

Spatially structured oscillations in a two-dimensional excitatory neuronal network with synaptic depression

Zachary P. Kilpatrick · Paul C. Bressloff

10 r 00 / ... t 1 t r 00 / ... t 1 t r 00 / ... t r 00
S r r S + C 00

Abstract

... t ... t ... t ... r ...
t - ... t t r ... r ... t r ... t
t ... r ... C ... t ... t ...
r ... t ... r ...
t ... t ... r ... t ... t t t ...
t r ... r ... t ... t r t r
t ... r ... r ...
r t ... r ... *in vivo*. T ... r t ... r
r ... t ... t ... t ... t ...
t ... t ... t ... t ... t ...
t ... r t t r ... t r t
...
r ... t r ... t r ... t t r t
t r t r t t r ... r ... t t ...
r ... t r ... r ... t t t r ...
r ... r t t ... t r ... t r ...
t ... r ... t ... t ... t r
... r ... t t r ... t ... t
... t r r ... t r t ...

Keywords

S t ... r ... t r ...
S t ... r ... t r ...
S t ... r ...

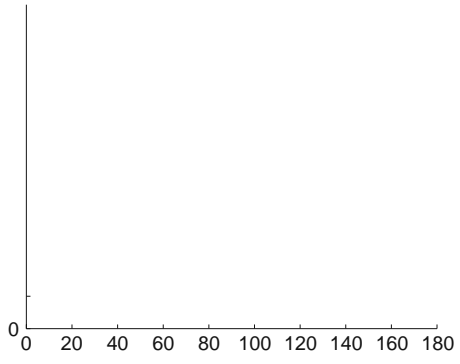
1 Introduction

S t ... t ... r ... t *in vivo*
in vitro ... r ... r ... t ...
t - ... r ... r ... t ...
(... 00). S ... r ... t ... r ...
r r t t ... r ... r ... t ...
(r ... t ... 001 ... t ... 00),
r ... t ... r ... t r (...
1), ... t ... (...
00). ... t r r ... r ...
t ... r ... t ...
r ... t ... r ...
t ... r ... t ... t ... t ...
r t t ... t ... t ... r t
... t ... (... r ... 00).
r ... r ... *in vitro* ... r
t r t ... t r ... r t r ... t r ...
... t ... t ... t ...
r r t t ... t ... t ...
S ... t ... t ... r ... t ...
r ... r ... t ... t ... t ...
r ... 1 10 (... t ... 1 ... 00
S ... t r ... T r ... 00) ... t ...

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... t r ... C. r ...
r t ... t ... t ... E t ... t ...
S t ... C t , T 11 -00 0, S
... C. r ... (B)
t ... t ... t t t ... E t ... r ...
- St. ... r ... 1 ...
- ... r ... 2 ... t ...

$$\left(\begin{array}{c} \mathbf{u} \\ \mathbf{v} \end{array} \right) + \left(\begin{array}{c} \mathbf{r} \\ \mathbf{f} \end{array} \right) = \left(\begin{array}{c} \mathbf{t} \\ \mathbf{t} \end{array} \right) \quad (1)$$



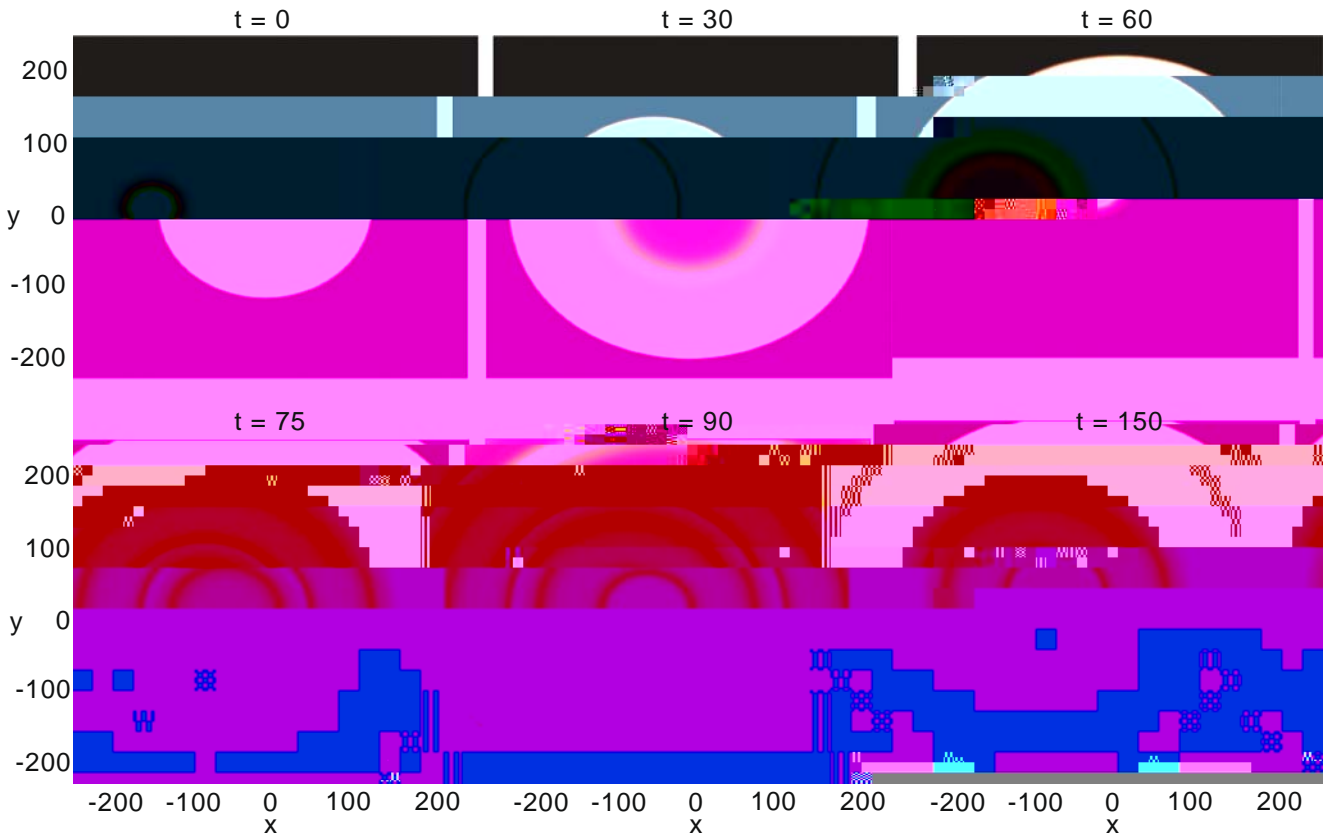


Fig. 7 $S_{r,t} = S_{r,t}(\mathbf{u}, x, y, t)$ $t = 0, 30, 60, 75, 90, 150$. r is the radius of the r -th cell, $r = 1, 2, \dots, N$. t is the time, $t = 0, 1, \dots, T$. $S_{r,t}$ is the state of the r -th cell at time t . \mathbf{u} is the velocity vector, $\mathbf{u} = (u_x, u_y)$. x and y are the coordinates of the cell center. C_1 is the first component of the velocity vector, $C_1 = u_x$. $r_{r,t}$ is the radius of the r -th cell at time t . (010) is the initial state of the system.

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$$L_h \frac{u_{ij}^{k+} - u_{ij}^k}{\Delta t} + u_{ij}^{k+} \Delta t = M q_{ij} f, u_{ij} \quad (.1)$$

$$L_h \frac{q_{ij}^{k+} - q_{ij}^k}{\Delta t} = - q_{ij} f, u_{ij} \quad (.)$$

for $i = 1, \dots, N_x, j = 1, \dots, N_y, L_h \Delta t \leq t \leq T$ -
 and $i = 1, \dots, N_x, j = 1, \dots, N_y, L_h \Delta t \leq t \leq T$ -
 $u_{ij} = q_{ij} f(57(y)Tj/F1 1 Tf 10 0 0p0n-0 6.9999 202.083 597.0.)T.m3e64 597.sl 202.08310609.5(the)-209(linear)m 0 Tc3line75c$

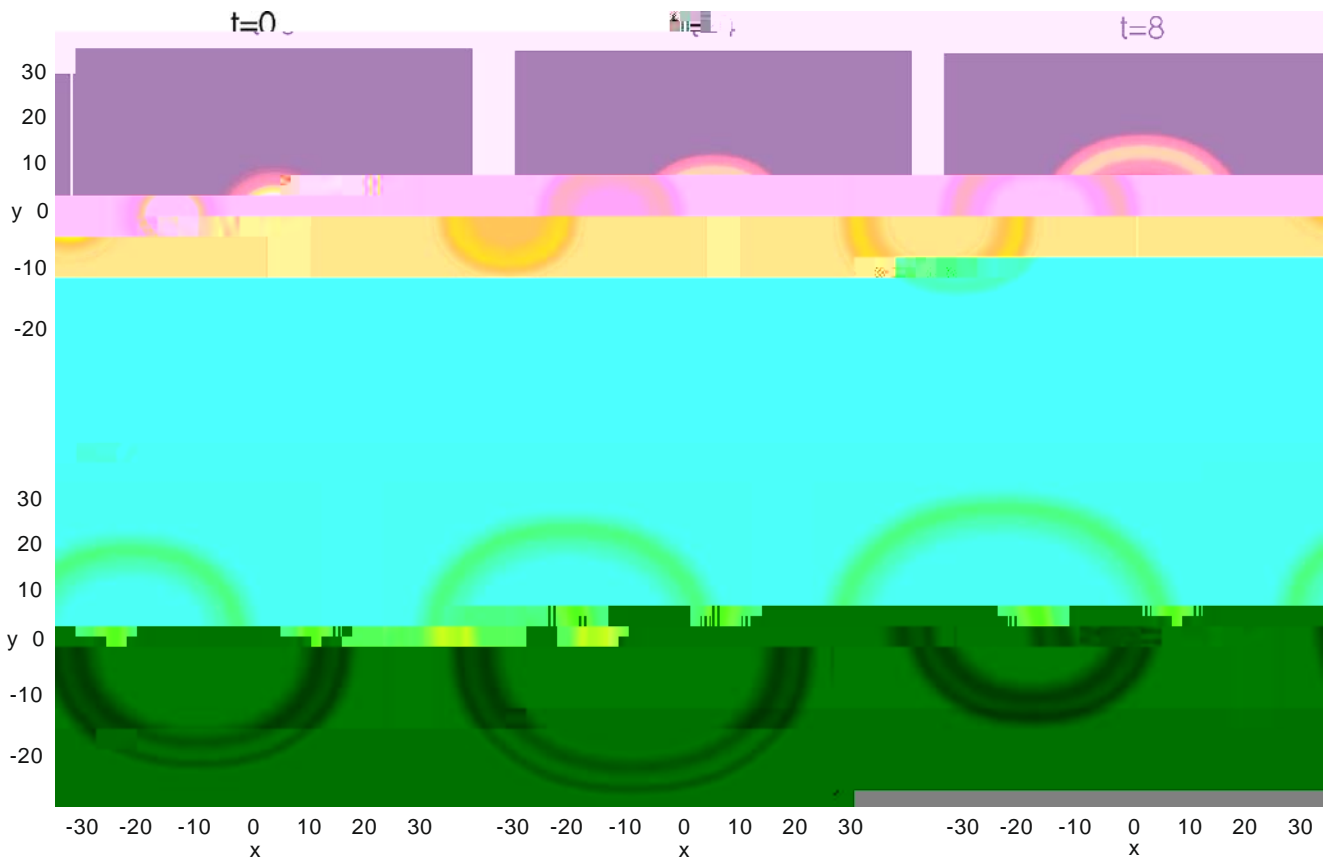


Fig. 13 S_i $r_{i,j}$ $t_{i,j}$ $u(x,y)$

... t t ... t r ... (.1) ...
 r r tr ... r ... t ... t ...
 r ... t (... r ... 00). T ...
 t t

$$\dots a.r = \dots a \dots J, \dots J, \dots \dots (.1)$$

... r ... t t ... r r tr ... r ...
 J, z ... t ... t ...
 T ... tr t t ... r ... t r ... t t ... r ...
 ... r t ... r t ... t ...
 ... t ... t ... r ...
 ... t ... (.), ... r r tr ... r (.).
 T ... t r (.1) ... t ... t ...
 ... t t t ... (.) ... t (.1), ... r = a, ... t ...
 ... t t

$$a \dots \frac{a}{s} J, \dots J, \dots \dots = \frac{a}{s} I, \dots K, \dots a.$$

... r I ... t ... t ... t ... t ...
 T ... t ... t ... r ... t ... t ... r ...
 ... r ... a ...

$$\dots + J \dots = \dots a. (.1)$$

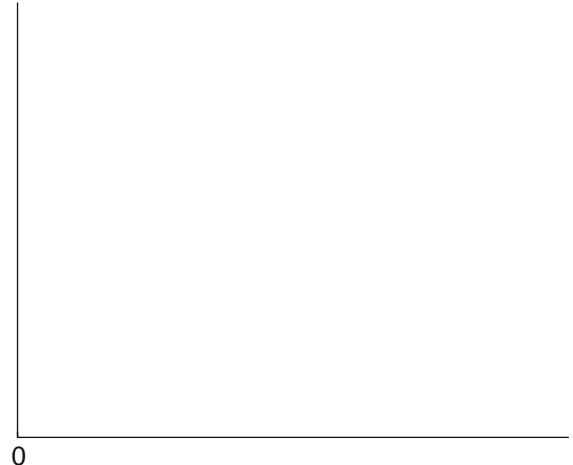
t

$$\dots a \dots a. a$$

$$= - a I, a K, a - \frac{a}{s} I, a K, a \dots (.1)$$

... t ... t ... r ... a ... r ...
 tr ... t ... r1 . N ... r ... t ...
 ... t ... r ... t ... t ... r ...
 ... t r ... t ... r ... r r t ... t ...
 ... t ... t r ... t ... t ...
 ... t ... (... t ... 00) ...

... r ... t ... t ... r ... tr ... t r ...
 ... t ... t ... r ... t ... t ...
 ... t ... t r ... t ... r ...
 ... r ... tr ... 001 ... r ... 00 ...
 ... t ... 00), ... r ... r ... t ... r ...
 ... t ... r ... r ... t ...
 ... t ... (... tr ...
 ... r ... 00), ... r ... r ... t ...
 ... t ... t r ... r ... r t r ... t ...
 ... r ... t r ... t ... t ... tr ...
 ... t ... sign ... r t r ... t ... t ...
 ... = < + J ... t ... t ...
 T ... t ... t ... r ... t ... r ...



(10) ... (0.11), ... (00). ...

Acknowledgements

T ... S ... (S-01) ... (ST). C ...

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