

constant flux yields constant increase of net cAMP

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In [65]: 1 from pde_sim_returns_camp import *
2 cnet_values,t_values = simulate(kPDE=0.,
3                               LPDE=100.0,
4                               c0=0.0,
5                               T=10.0,
6                               iter_no=2.0,
7                               dt=0.005,
8                               time_res = 10.0,
9                               use_constant_fluxLeft=True);
```

executed in 2m 25s, finished 15:29:31 2020-07-12

Printing Inputs:

kPDE:0.0 LPDE:100.0 c0:0.0 T:10.0 iter_no:2.0 dt:0.005 time_res:10.0

Printing Outputs including mean cell direction (mcd):

cycle_no,mean_c,mcd_at_100,mcd_at_200,mcd_at_300,mcd_at_400,mcd_at_500,mcd_at_800

0,12.03028,-1.00000,-0.98333,-0.93333,-0.85000,-0.73333,-0.13333

1,24.06045,-1.00000,-0.99167,-0.96667,-0.92500,-0.86667,-0.56667

the final radial cAMP field is:

cAMP=

```
[236.86192842 234.88212557 232.94116076 231.037562 229.16993994
227.33698157 225.53744502 223.77015414 222.03399441 220.32790814
218.65089133 217.00198937 215.38029464 213.7849426 212.21511008
210.67001164 209.14889839 207.6510546 206.175797 204.72247157
203.29045321 201.87914269 200.48796668 199.11637478 197.76383987
196.42985519 195.11393503 193.81561177 192.53443685 191.26997788
190.02181977 188.78956187 187.57281935 186.37122026 185.18440713
184.01203403 182.85376836 181.70928782 180.5782824 179.46045134
178.35550523 177.26316295 176.18315394 175.11521501 174.05909284
173.01454071 171.98132109 170.95920238 169.94796157 168.94738093
167.95335584 166.97336633 166.0075333 165.04754433 164.08333333]
```

```
In [68]: 1 x_values = t_values
2 y_values = cnet_values
3 print(f"$dc_net(t)/dt$ = {np.mean(np.diff(y_values))/np.mean(np.diff(x_values))} nM μm^2 / sec.")
```

executed in 78ms, finished 15:31:58 2020-07-12

$\$dc_net(t)/dt\$ = 62952.05542761571 \text{ nM } \mu\text{m}^2 / \text{sec.}$

where

$$c_{\text{net}}(t) = \sum_{r=r_0=50\mu\text{m}}^{1000\mu\text{m}} c(r,t) \left(2\pi r dr + \pi dr^2 \right)$$

```
In [69]: 1 plt.scatter(x=x_values, y=y_values)
2 plt.xlabel('time (seconds)', fontsize=24)
3 plt.ylabel('$c_{\text{net}}$ ($\text{nM} \cdot \mu\text{m}^2$)', fontsize=24)
4 plt.show()
```

executed in 3.64s, finished 15:32:21 2020-07-12

