# Uchigashima Documentation August 2016

Changes made in the github MSPN table

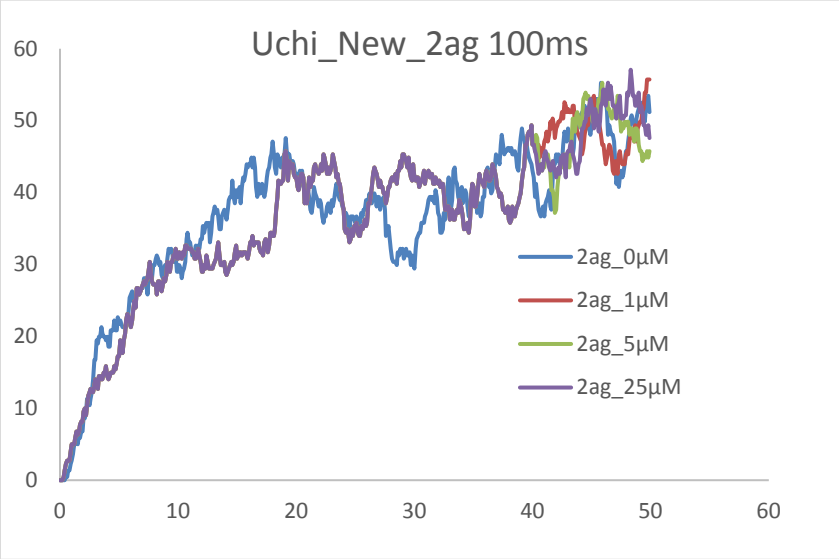
| Reactions | Github rates (New MSPN table) | | | | Updated | | | |
|---|---|---|---|---|---|---|---|---|
| | kf ($nM^{-1}$ $s^{-1}$) | kb ($s^{-1}$) | kcat ($s^{-1}$) | Kd or Km (nM) | kf ($nM^{-1}$ $s^{-1}$) | kb ($s^{-1}$) | kcat ($s^{-1}$) | Kd or Km (nM) |
| Gqabg + GluMglu ⇔ GqabgGluMglu⇒ GqaGTP + GluMglu | 0.0015 | 0.68 | 0.5 | 453.33 | 0.0075 | 3.39 | 2.5 | 786.66 |
| PlcCa + GqaGTP ⇔ PlcCa-GqaGTP → PlcCa+GaqGDP | 0.0035 | 0.7 | 12 | 200 | 0.0175 | 51.49 | 12 | 3628 |
| Plc + GqaGTP ⇔ PlcGqaGTP → PLC+GaqGDP | 0.0007 | 0.7 | 12 | 1000 | 0.0035 | 51.49 | 12 | 18142.4 |
| PlcGqaGTP  Ca ⇔ PlcCaGqaGTP | 0.0025 | 1 | | 400 | 0.0125 | 53 | 12 | 5200 |

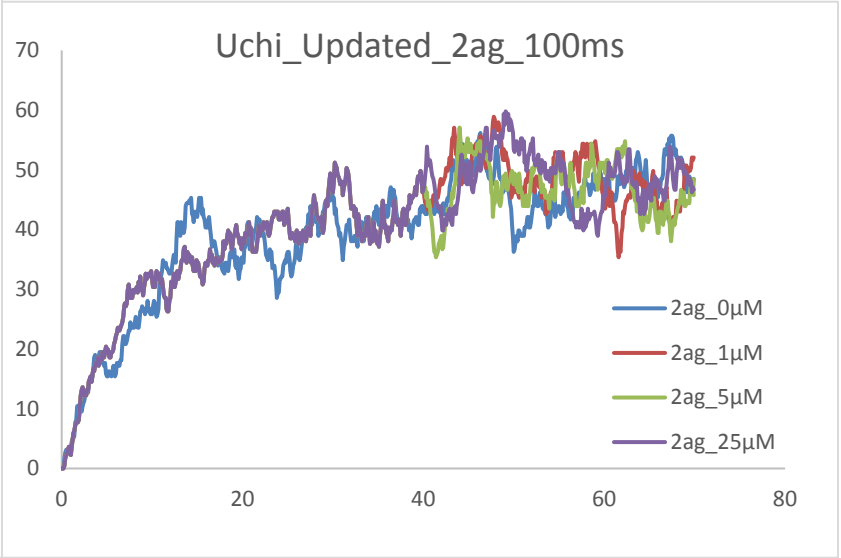
Two set of Uchigashima simulations were carried out:

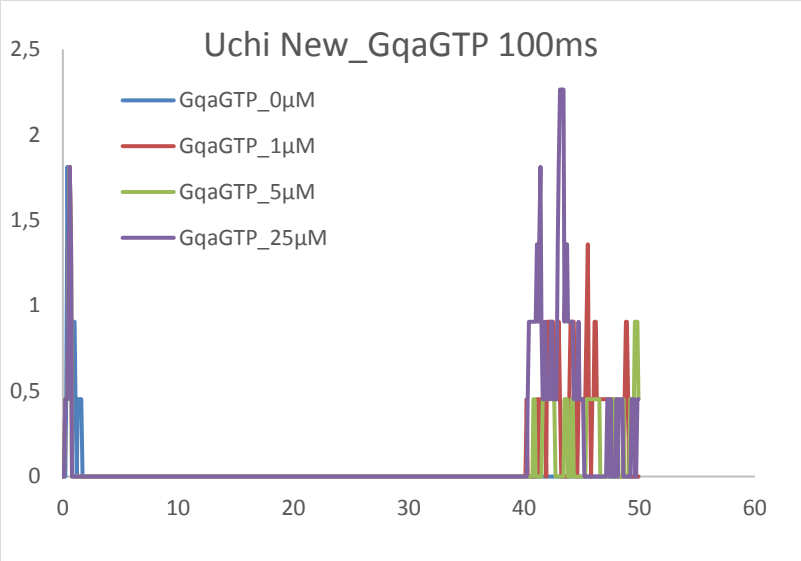
1. Uchi_new: Reaction rates from the new MSPN table. Reactions were carried out for 50s.
2. Uchi_updated: Modified reaction rates of the MSPN table where the reactions were speeded up 5 times. $K_f$ was speeded up 5 times and $K_b$ was calculated accordingly. Kcat and Km were kept the same with the exception of GqaGTP (Gqabg + GluMglu ⇔ GqabgGluMglu⇒ GqaGTP + GluMglu) reaction, where the Kcat was increased so we have GqaGTP available. Reactions were carried out for 70s. Updated rates are in red in table.
3. Calcium comes at 40s.

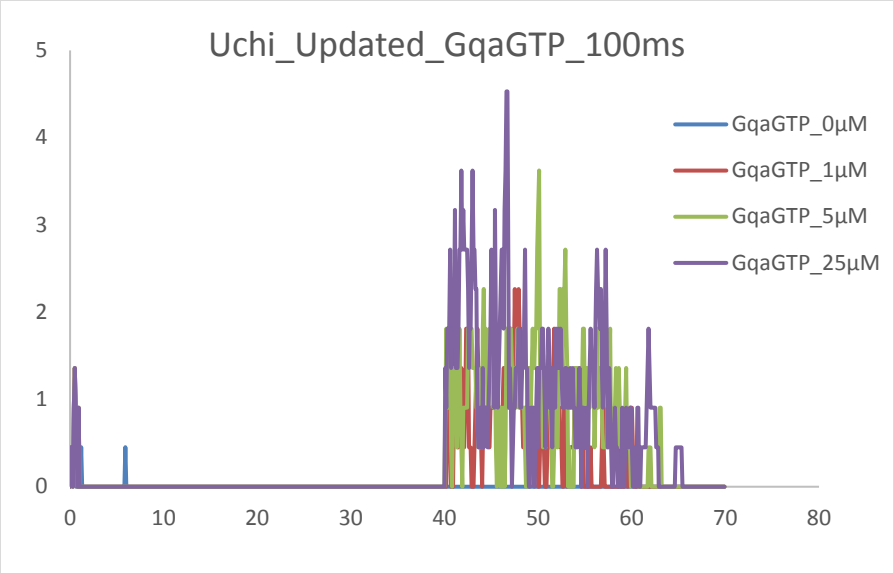
Plots

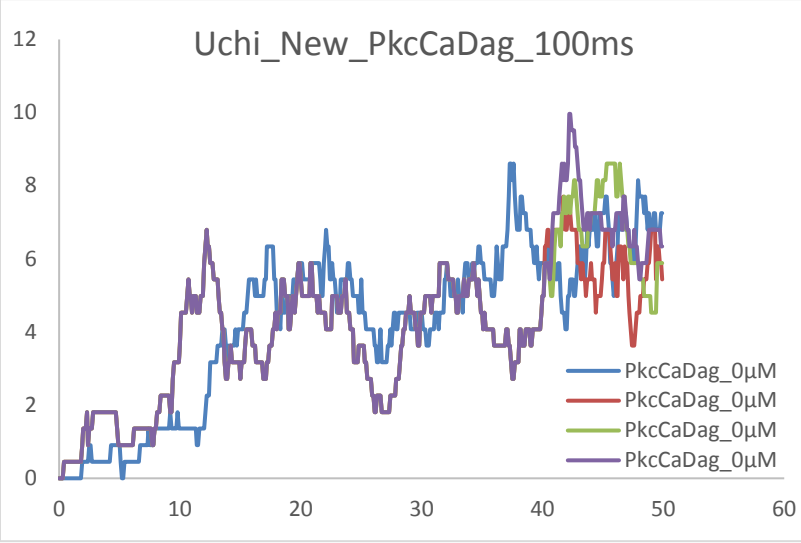
100ms depolarization




Uchi New_GqaGTP 100ms
GqaGTP_0µM
GqaGTP_1µM
GqaGTP_5µM
GqaGTP_25µM
2,5
2
1,5
1
0,5
0
0
10
20
30
40
50
60


Uchi_Updated_GqaGTP_100ms
GqaGTP_0µM
GqaGTP_1µM
GqaGTP_5µM
GqaGTP_25µM
5
4
3
2
1
0
0
10
20
30
40
50
60
70
80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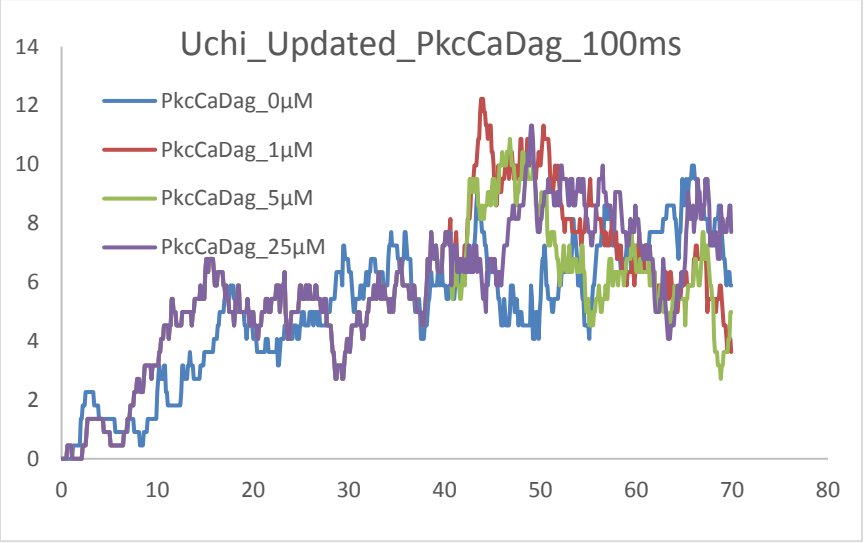
PkcCaDag_0µM
PkcCaDag_0µM
PkcCaDag_0µM
PkcCaDag_0µM
12
10
8
6
4
2
0
0
10
20
30
40
50
60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PkcCaDag_0µM
PkcCaDag_1µM
PkcCaDag_5µM
PkcCaDag_25µM
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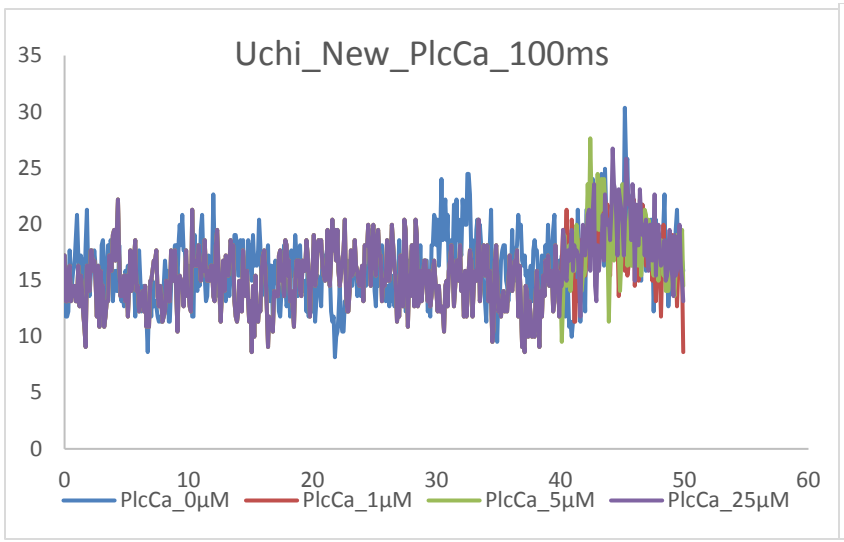
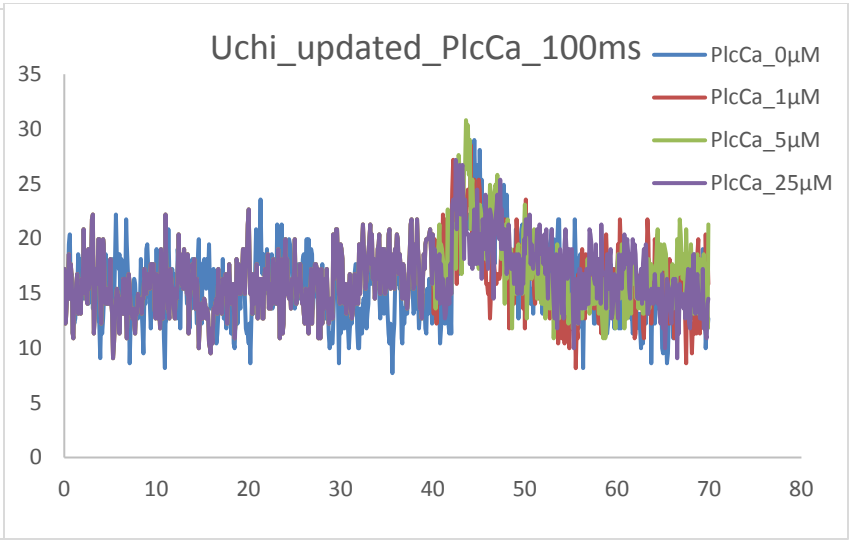
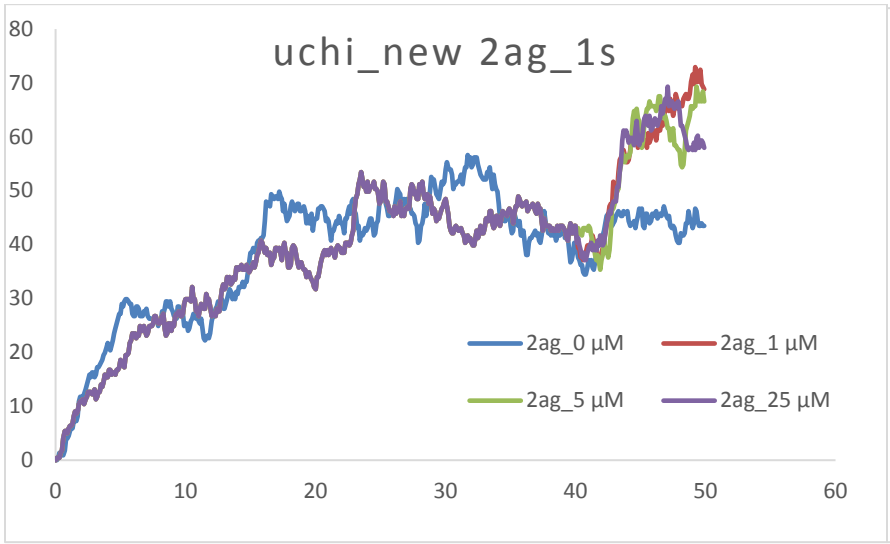
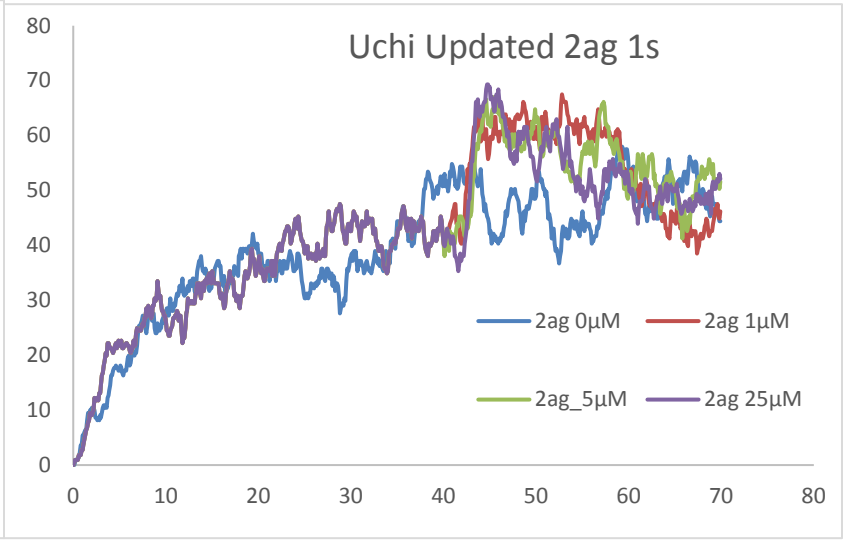
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80

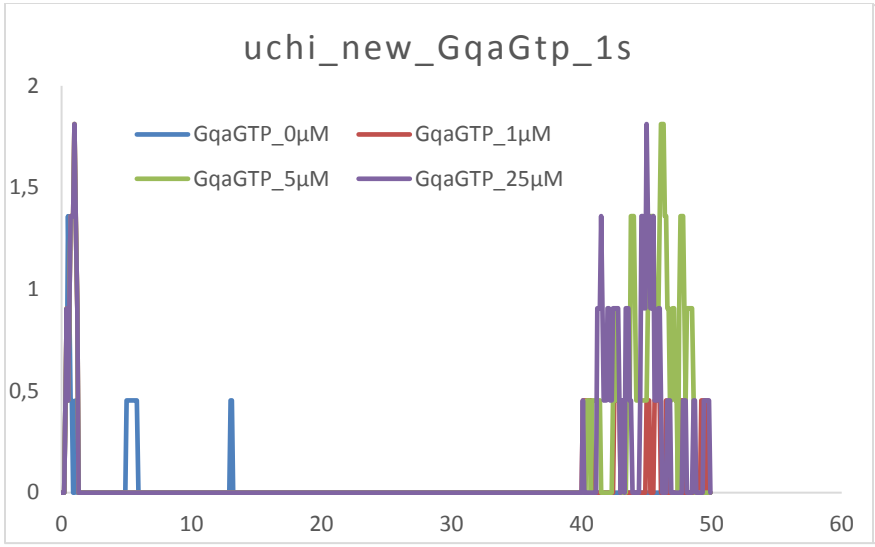


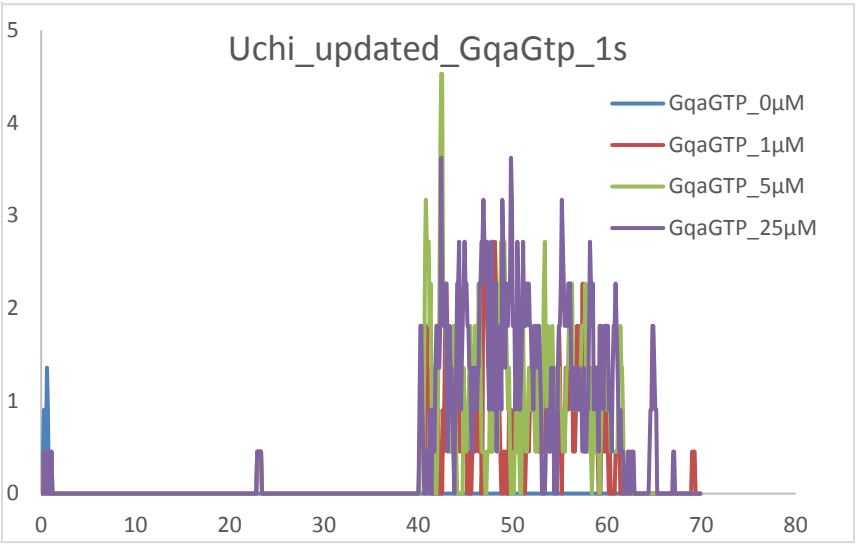




1 Second Depolarization




uchi_new_GqaGtp_1s
GqaGTP_0μM
GqaGTP_1μM
GqaGTP_5μM
GqaGTP_25μM
2
1,5
1
0,5
0
0
10
20
30
40
50
60


Uchi_updated_GqaGtp_1s
GqaGTP_0μM
GqaGTP_1μM
GqaGTP_5μM
GqaGTP_25μM
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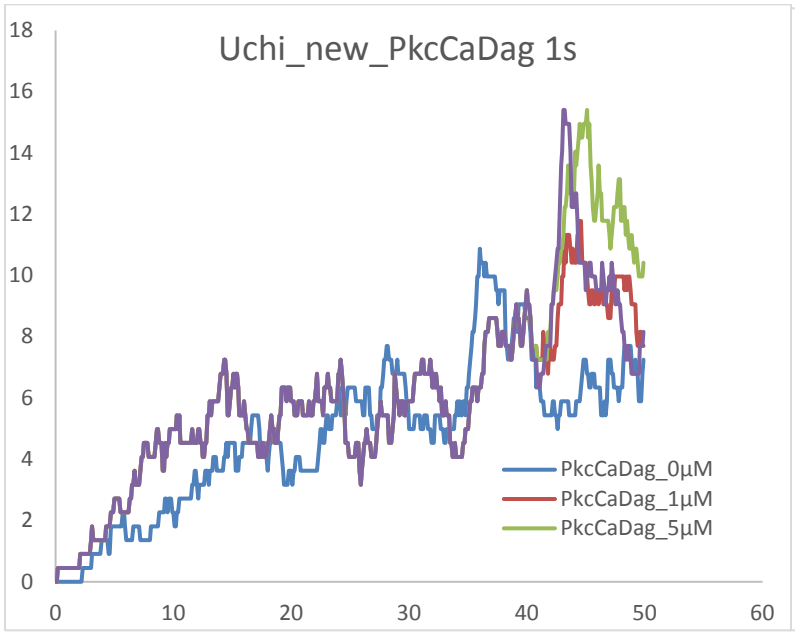
3
2
1
0
0
10
20
30
40
50
60
70
80


Uchi_new_PkcCaDag 1s
PkcCaDag_0μM
PkcCaDag_1μM
PkcCaDag_5μM
18
16
14
12
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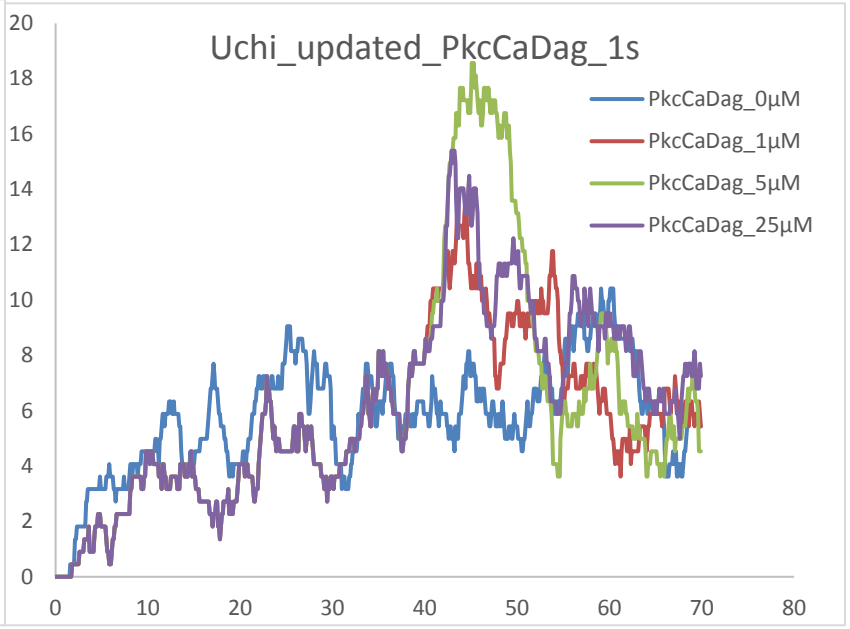
8
6
4
2
0
0
10
20
30
40
50
60


Uchi_updated_PkcCaDag_1s
PkcCaDag_0μM
PkcCaDag_1μM
PkcCaDag_5μM
PkcCaDag_25μM
20
18
16
14
12
10
8
6
4
2
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10
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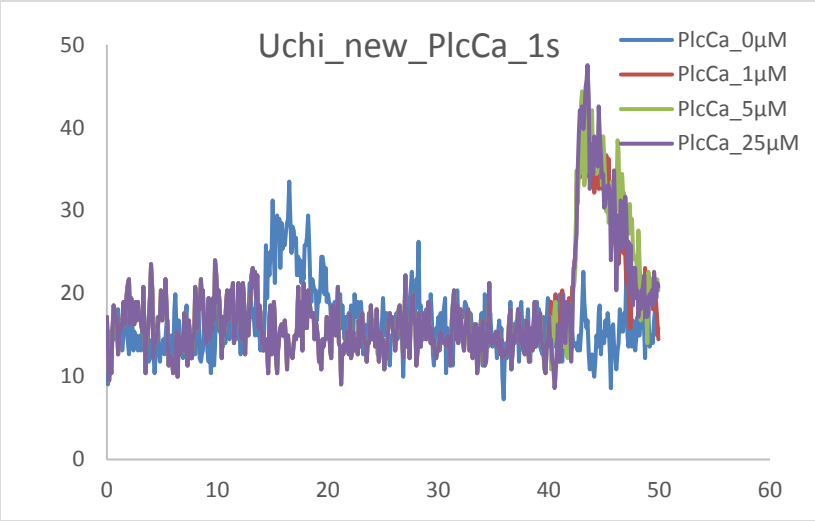
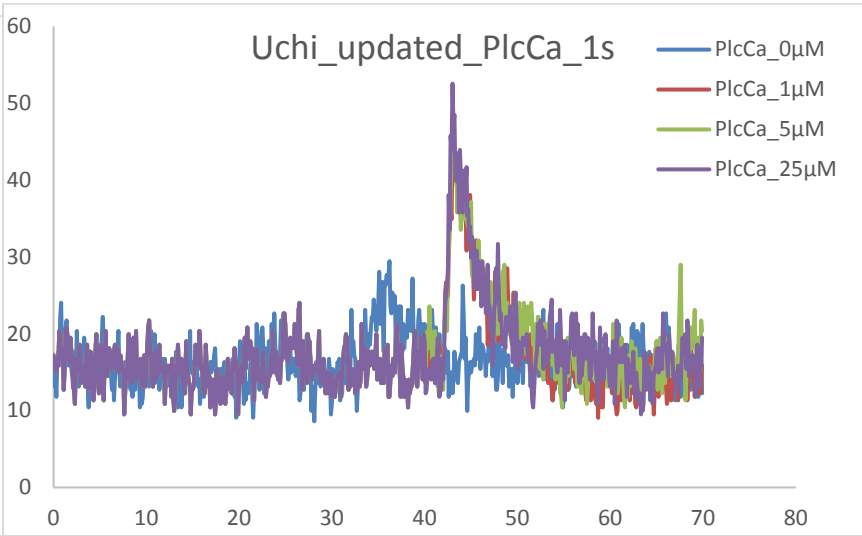
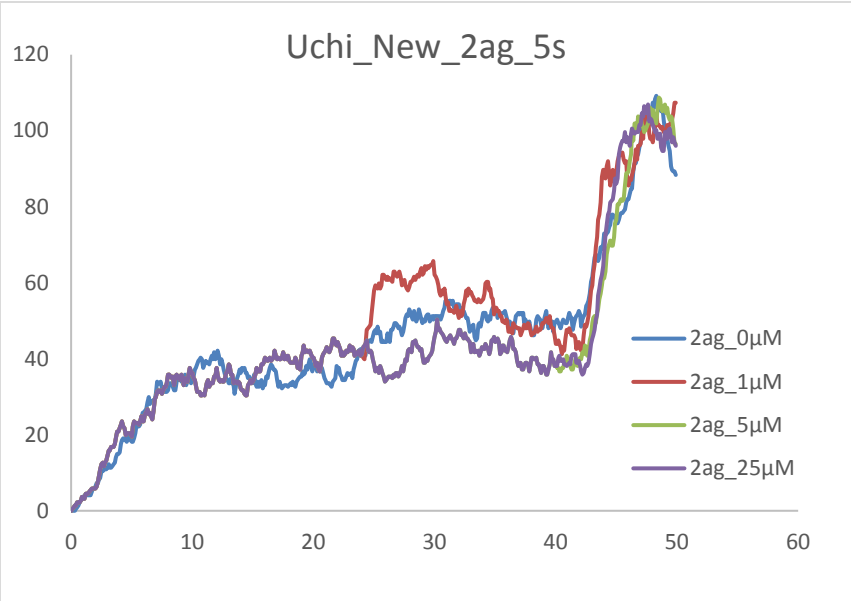
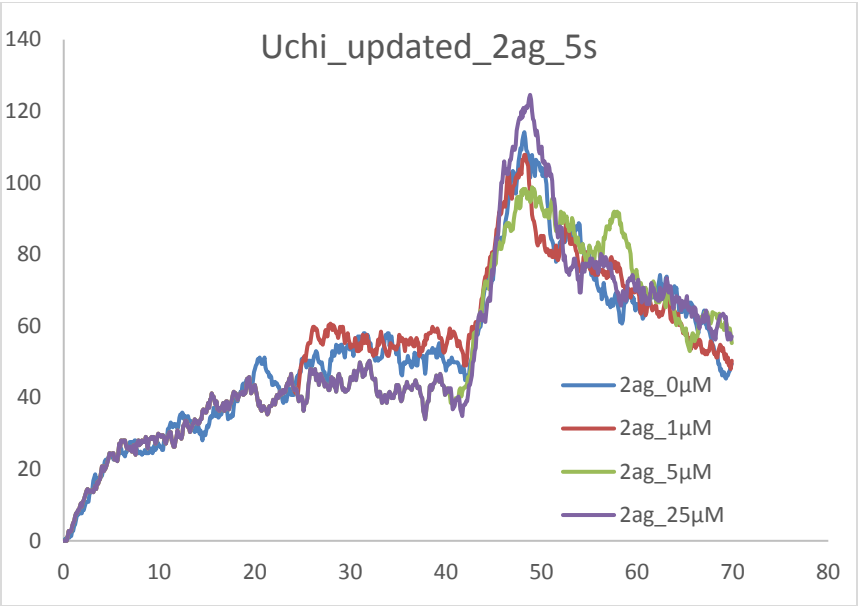
30
40
50
60
70
80




5s depolarization


Uchi_New_2ag_5s
120
100
80
60
40
20
0
0
10
20
30
40
50
60
2ag_0µM
2ag_1µM
2ag_5µM
2ag_25µM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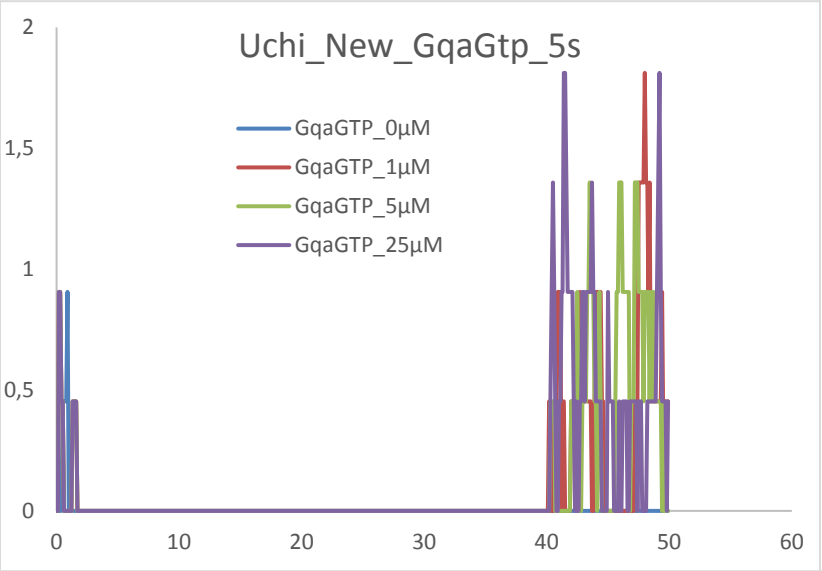
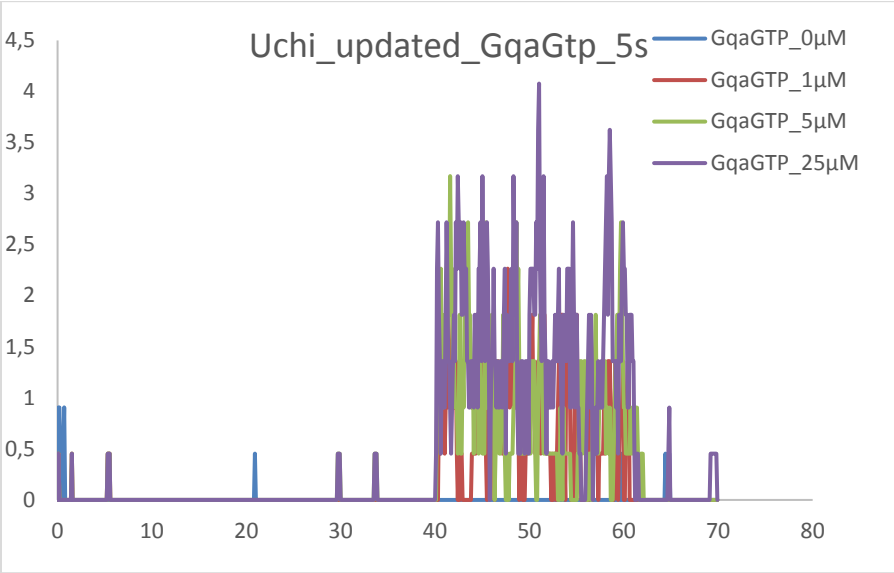
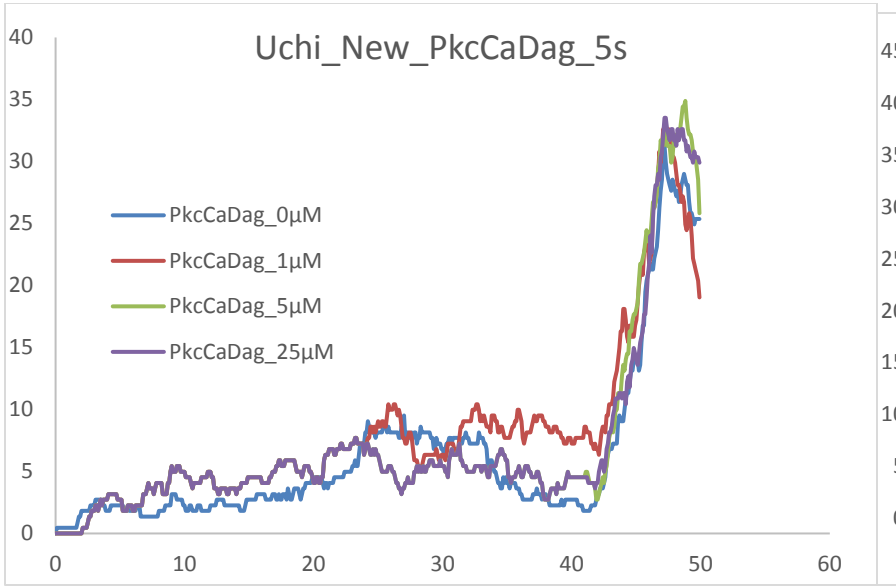
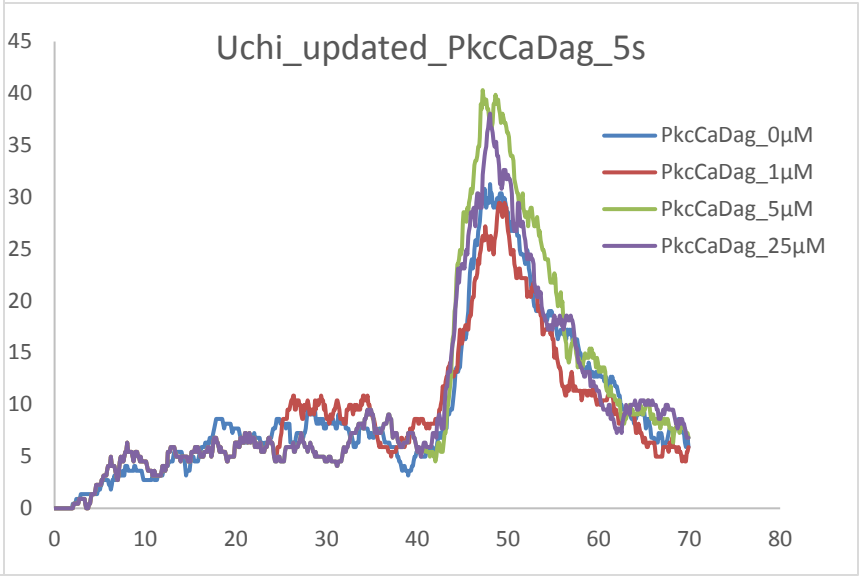
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
2ag_0µM
2ag_1µM
2ag_5µM
2ag_25µM


Uchi_New_GqaGtp_5s
2
1,5
1
0,5
0
0
10
20
30
40
50
60
GqaGTP_0µM
GqaGTP_1µM
GqaGTP_5µM
GqaGTP_25µM


Uchi_updated_GqaGtp_5s
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
0
10
20
30
40
50
60
70
80
GqaGTP_0µM
GqaGTP_1µM
GqaGTP_5µM
GqaGTP_25µM


Uchi_New_PkcCaDag_5s
PkcCaDag_0μM
PkcCaDag_1μM
PkcCaDag_5μM
PkcCaDag_25μM
0
5
10
15
20
25
30
35
40
0
10
20
30
40
50
60


Uchi_updated_PkcCaDag_5s
PkcCaDag_0μM
PkcCaDag_1μM
PkcCaDag_5μM
PkcCaDag_25μM
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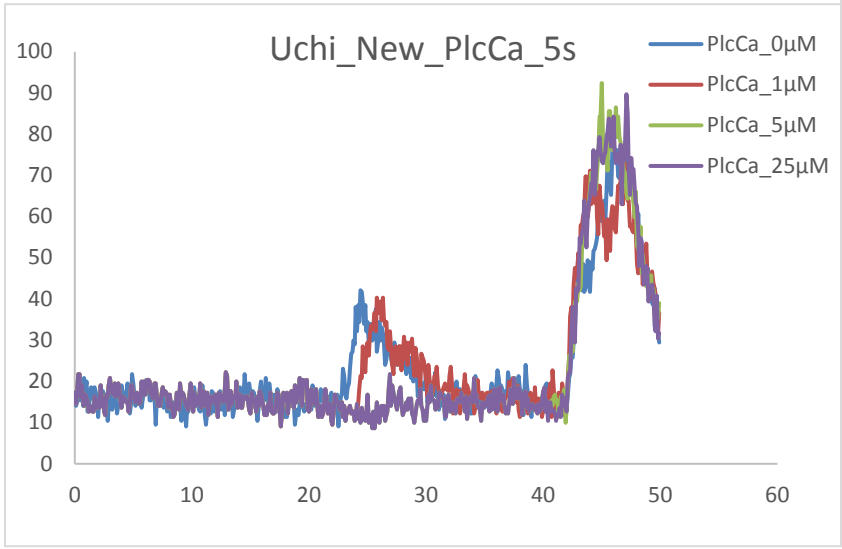
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80


Uchi_New_PlcCa_5s
PlcCa_0μM
PlcCa_1μM
PlcCa_5μM
PlcCa_25μM
0
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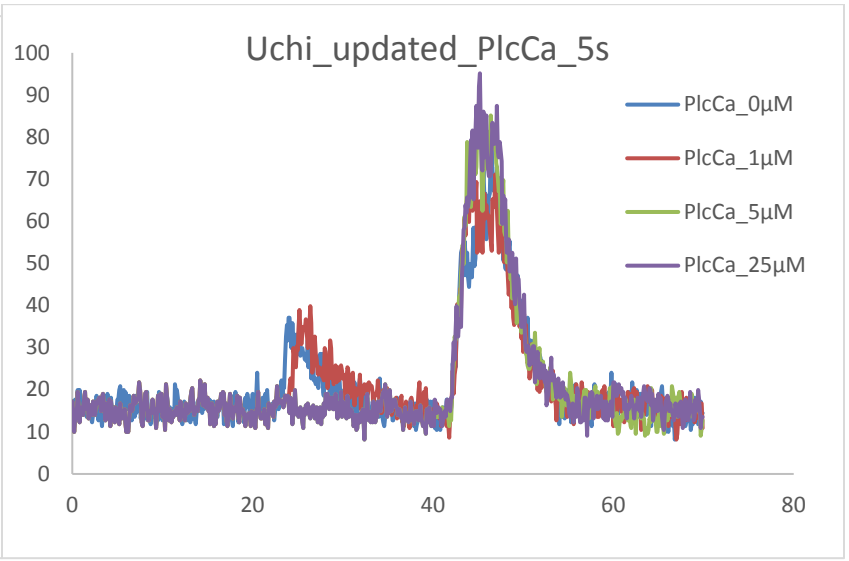
20
30
40
50
60
70
80
90
100
0
10
20
30
40
50
60


Uchi_updated_PlcCa_5s
PlcCa_0μM
PlcCa_1μM
PlcCa_5μM
PlcCa_25μM
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80

Notes:

1. GqGTP produced is too little in both the github and updated version. The speeding up of 5 times didn't show any significant increase in the production of GqGTP.
2. Active PKC in both Github and Updated is too little and there is almost no difference with changing Dhpg concentration.
3. The amounts of G protein is lower in the github MSPN table compared to the published model, but a large difference is in amount of the G protein present.

| Published Model | Github |
|---|---|
| Gq are 3500 nM<br>mGluR1 is 5000nM | Gs, Gi and Gq are around 2000 nM<br>mGluR1 is 150nM |