P	S11
	$k^{-}_{tfpia:e_{10}}$	KTFPI_E10_M	S11
Rates of inhibition of TF:VIIa by TFPIa	$k^{+}_{tfpia:e_7^m}$	KTFPIa_E7m_P	S11
	$k^{-}_{tfpia:e_7^m}$	KTFPIa_E7m_M	S11
Rates of inhibition of fVa by APC on plt. surface	K_M	KE5mAPCM	S11
	$k^{cat}_{e_5^m:APC}$	KE5mAPCCAT	S11
	$k^{-}_{e_5^m:APC}$	KE5mAPCMI	S11
Rates of inhibition of fVIIIa by APC on plt. surface	K_M	KE8mAPCM	S11
	$k^{cat}_{e_8^m:APC}$	KE8mAPCCAT	S11
	$k^{-}_{e_8^m:APC}$	KE8mAPCMI	S11
Rates of inhibition of fIIa by TM on plt. surface	k^{on}_{TM}	KTMP	S11
	k^{off}_{TM}	KTMM	S12

Kinetic and Physical Parameter Values:

S5 Table. DIFFUSION COEFFICIENTS FOR PLATELETS AND FLUID-PHASE CHEMICAL SPECIES (a) From [3]. (b) From [4].

Platelets	2.5×10^{-7} cm^2/s	a
Proteins	5×10^{-7} cm^2/s	b

S6 Table. NORMAL CONCENTRATIONS AND SURFACE BINDING SITE NUMBERS (a) From [5]. (b) From [6]. (c) [7] suggests that normal plasma concentration of fVIIa is about 1% of the normal fVII concentration. (d) From [8]. (e) (f) From [9]. (g) Estimated as described in the text of the Supplementary Information. (h) From [10]. (i) From [11]. (j) From [12]. (k) From [13]. (l) From [14,15]. (m) Number of fV molecules released per activated platelet [16]. (n) Maximum concentration of platelets in a 2 μm high reaction zone assuming that 20 platelets can cover a 10μm-by-10μm injured surface [17].

Prothrombin	1.4 μM	a
Factor V	0.01 μM	b
Factor VII	0.01 μM	a
Factor VIIa	0.1 nM	c
Factor VIII	1.0 nM	a
Factor IX	0.09 μM	a
Factor X	0.17 μM	a
Factor XI	30.0 nM	a
TFPI	2.5 nM	d
Protein C	65 nM	e
Platelet count	$2.5(10)^5/\mu$l	f
N_2	1000/plt	g
N_2^*	1000/plt	g
N_5	3000/plt	h
N_8	450/plt	i
N_9	250/plt	j
N_9^*	250/plt	j
N_{10}	2700/plt	k
N_{11}	1500/plt	l
N_{11}^*	250/plt	l
n_5	3000/plt	m
p_{PLAS}	0.167 nM	n

S7 Table. REACTIONS ON SUBENDOTHELIUM (a) $k^{\text{cat}}_{z_7^m:e_{10}} = 5.0$ sec^{-1} and $K_M = 1.2 \cdot 10^{-6}$ M [18]. (b) $k^{\text{cat}}_{z_7^m:e_2} = 6.1 \cdot 10^{-2}$ sec^{-1} and $K_M = 2.7 \cdot 10^{-6}$ M [18]. (d) $k^{\text{cat}}_{z_{10}:e_7^m} = 1.15$ sec^{-1} and $K_M = 4.5 \cdot 10^{-7}$ M [5]. (d) $k^{\text{cat}}_{z_9:e_7^m} = 1.15$ sec^{-1} and $K_M = 2.4 \cdot 10^{-7}$ M [19]. (e) $K_d = 1.0 \cdot 10^{-10}$ M [20].

Activation (of -, by -)							
(TF:VII,fXa)	E_{10}, Z_7^m	$Z_7^m : E_{10}$	E_7^m	$k^+_{z_7^m:e_{10}}$=$5.0 \cdot 10^6$	$k^-_{z_7^m:e_{10}}$=1.0	$k^{\text{cat}}_{z_7^m:e_{10}}$=5.0	a
(TF:VII, fIIa)	E_2, Z_7^m	$Z_7^m : E_2$	E_7^m	$k^+_{z_7^m:e_2}$=$3.92 \cdot 10^5$	$k^-_{z_7^m:e_2}$=1.0	$k^{\text{cat}}_{z_7^m:e_2}$=$6.1 \cdot 10^{-2}$	b
(fX, TF:VIIa)	E_7^m, Z_{10}	$Z_{10} : E_7^m$	E_{10}	$k^+_{z_{10}:e_7^m}$=$5.0 \cdot 10^6$	$k^-_{z_{10}:e_7^m}$=1.0	$k^{\text{cat}}_{z_{10}:e_7^m}$=1.15	c
(fIX, TF:VIIa)	E_7^m, Z_9	$Z_9 : E_7^m$	E_9	$k^+_{z_9:e_7^m}$=$9.4 \cdot 10^6$	$k^-_{z_9:e_7^m}$=1.0	$k^{\text{cat}}_{z_9:e_7^m}$=1.15	d
Binding (of -, with -)							
(fVII, TF)	Z_7, TF		Z_7^m	k_7^{on}=$5.0 \cdot 10^7$	k_7^{off}=$5.0 \cdot 10^{-3}$		e
(fVIIa, TF)	E_7, TF		E_7^m	k_7^{on}=$5.0 \cdot 10^7$	k_7^{off}=$5.0 \cdot 10^{-3}$		e

S8 Table. REACTIONS IN THE PLASMA (a) $k^{\text{cat}}_{z_7:e_{10}} = 5.0\ \text{sec}^{-1}$ and $K_M = 1.2 \cdot 10^{-6}$ M [18]. (b) $k^{\text{cat}}_{z_7:e_2} = 6.1 \cdot 10^{-2}\ \text{sec}^{-1}$ and $K_M = 2.7 \cdot 10^{-6}$ M [18] (c) $k^{\text{cat}}_{z_5:e_2} = 0.23\ \text{sec}^{-1}$ and $K_M = 7.17 \cdot 10^{-8}$ M [21]. (d) $k^{\text{cat}}_{z_8:e_2} = 0.9\ \text{sec}^{-1}$ [22] and $K_M = 2 \cdot 10^{-7}$ M [23]. (e) $k^{\text{cat}}_{z_{11}:e_2} = 1.3 \cdot 10^{-4}$, $K_M = 50\text{nM}$ [24]. Rate constants apply also for thrombin-activation of XIa-XI. (f) $k^{\text{cat}}_{z_9:e^h_{11}} = 0.21$, $K_M = 0.2\mu\text{M}$ [25, 26]. Rate constants apply also for activation of IX by XIa-XIa.

Reaction	Reactants	Complex	Product	$\text{M}^{-1}\text{sec}^{-1}$	sec^{-1}	sec^{-1}	Note
Activation (of -, by -)							
(fVII, fXa)	Z_7, E_{10}	$Z_7 : E_{10}$	E_7	$k^{+}_{z_7:e_{10}}=5 \cdot 10^{6}$	$k^{-}_{z_7:e_{10}}=1.0$	$k^{\text{cat}}_{z_7:e_{10}}=5.0$	a
(fVII, fIIa)	Z_7, E_2	$Z_7 : E_2$	E_7	$k^{+}_{z_7:e_2}=3.92 \cdot 10^{5}$	$k^{-}_{z_7:e_2}=1.0$	$k^{\text{cat}}_{z_7:e_2}=6.1 \cdot 10^{-2}$	b
(fV, fIIa)	Z_5, E_2	$Z_5 : E_2$	E_5	$k^{+}_{z_5:e_2}= 1.73 \cdot 10^{7}$	$k^{-}_{z_5:e_2}=1.0$	$k^{\text{cat}}_{z_5:e_2}=0.23$	c
(fVIII, fIIa)	Z_8, E_2	$Z_8 : E_2$	E_8	$k^{+}_{z_8:e_2}=2.64 \cdot 10^{7}$	$k^{-}_{z_8:e_2}=1.0$	$k^{\text{cat}}_{z_8:e_2}=0.9$	d
(fXI-fXI, fIIa)	Z_{11}, E_2	$Z_{11} : E_2$	E^h_{11}	$k^{+}_{z_{11}:e_2} = 2.0 \cdot 10^{7}$	$k^{-}_{z_{11}:e_2} = 1.0$	$k^{\text{cat}}_{z_{11}:e_2} = 1.3 \cdot 10^{-4}$	e
(fIX, fXIa)	Z_9, E^h_{11}	$Z_9 : E^h_{11}$	E_9	$k^{+}_{z_9:e^h_{11}} = 0.6 \cdot (10)^{7}$	$k^{-}_{z_9:e^h_{11}} = 1.0$	$k^{\text{cat}}_{z_9:e^h_{11}} = 0.21$	f

S9 Table. BINDING TO PLATELET SURFACES (a) For fIX binding to platelets, $K_d = 2.5 \cdot 10^{-9}$ M [12], and for fX binding to platelets, K_d has approximately the same value [10]. For fX binding to PCPS vesicles, the on-rate is about 10^7 $\mathrm{M}^{-1}\mathrm{sec}^{-1}$ and the off-rate is about 1.0 sec^{-1} [27] giving a dissociation constant of about 10^{-7} M. To estimate on- and off-rates for the higher-affinity binding of fX to platelets, we keep the on-rate the same as for vesicles and adjust the off-rate to give the correct dissociation constant. The rates for fIX binding with platelets are taken to be the same as for fX binding. (b) We assume binding constants for fIXa binding to the specific fIXa binding sites are the same as for shared sites. (c) fV binds with high-affinity to phospholipids (PCPS) [27] and we use the same rate constants reported there to describe fV binding to platelets. (d) The K_d for fVIII binding with platelets is taken from [11]. We set the off-rate k_8^{off} for fVIII binding to platelets equal to that for fV binding to platelets, and calculate the on-rate k_8^{on}. (e) For prothrombin interactions with platelets, K_d is reported to be $5.9 \cdot 10^{-7}$ M [28]. We choose k_2^{off} and set $k_2^{\mathrm{on}} = k_2^{\mathrm{off}}/K_d$. (f) Estimated as described in the text of the Supplementary Information. (g) $K_d = 10$ nM [29]. (h) $K_d = 1.7$ nM [15].

Reaction	Reactants	Products	$\mathrm{M}^{-1}\mathrm{sec}^{-1}$	sec^{-1}	Note
Factor IX	Z_9, P_9	Z_9^m	k_9^{on}=$1.0 \cdot 10^7$	k_9^{off}=$2.5 \cdot 10^{-2}$	a
Factor IXa	E_9, P_9	E_9^m	k_9^{on}=$1.0 \cdot 10^7$	k_9^{off}=$2.5 \cdot 10^{-2}$	a
Factor IXa	E_9, P_9^*	$E_9^{m,*}$	k_9^{on}=$1.0 \cdot 10^7$	k_9^{off}=$2.5 \cdot 10^{-2}$	b
Factor X	Z_{10}, P_{10}	Z_{10}^m	k_{10}^{on}=$1.0 \cdot 10^7$	k_{10}^{off}=$2.5 \cdot 10^{-2}$	a
Factor Xa	E_{10}, P_{10}	E_{10}^m	k_{10}^{on}=$1.0 \cdot 10^7$	k_{10}^{off}=$2.5 \cdot 10^{-2}$	a
Factor V	Z_5, P_5	Z_5^m	k_5^{on}=$5.7 \cdot 10^7$	k_5^{off}=0.17	c
Factor Va	E_5, P_5	E_5^m	$k_5^{\mathrm{on}} = 5.7 \cdot 10^7$	k_5^{off}=0.17	c
Factor VIII	Z_8, P_8	Z_8^m	$k_8^{\mathrm{on}} = 5.0 \cdot 10^7$	k_8^{off}=0.17	d
Factor VIIIa	E_8, P_8	E_8^m	$k_8^{\mathrm{on}} = 5.0 \cdot 10^7$	k_8^{off}=0.17	d
Factor II	Z_2, P_2	Z_2^m	$k_2^{\mathrm{on}} = 1.0 \cdot 10^7$	k_2^{off}=5.9	e
Factor IIa	E_2, P_2	E_2^m	$k_2^{*,\mathrm{on}} = 1.0 \cdot 10^7$	$k_2^{*,\mathrm{off}} = 0.2$	f
Factor XI	Z_{11}, P_{11}	Z_{11}^m	$k_{z_{11}}^{\mathrm{on}} = 1.0 \cdot 10^7$	$k_{z_{11}}^{\mathrm{off}}$=0.1	g
Factor XIa	E_{11}, P_{11}^*	E_{11}^m	$k_{e_{11}}^{\mathrm{on}} = 1.0 \cdot 10^7$	$k_{e_{11}}^{\mathrm{off}}$=0.017	h

S10 Table. REACTIONS ON PLATELET SURFACES (a) $k^{\text{cat}}_{z_5^m:e_{10}^m} = 0.046$ sec^{-1} and $K_M = 10.4 \cdot 10^{-9}$ M [30]. (b) The rate constants for thrombin activation of fV on platelets are assumed to be the same as in plasma. (c) $k^{\text{cat}}_{z_8^m:e_{10}^m} = 0.023$ sec^{-1} and $K_M = 2.0 \cdot 10^{-8}$ M [23]. (d) The rate constants for thrombin activation of fVIII on platelets are assumed to be the same as in plasma. (e) The formation of the tenase and prothrombinase complexes is assumed to be very fast with $K_d = 1.0 \cdot 10^{-10}$ M [31]. (f) $k^{\text{cat}}_{z_{10}^m:ten} = 20$ sec^{-1} and $K_M = 1.6 \cdot 10^{-7}$ M [32]. (g) $k^{\text{cat}}_{z_2^m:pro} = 30$ sec^{-1} and $K_M = 3.0 \cdot 10^{-7}$ M [33]. (h) $k^{\text{cat}}_{z_{11}^m:e_2^m} = 1.3 \cdot 10^{-4}$, $K_M = 50$ nM [24]. Rate constants apply also for thrombin-activation of Plt-XIa-XI. (i) $k^{\text{cat}}_{z_9^m:e_{11}^{h,m}} = 0.21$, $K_M = 0.2\mu$M [25, 26]. Rate constants apply also for activation of platelet-bound IX by Plt-XIa-XIa.

Reaction	Reactants	Complex	Product	M^{-1}sec^{-1}	sec^{-1}	sec^{-1}	Note
Activation (of -, by -)							
(V, Xa)	Z_5^m, E_{10}^m	$Z_5^m : E_{10}^m$	E_5^m	$k^+_{z_5^m:e_{10}^m}$=$1.0 \cdot 10^8$	$k^-_{z_5^m:e_{10}^m}$=1.0	$k^{\text{cat}}_{z_5^m:e_{10}^m}$=$4.6 \cdot 10^{-2}$	a
(V, IIa)	Z_5^m, E_2^m	$Z_5^m : E_2^m$	E_5^m	$k^+_{z_5^m:e_2^m}$=$1.73 \cdot 10^7$	$k^-_{z_5^m:e_2^m}$=1.0	$k^{\text{cat}}_{z_5^m:e_2^m}$= 0.23	b
(VIII, Xa)	Z_8^m, E_{10}^m	$Z_8^m : E_{10}^m$	E_8^m	$k^+_{z_8^m:e_{10}^m}$=$5.1 \cdot 10^7$	$k^-_{z_8^m:e_{10}^m}$=1.0	$k^{\text{cat}}_{z_8^m:e_{10}^m}$=$2.3 \cdot 10^{-2}$	c
(VIII, IIa)	Z_8^m, E_2^m	$Z_8^m : E_2^m$	E_8^m	$k^+_{z_8^m:e_2^m}$=$2.64 \cdot 10^7$	$k^-_{z_8^m:e_2^m}$=1.0	$k^{\text{cat}}_{z_8^m:e_2^m}$= 0.9	d
(X, VIIIa:IXa)	Z_{10}^m, TEN	$Z_{10}^m : TEN$	E_{10}^m	$k^+_{z_{10}^m:ten}$=$1.31 \cdot 10^8$	$k^-_{z_{10}^m:ten}$=1.0	$k^{\text{cat}}_{z_{10}^m:ten}$=20.0	f
(X, VIIIa:IXa*)	Z_{10}^m, TEN^*	$Z_{10}^m : TEN^*$	E_{10}^m	$k^+_{z_{10}^m:ten}$=$1.31 \cdot 10^8$	$k^-_{z_{10}^m:ten}$=1.0	$k^{\text{cat}}_{z_{10}^m:ten}$=20.0	f
(II, Va:Xa)	Z_2^m, PRO	$Z_2^m : PRO$	E_2^m	$k^+_{z_2^m:pro}$= $1.03 \cdot 10^8$	$k^-_{z_2^m:pro}$=1.0	$k^{\text{cat}}_{z_2^m:pro}$=30.0	g
(XI-XI, IIa)	Z_{11}^m, E_2^m	$Z_{11}^m : E_2^m$	E_{11}^{hm}	$k^+_{z_{11}^m:e_2^m}$ = $2.0 \cdot 10^7$	$k^-_{z_{11}^m:e_2^m}$ = 1.0	$k^{\text{cat}}_{z_{11}^m:e_2^m}$ = $1.3 \cdot 10^{-4}$	h
(IX, XIa)	Z_9^m, E_{11}^{hm}	$Z_9^m : E_{11}^{hm}$	E_9	$k^+_{z_9^m:e_{11}^m}$ = $0.6 \cdot 10^7$	$k^-_{z_9^m:e_{11}^m}$ = 1.0	$k^{\text{cat}}_{z_9^m:e_{11}^m}$ = 0.21	i
Binding (of -, with -)							
(VIIIa, IXa)	E_8^m, E_9^m		TEN	k^+_{ten}=$1.0 \cdot 10^8$	k^-_{ten}=0.01		e
(VIIIa, IXa*)	E_8^m, $E_9^{m,*}$		TEN^*	k^+_{ten}=$1.0 \cdot 10^8$	k^-_{ten}=0.01		e
(Va, Xa)	E_5^m, E_{10}^m		PRO	k^+_{pro}=$1.0 \cdot 10^8$	k^-_{pro}=0.01		e

S11 Table. INHIBITION REACTIONS (a) We estimate these parameters based on the half-lives of Factors IXa, Xa, IIa in plasma [34] and assume that the rate of fXIa inactivation is the same as that of fXa and thrombin. (b) For inhibition of fVa by APC, $k^{\text{cat}}_{e_5^m:APC} = 0.5 \text{ sec}^{-1}$ and $K_M = 12.5 \cdot 10^{-9}$ [35]. We assume the same reaction rates for the inhibition of fVIIIa by APC. (c) From [36]. (d) $K_d = 0.5$ nM and $[PC] = 65$ nM [37]. (e) $k_{PC:TM:e_2^{ec}} = 0.167 \text{ sec}^{-1}$, $K_M = 0.7 \cdot 10^{-6}$ M [38].

Reaction	Reactants	Product	$\text{M}^{-1}\text{sec}^{-1}$	sec^{-1}	sec^{-1}	Note
Inactivation (of -, by -)						
(IXa, AT-III)	E_9	none		$k^{in}_{AT:e_9}$=0.1		a
(Xa, AT-III)	E_{10}	none		$k^{in}_{AT:e_{10}}$=0.1		a
(IIa, AT-III)	E_2	none		$k^{in}_{AT:e_2}$=0.2		a
(XIa, AT-III)	E_{11}	none		$k^{in}_{AT:e_{11}}$=0.2		a
(APC, Va)	$APC,\ E_5^m$	none	$k^+_{e_5^m:APC} = 1.2 \cdot 10^8$	$k^-_{e_5^m:APC} = 1.0$	$k^{\text{cat}}_{e_5^m:APC} = 0.5$	b
(APC, VIIIa)	$APC,\ E_8^m$	none	$k^+_{e_8^m:APC} = 1.2 \cdot 10^8$	$k^-_{e_8^m:APC} = 1.0$	$k^{\text{cat}}_{e_8^m:APC} = 0.5$	b
Binding (of -, with -)						
(TFPI, Xa)	$TFPI$,E_{10}	$TFPIa$	$k^+_{tfpia:e_{10}}$=$1.6 \cdot 10^7$	$k^-_{tfpia:e_{10}}$=$3.3 \cdot 10^{-4}$		c
(TFPIa, TF:VIIa)	$TFPIa$,E_7^m	$TFPIa : E_7^m$	$k^+_{tfpia:e_7^m}$=$1.0 \cdot 10^7$	$k^-_{tfpia:e_7^m}$=$1.1 \cdot 10^{-3}$		c
(TM, Thrombin)	$TM,\ E_2^{ec}$	$TM : E_2^{ec}$	$k^{\text{on}}_{TM} = 1.0 \cdot 10^8$	$k^{\text{off}}_{TM} = 5.0 \cdot 10^{-2}$		d
Activation (of -, by -)						
(PC, TM:E_2^{ec})	$TM : E_2^{ec}$	APC	$k^+_{PC:TM:e_2^{ec}} = 1.7 \cdot 10^6$	$k^-_{PC:TM:e_2^{ec}} = 1.0$	$k^{\text{cat}}_{PC:TM:e_2^{ec}} = 0.16$	e

S12 Table. PLATELET TRANSITIONS (a) Estimated from data in [39, 40] as described in [1]. (b) Estimated from data in [41] as described in [1]. SE=subendothelium.

Reactants	Reactants	Products	$M^{-1}sec^{-1}$	sec^{-1}	Note
Unactivated platelet adhering to SE	PL, SE	PL_a^s	$k_{\text{adh}}^{+}=2 \cdot 10^{10}$	$k_{\text{adh}}^{-}=0$	a
Activated platelet adhering to SE	PL_a^v, SE	PL_a^v	$k_{\text{adh}}^{+}=2 \cdot 10^{10}$	$k_{\text{adh}}^{-}=0$	a
Platelet activation by platelet in solution	PL, PL_a^v	$2PL_a^v$	$k_{plt}^{\text{act}} = 3 \cdot 10^8$		b
Platelet activation on SE	PL, PL_a^s	PL_a^v, PL_a^s	$k_{plt}^{\text{act}} = 3 \cdot 10^8$		b
Platelet activation by thrombin	PL, E_2	PL_a^v		$k_{e_2}^{\text{act}}=0.50$	b

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