Table 1. The parameter values used in the model

Parameter	Definition	Value	References
g_{Na}	Conductivity of Na current	120 mS/sm^2	[1]
g_K	Conductivity of K current	36 mS/sm^2	[1]
g_{leak}	Leakage current conductivity	0.3 mS/sm^2	[1]
V_{Na}	Reversible Na potential	55 mV	[1]
V_K	Reversible K potential	-77 mV	[1]
V_{leak}	Reversible leakage potential	-54.4 mV	[1]
C	Specific membrane capacity	1 µF/sm^2	[1]
I_{app}	Current simulating constant membrane depolarization	4.5 µA/sm^2	[1, 2]
α_G	Neurotransmitter clearance constant	0.1 ms^{-1}	[3]
α_I	Rate constant of EPSCs	0.1 ms^{-1}	[3]
k_{pre}	The efficacy of neurotransmitter release	3.9	[3]
b	Scaling factor of gamma-distribution	20	[3]
k_0	The efficacy of neurotransmitter release without astrocytic impact	3.9	[3]
b_0	Scaling factor of gamma-distribution without astrocytic impact	20	[3]
γ_1	Presynaptic feedback gain describing the influence of astrocytic glutamate on the average amount of released neurotransmitter	0.1, -0.4 for potentiation and for depression of presynaptic neurotransmitter release, respectively	[3]
γ_2	Postsynaptic feedforward gain describing the influence of astrocytic D-serine on EPSCs amplitudes	1	[3]
Θ_G	Midpoint of neuronal activation	0.2	[3]
k_G	Slope of neuronal activation	0.05	[3]
v_1	Max Ca^{2+} channel flux	6 s^{-1}	[4,5]
v_2	Ca^{2+} leak flux constant	0.11 s^{-1}	[4,5]
v_3	Max Ca^{2+} uptake	2.2 µM s^{-1}	[4,5]
k_3	Activation constant for ATP-Ca^{2+} pump	0.1 µM	[4,5]
a_2	Ca^{2+} inhibition constant	0.2 s^{-1}	[4,5]
d_1	Dissociation constant for IP$_3$	0.13 µM	[4,5]
d_2	Dissociation constant for Ca^{2+} inhibition	1.049 µM	[4,5]
d_3	Receptor dissociation constant for IP$_3$	0.9434 µM	[4,5]
d_5	Ca^{2+} activation constant	0.082 µM	[4,5]
v_β	Maximal rate of IP$_3$ production by	63 µM s^{-1}	[6]

	PLCβ		
K_r	Glutamate affinity of the receptor	1.3 μM	[6]
K_p	Ca^{2+}/PKC-dependent inhibition factor	10 μM	[6]
K_π	Ca^{2+} affinity of PKC	0.6 μM	[6]
v_δ	Maximal rate of IP_3 production by PLCδ	0.02 μM s^{-1}	[6]
K_δ	Inhibition constant of PLCδ activity	1.5 μM	[6]
$K_{PLC\delta}$	Ca^{2+} affinity of PLCδ	0.1 μM	[6]
v_{3K}	Maximal rate of degradation by IP_3-3K	2 μM s^{-1}	[6]
K_D	Ca^{2+} affinity of IP_3-3K	0.7 μM	[6]
K_3	IP3 affinity of IP_3-3K	1 μM	[6]
r_{5p}	Maximal rate of degradation by IP-5P	0.04 s^{-1}	[6]
α_1	Clearance constant of glutamate released from astrocyte	10 ms^{-1}	[3]
α_2	Clearance constant of D-serine released from astrocyte	10 ms^{-1}	[3]
$[Ca_c]_{th}$	Threshold intracellular calcium concentration for gliotransmission	0.19 μM	[9]
$k_{1,2}$	Slope of activation function $H_{1,2}(X)$	0.01	[3]
D_{Ca}	Coefficient of Ca^{2+} diffusion	30 μm^2/s	[10]
D_{IP3}	Coefficient of IP_3 diffusion	300 μm^2/s	[10]
d_{CaER}	Coefficient of Ca^{2+} diffusion in ER	0.001 s^{-1}	[10]
F	Faraday constant	96485 C/mol	
r_{ER}	Ratio of the volume of ER to the volume of cytoplasm	0.15-0.05 see Table 2	[7,8]
r	Radius of the astrocytic compartment	0.25-8 μm see Table 2	[7,8]
l	Unit length	1 μm	

[1] (Izhikevich, 2007)
[2] (Kazantsev, Asatryan 2011)
[3] (Gordleeva et al., 2012)
[4, 5] (De Young & Keizer, 1992; Li & Rinzel, 1994)
[6] (De Pitta M et al., 2009)
[7, 8] (Oschmann et al., 2017, Patrushev et al., 2013).
[9] (Parpura & Haydon, 2000)
[10] (Kang & Othmer, 2009)

Table 2. Geometry of the astrocytic model

Compartment number (Fig. 2A), N	Value r_{ER}	Value r, μm
Soma, 0	0.15	8
1, 9, 14, 19, 25, 33, 39	0.1	4

2, 6, 10, 15, 20, 26, 28, 34, 40, 47	0.09	3
3, 5, 7, 8, 11, 16, 21, 27, 29, 35, 48, 41	0.08	2
4, 12, 17, 22, 30, 36, 42, 49, 50	0.07	1
13, 18, 23, 31, 37, 43, 51, 52	0.06	0.5
24, 32, 38, 44, 45, 46	0.05	0.25