Figure 1

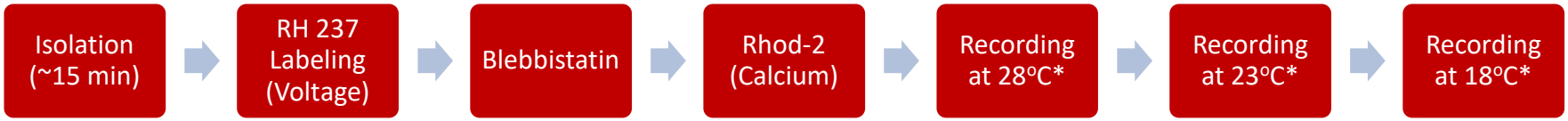

Isolation (~15 min)
RH 237 Labeling (Voltage)
Blebbistatin
Rhod-2 (Calcium)
Recording at 28°C*
Recording at 23°C*
Recording at 18°C*

Figure 2

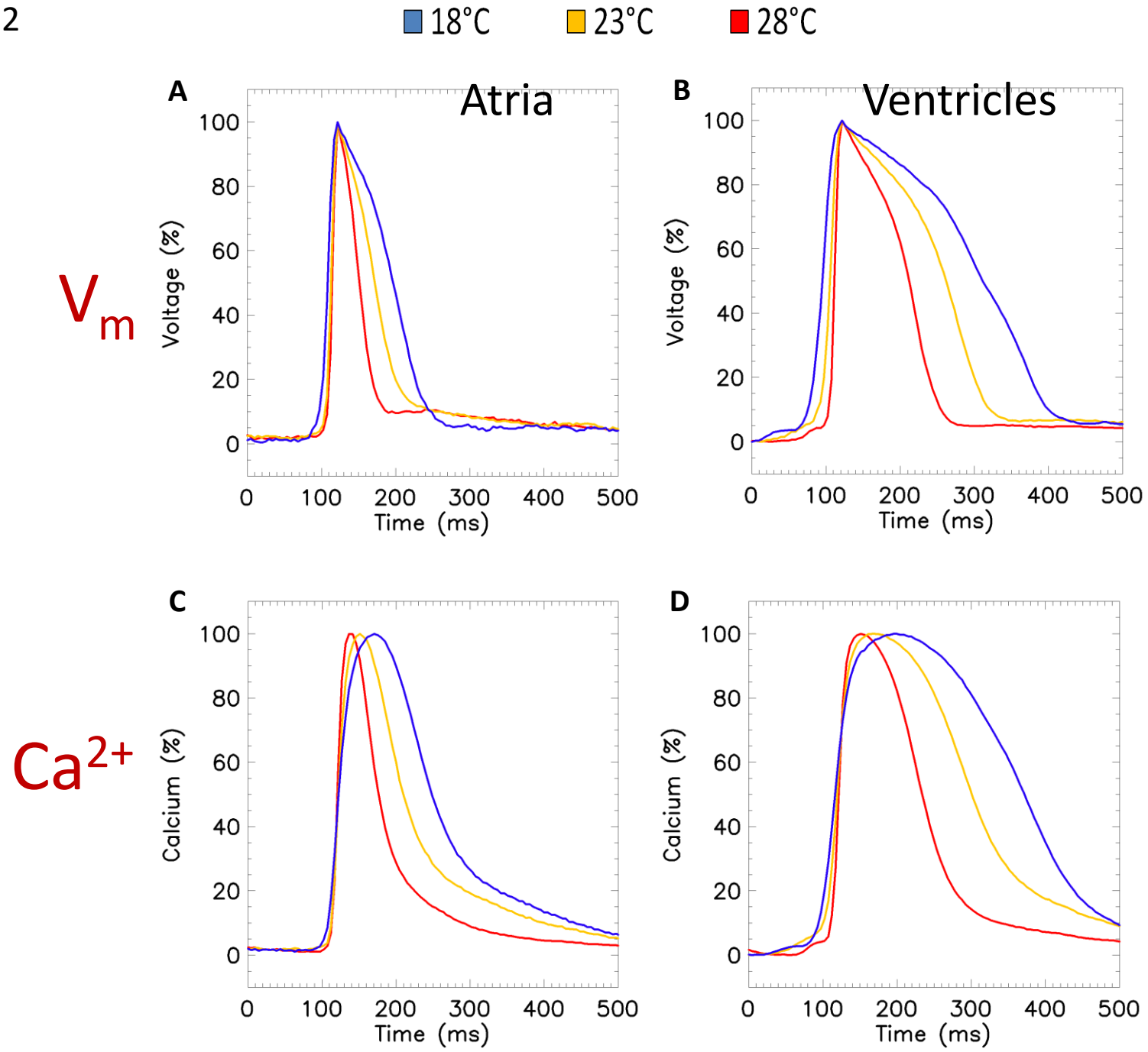

18°C
23°C
28°C
A
Atria
B
Ventricles
V_m
Voltage (%)
Time (ms)
C
D
Ca^{2+}
Calcium (%)
Time (ms)

Figure 3 - Atrial

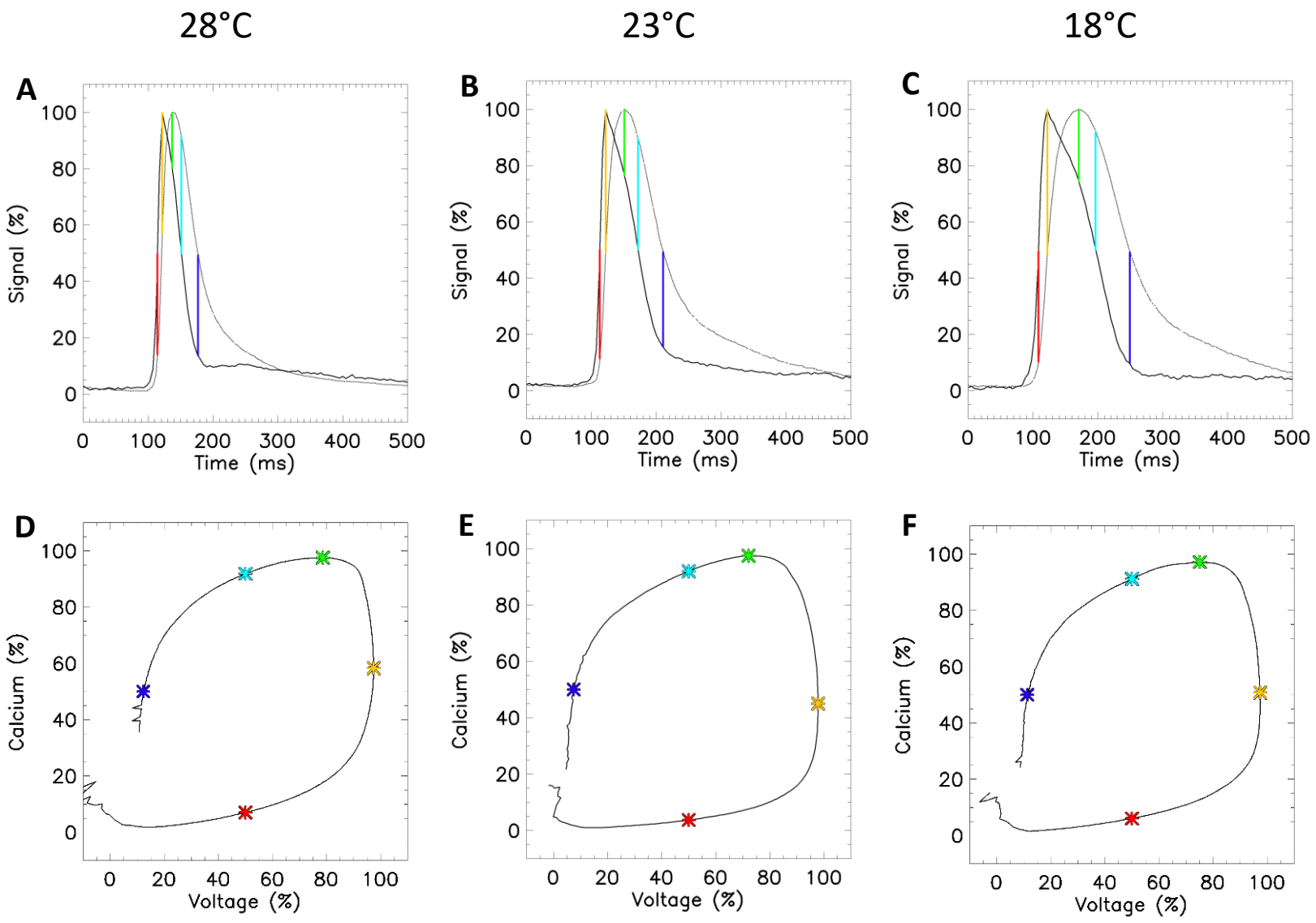


Figure 4: Ventricular

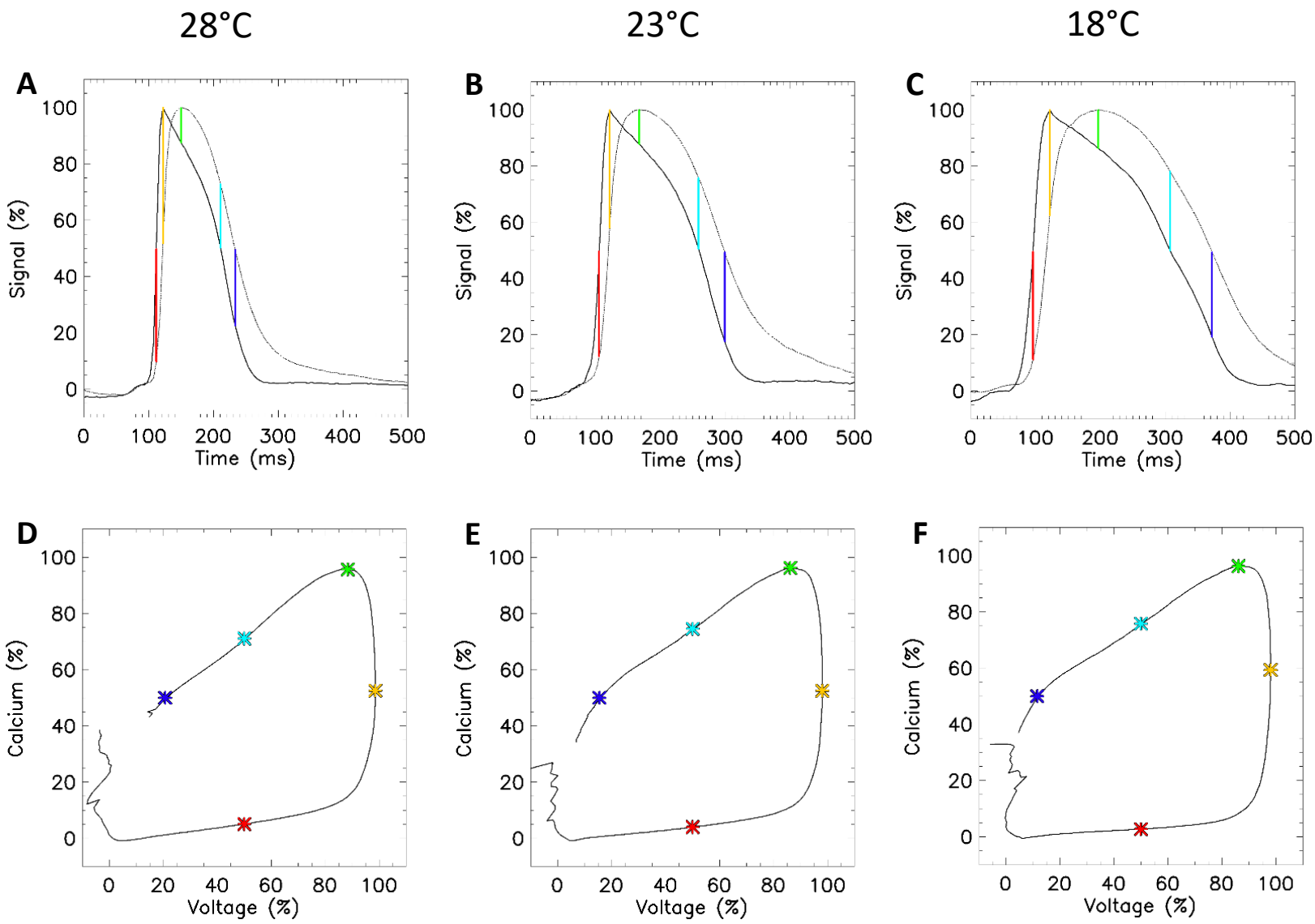
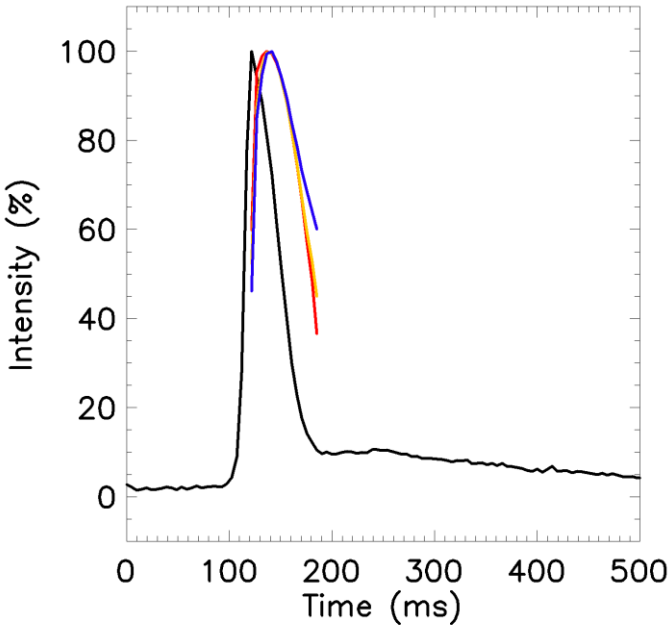
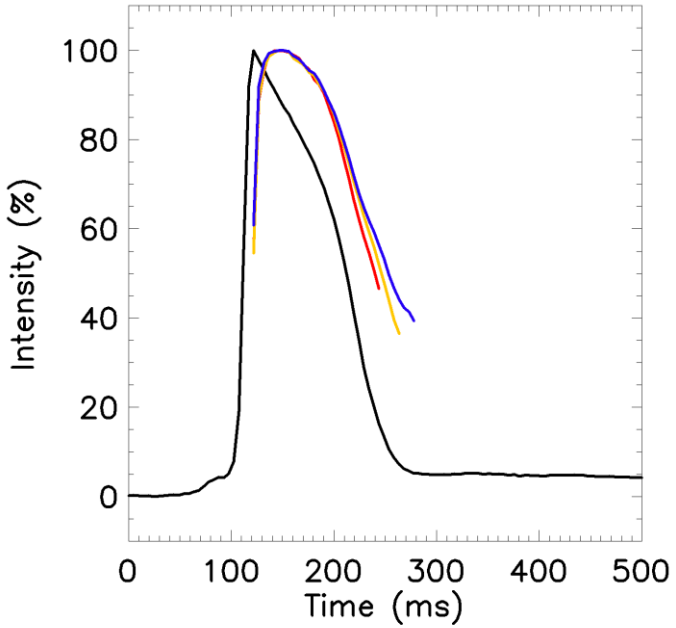


Figure 5

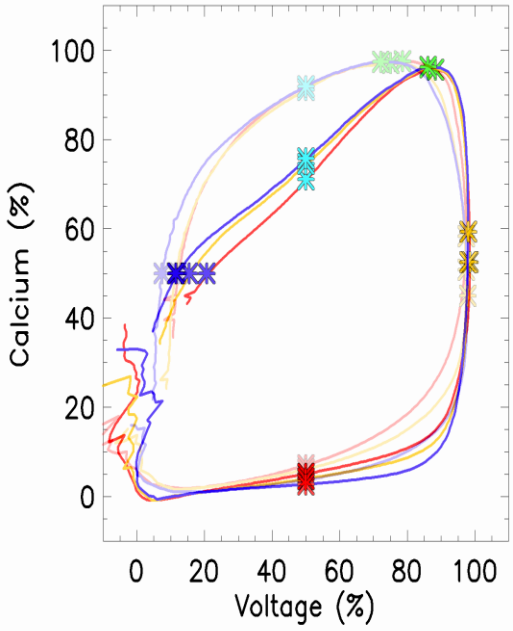
A Atrium



B Ventricle



C Atrium and Ventricle Phase plots



18°C 23°C 28°C

Figure 6

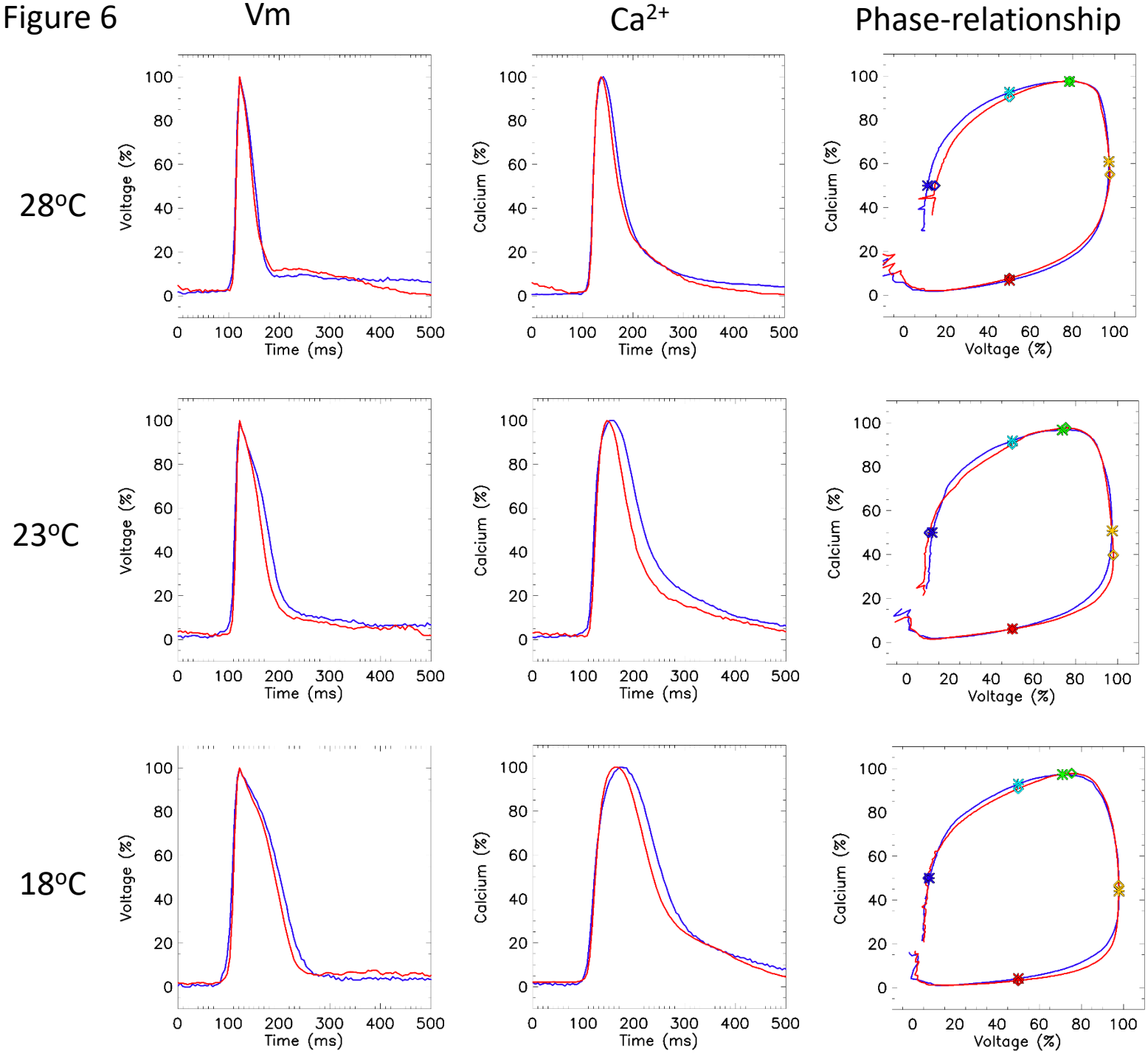

Vm
Ca2+
Phase-relationship
28ºC
23ºC
18ºC
Voltage (%)
Calcium (%)
Time (ms)
0
20
40
60
80
100
0
100
200
300
400
500

Figure 7

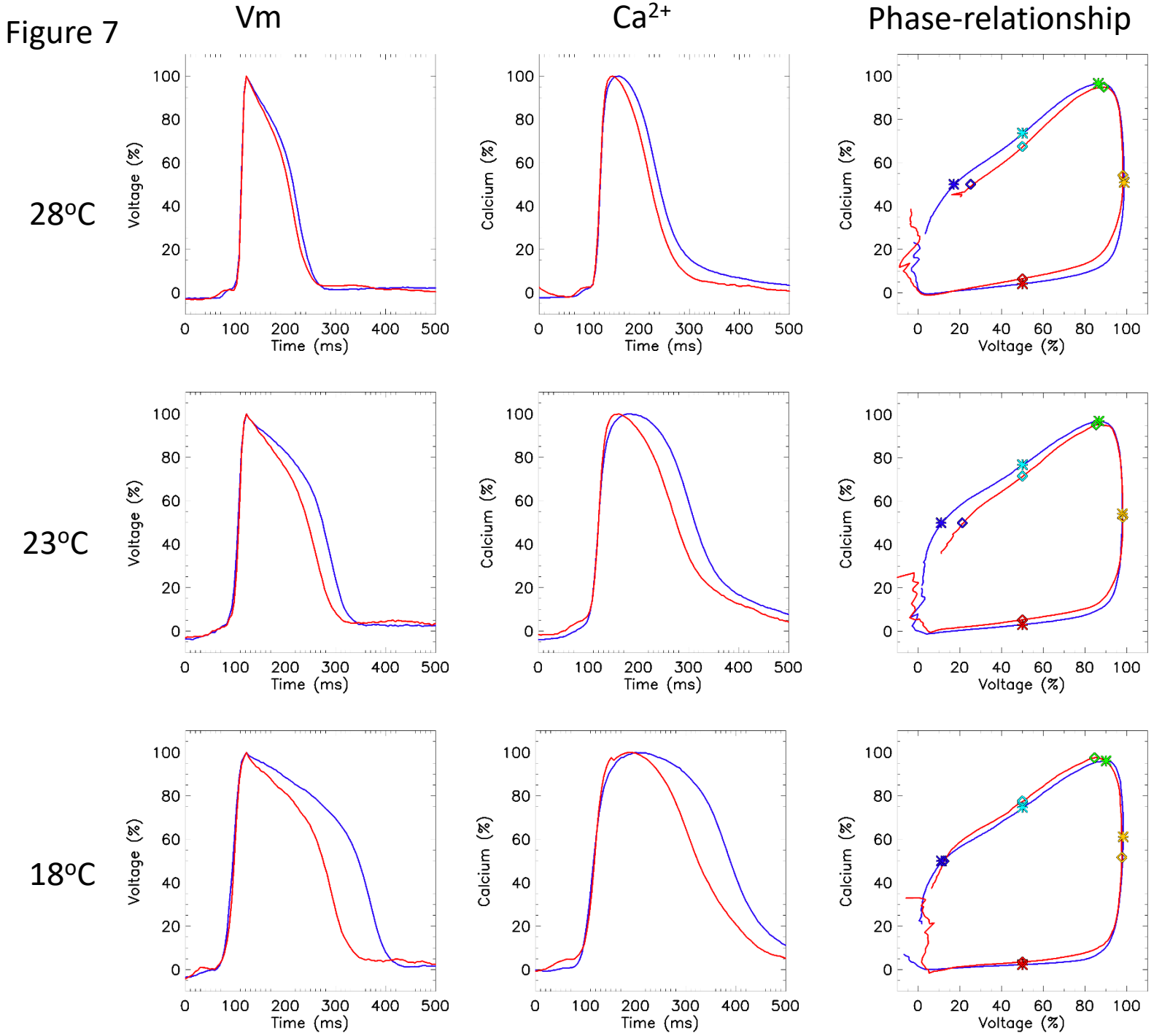

Vm
Ca2+
Phase-relationship
28ºC
23ºC
18ºC
Voltage (%)
Calcium (%)
Time (ms)
Voltage (%)
0
20
40
60
80
100
0
100
200
300
400
500

Figure 8

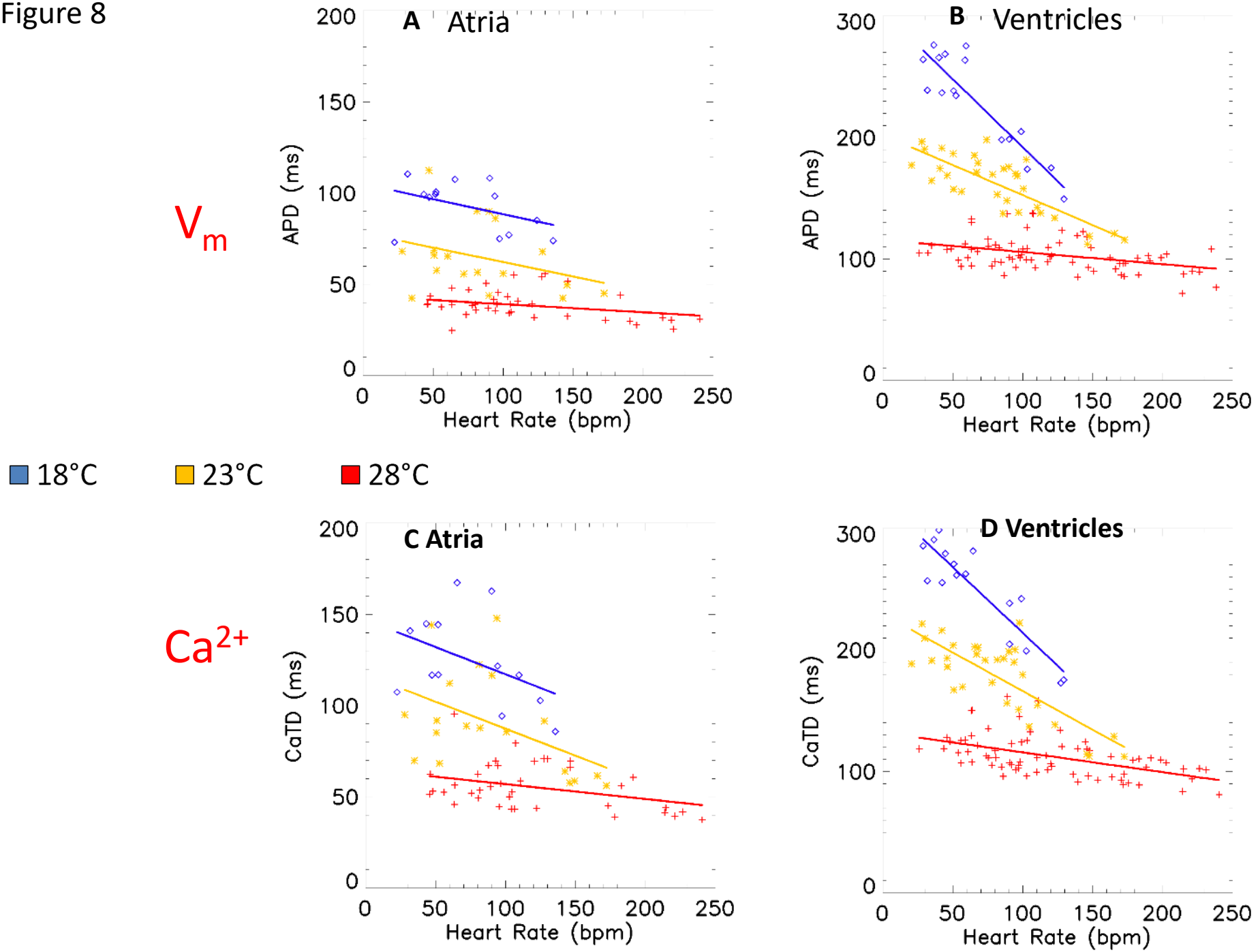

A Atria
B Ventricles
C Atria
D Ventricles
APD (ms)
CaTD (ms)
Heart Rate (bpm)
0
50
100
150
200
250
300
V_m
Ca^{2+}
18°C
23°C
28°C

Figure 9

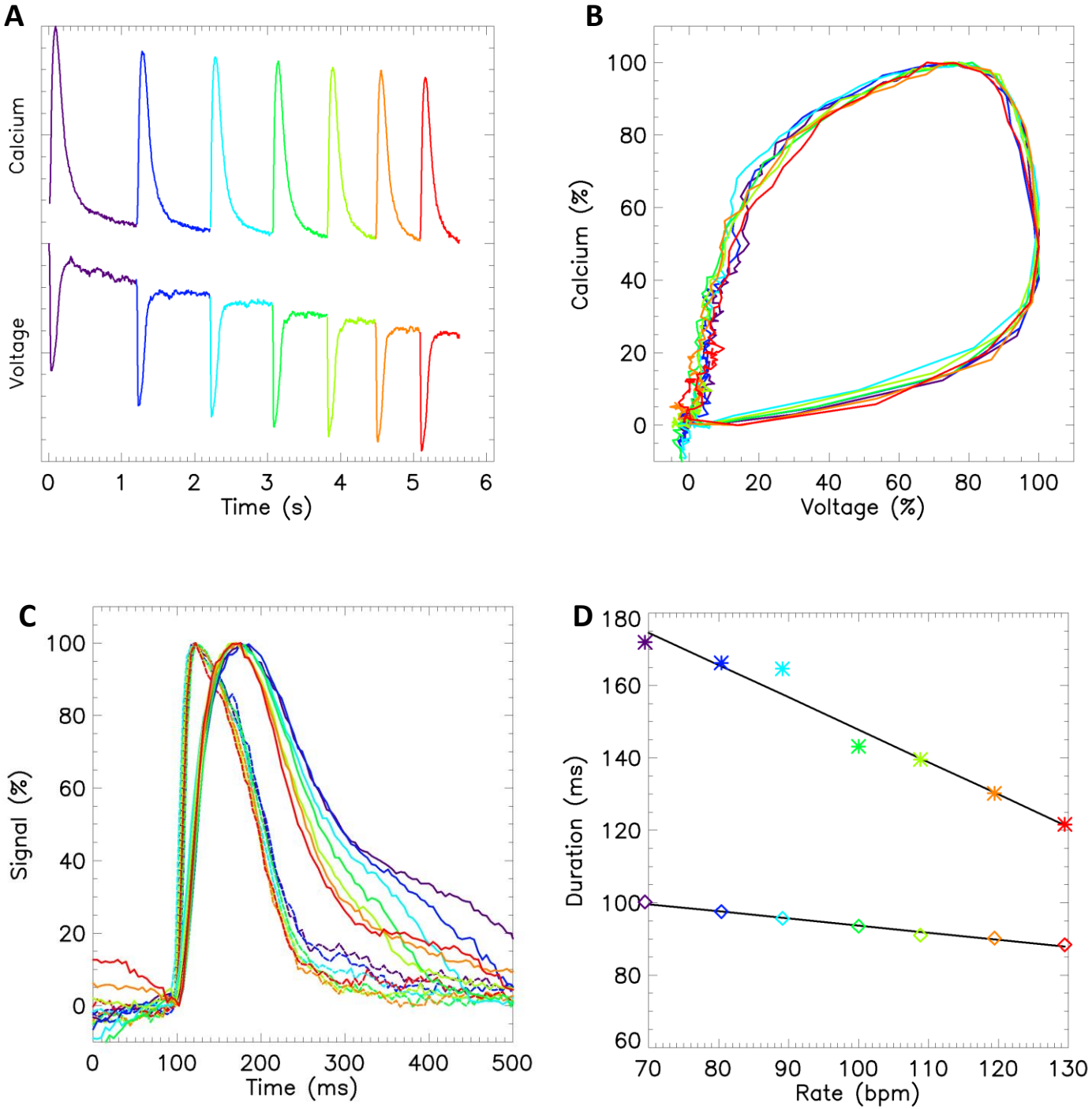

A
Calcium
Voltage
0
1
2
3
4
5
6
Time (s)
B
100
80
60
40
20
0
Calcium (%)
0
20
40
60
80
100
Voltage (%)
C
100
80
60
40
20
0
Signal (%)
0
100
200
300
400
500
Time (ms)
D
180
160
140
120
100
80
60
Duration (ms)
70
80
90
100
110
120
130
Rate (bpm)

Figure 10

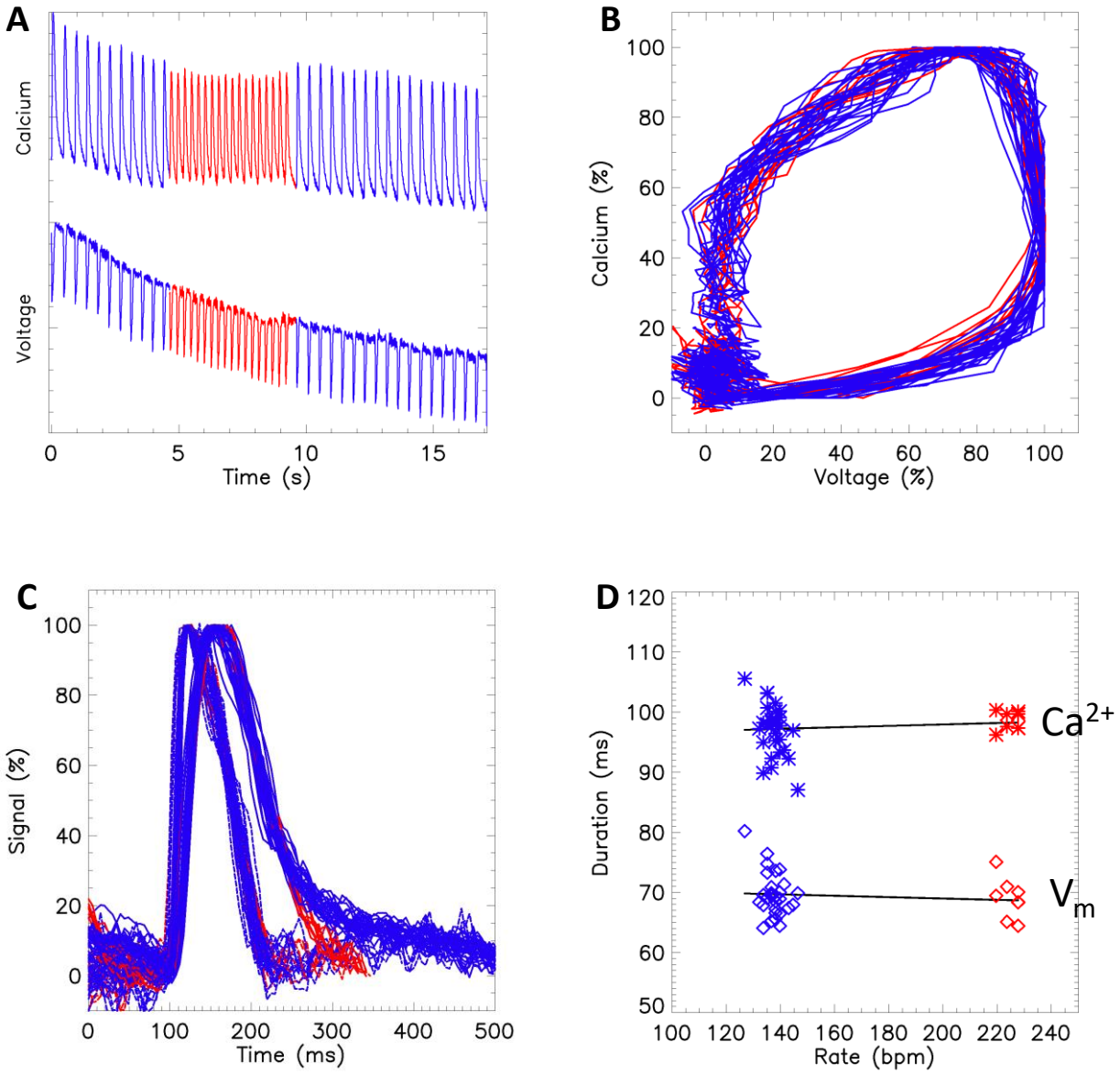

A
Calcium
Voltage
0
5
10
15
Time (s)
B
Calcium (%)
Voltage (%)
0
20
40
60
80
100
C
Signal (%)
Time (ms)
0
100
200
300
400
500
D
Duration (ms)
Rate (bpm)
50
60
70
80
90
100
110
120
100
120
140
160
180
200
220
240
Ca^{2+}
V_m

Figure 11

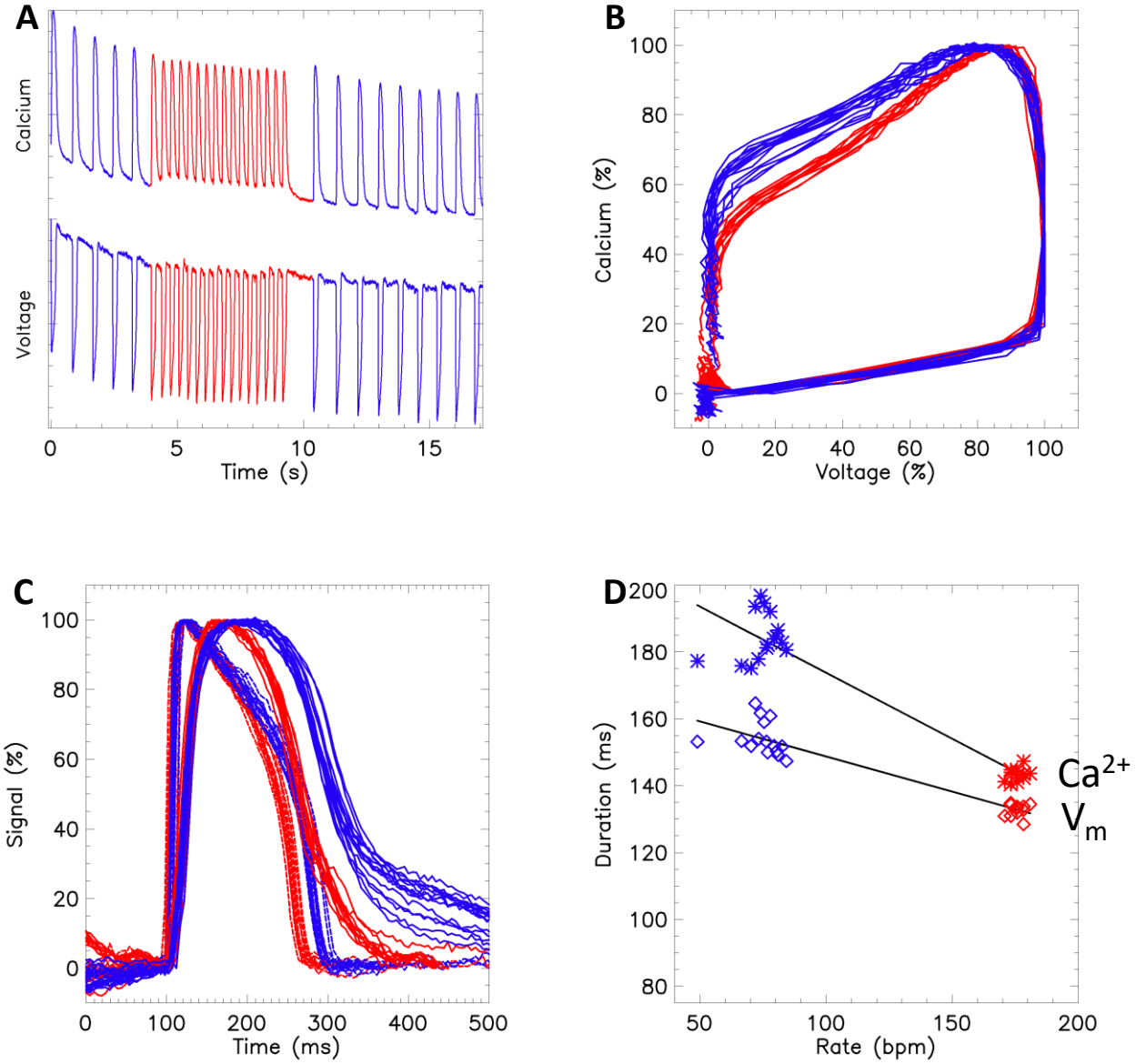
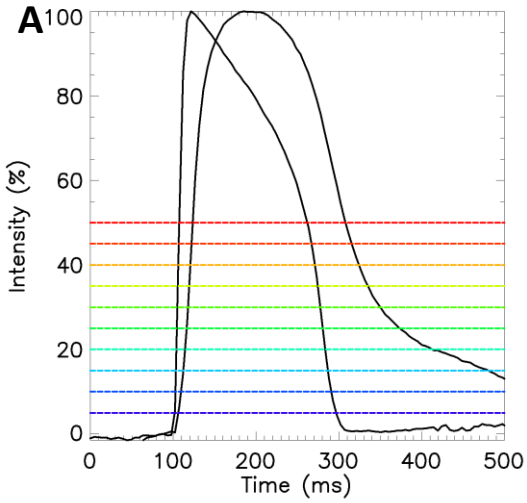
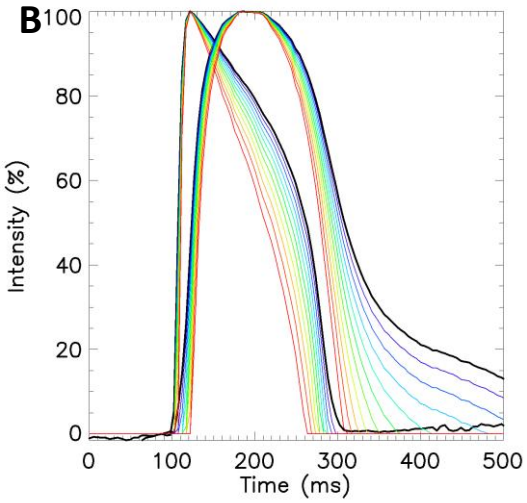
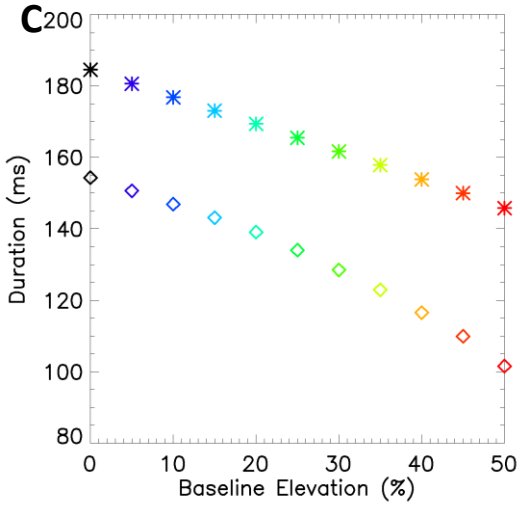
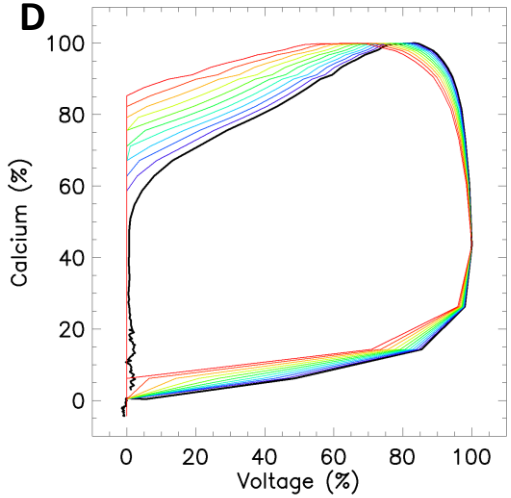

A
Calcium
Voltage
0
5
10
15
Time (s)
B
Calcium (%)
Voltage (%)
0
20
40
60
80
100
C
Signal (%)
Time (ms)
0
100
200
300
400
500
D
Duration (ms)
Rate (bpm)
50
100
150
200
80
100
120
140
160
180
200
Ca2+
Vm

Figure 12

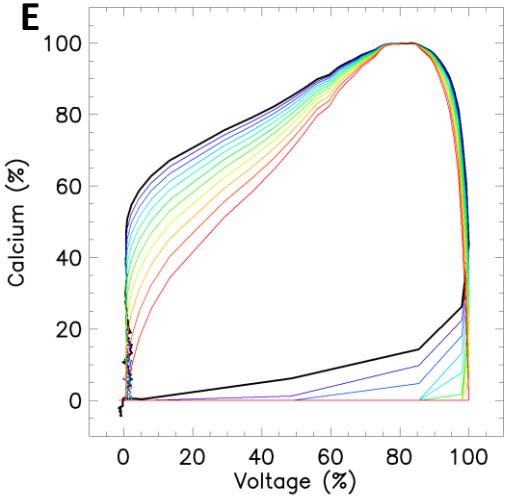




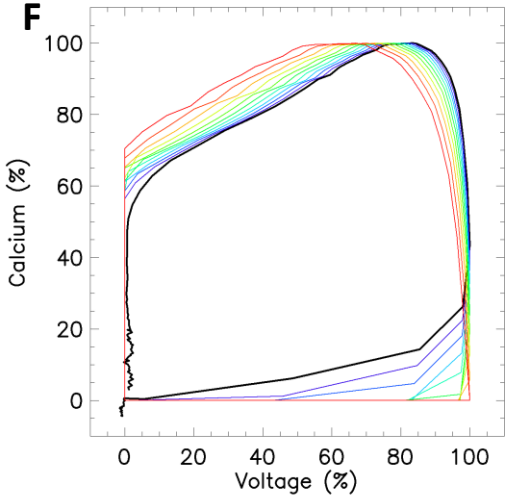




Elevated V_m Baseline
Normal Ca^{2+} Baseline

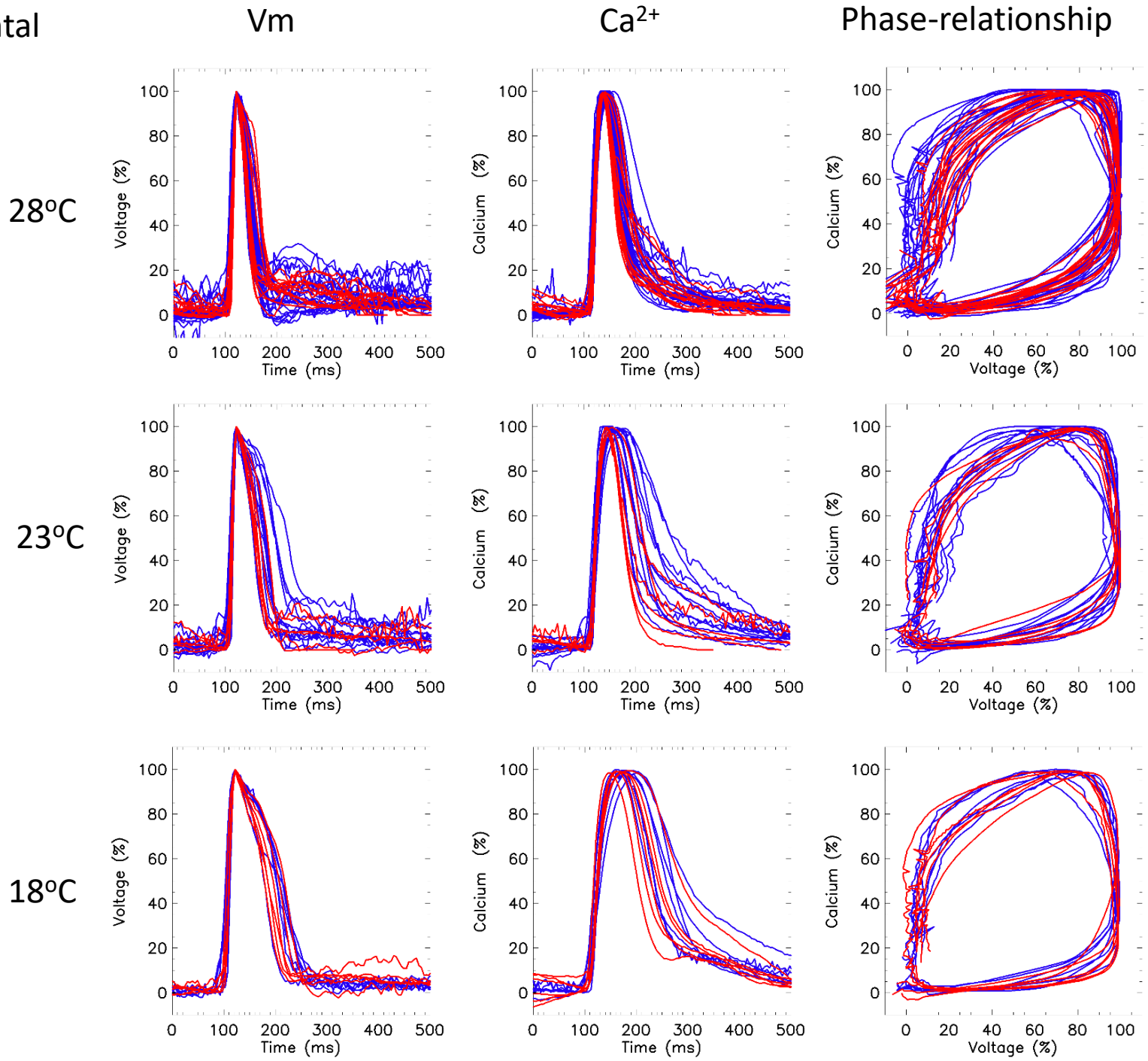


Normal V_m Baseline
Elevated Ca^{2+} Baseline



Elevated V_m Baseline
Elevated Ca^{2+} Baseline

Supplemental Figure 1



Supplemental Figure 2

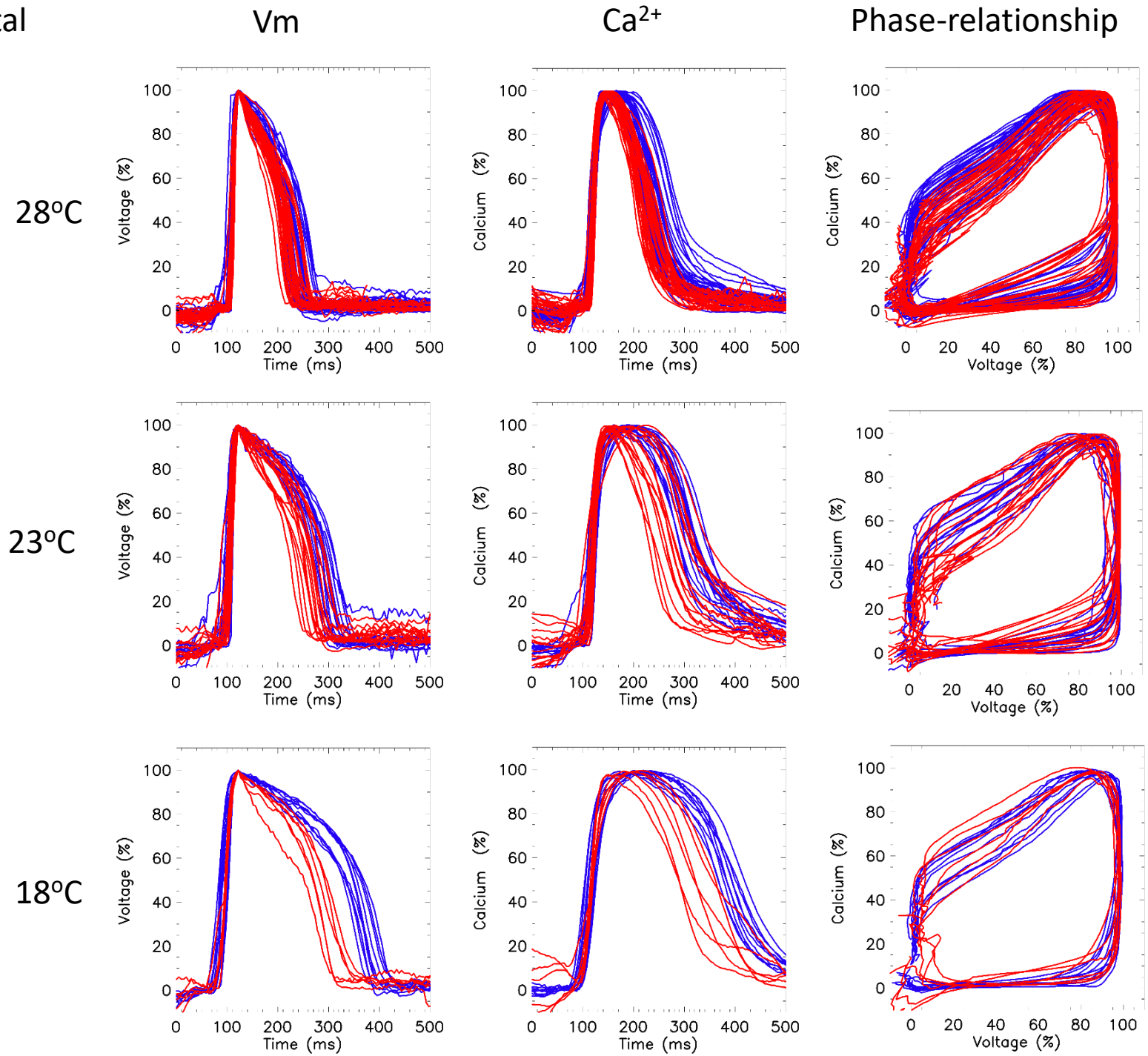


Table 1

Chamber	Temperature (°C)	n	Beating Rate ± SD (bpm)	Mean APD_{50} ± SD (ms)	Mean CaT_{50} ± SD (ms)	$CaTD_{50}$/ APD_{50}
Atria	28	38	119 ± 55$^{\#*}$	39 ± 8$^{\#*}$	56 ± 13$^{\#*}$	1.44
	23	19	92 ± 46$^{\#‡}$	65 ± 19$^{\#‡}$	90 ± 28$^{\#‡}$	1.39
	18	13	74 ± 37*‡	93 ± 14*‡	125 ± 25*‡	1.34
Ventricles	28	74	120 ± 54$^{\#*}$	104 ± 13$^{\#*}$	112 ± 17$^{\#*}$	1.08
	23	30	83 ± 40$^{\#‡}$	161 ± 24$^{\#‡}$	177 ± 32$^{\#‡}$	1.10
	18	16	68 ± 34*‡	229 ± 41*‡	259 ± 40*‡	1.13

$^{\#}$indicates significant difference ($p<0.001$) from the 18 °C condition
*indicates significant difference ($p<0.001$) from the 23 °C condition
‡indicates significant difference ($p<0.001$) from the 28 °C condition

Supplementary Table 1 - data from phase maps

Chamber		Temperature				P-values	
		28 ^{o}C	23 ^{o}C	18 ^{o}C	28^{o}C vs. 23^{o}C	23^{o}C vs. 18^{o}C	28^{o}C vs. 18^{o}C
Atria	Ca^{2+} at 50% Vm Upstroke	7.25 ± 2.58	6.13 ± 3.25	3.77 ± 2.25	0.1639	0.0308	0.0001
	Ca^{2+} at Vm Peak	84.01 ± 9.22	69.02 ± 12.07	61.03 ± 11.32	0.0000	0.0690	0.0000
	Vm at Ca^{2+} Peak	75.96 ± 10.28	75.74 ± 8.93	73.80 ± 8.55	0.9361	0.5448	0.4990
	Ca^{2+} at 50% Vm Repolarization	74.05 ± 12.02	75.14 ± 7.78	78.37 ± 7.67	0.7200	0.2563	0.2318
	Vm at 50% Ca^{2+}Relaxation	11.09 ± 7.31	9.57 ± 5.03	6.92 ± 4.04	0.4171	0.1251	0.0569
Ventricles	Ca^{2+} at 50% Vm Upstroke	5.12 ± 4.80	3.90 ± 3.61	2.65 ± 1.58	0.2155	0.1961	0.0464
	Ca^{2+} at Vm Peak	76.16 ± 10.32	71.25 ± 11.98	70.85 ± 11.38	0.0365	0.9126	0.0702
	Vm at Ca^{2+} Peak	85.82 ± 4.65	85.86 ± 5.06	84.83 ± 4.77	0.9648	0.5050	0.4477
	Ca^{2+} at 50% Vm Repolarization	53.80 ± 8.39	59.07 ± 9.70	60.94 ± 8.06	0.0060	0.5115	0.0025
	Vm at 50% Ca^{2+}Relaxation	19.12 ± 10.55	13.30 ± 10.76	10.49 ± 8.65	0.0129	0.3728	0.0030

Supplementary Table 2

		Atrial	Ventricular	p-value
APD_{50} (ms)	Atria 28°C vs. Ventricular 28°C	38.53 ± 8.25	103.82 ± 13.22	0.0000
	Atria 23°C vs. Ventricular 23°C	64.69 ± 19.37	161.07 ± 24.42	0.0000
	Atria 18°C vs. Ventricular 18°C	92.78 ± 13.95	228.99 ± 40.65	0.0000
$CaTD_{50}$ (ms)	Atria 28°C vs. Ventricular 28°C	55.51 ± 12.68	112.45 ± 16.65	0.0000
	Atria 23°C vs. Ventricular 23°C	89.74 ± 28.03	177.27 ± 32.16	0.0000
	Atria 18°C vs. Ventricular 18°C	124.82 ± 25.39	248.56 ± 40.23	0.0000
Ca^{2+} at 50% Vm Upstroke	Atria 28°C vs. Ventricular 28°C	7.25 ± 2.58	5.12 ± 4.80	0.0119
	Atria 23°C vs. Ventricular 23°C	6.13 ± 3.25	3.90 ± 3.61	0.0338
	Atria 18°C vs. Ventricular 18°C	3.77 ± 2.25	2.65 ± 1.58	0.1274
Ca^{2+} at Vm Peak	Atria 28°C vs. Ventricular 28°C	84.01 ± 9.22	76.16 ± 10.32	0.0001
	Atria 23°C vs. Ventricular 23°C	69.02 ± 12.07	71.25 ± 11.98	0.5280
	Atria 18°C vs. Ventricular 18°C	61.03 ± 11.32	70.85 ± 11.38	0.0284
Vm at Ca^{2+} Peak	Atria 28°C vs. Ventricular 28°C	75.96 ± 10.28	85.82 ± 4.65	0.0000
	Atria 23°C vs. Ventricular 23°C	75.74 ± 8.93	85.86 ± 5.06	0.0000
	Atria 18°C vs. Ventricular 18°C	73.80 ± 8.55	84.83 ± 4.77	0.0002
Ca^{2+} at 50% Vm Repolarization	Atria 28°C vs. Ventricular 28°C	74.05 ± 12.02	53.80 ± 8.39	0.0000
	Atria 23°C vs. Ventricular 23°C	75.14 ± 7.78	59.07 ± 9.70	0.0000
	Atria 18°C vs. Ventricular 18°C	78.37 ± 7.67	60.94 ± 8.06	0.0000
Vm at 50% Ca^{2+} Relaxation	Atria 28°C vs. Ventricular 28°C	11.09 ± 7.31	19.12 ± 10.55	0.0001
	Atria 23°C vs. Ventricular 23°C	9.57 ± 5.03	13.30 ± 10.76	0.1634
	Atria 18°C vs. Ventricular 18°C	6.92 ± 4.04	10.49 ± 8.65	0.1821

Supplementary Table 3 - atrial

		Fast	Slow	p-value
28°C	APD_{50} (ms)	35.76 ± 9.73	39.77 ± 7.37	0.1646
	$CaTD_{50}$ (ms)	50.95 ± 12.86	57.53 ± 12.29	0.1367
	Ca^{2+} at 50% Vm Upstroke (%)	7.28 ± 2.56	7.24 ± 2.64	0.9637
	Ca^{2+} at Vm Peak (%)	85.79 ± 4.45	83.22 ± 10.66	0.4282
	Vm at Ca^{2+} Peak (%)	77.69 ± 9.15	75.19 ± 10.82	0.4921
	Ca^{2+} at 50% Vm Repolarization (%)	71.02 ± 9.86	75.40 ± 12.80	0.3001
	Vm at 50% Ca^{2+} Relaxation (%)	14.35 ± 6.13	9.59 ± 7.43	0.0612
23°C	APD_{50} (ms)	55.89 ± 16.02	70.29 ± 19.88	0.1274
	$CaTD_{50}$ (ms)	77.86 ± 31.28	98.37 ± 23.13	0.1178
	Ca^{2+} at 50% Vm Upstroke (%)	5.96 ± 3.94	6.26 ± 2.85	0.8481
	Ca^{2+} at Vm Peak (%)	63.18 ± 10.15	73.27 ± 11.95	0.0701
	Vm at Ca^{2+} Peak (%)	75.37 ± 7.07	76.01 ± 10.41	0.8815
	Ca^{2+} at 50% Vm Repolarization (%)	72.06 ± 5.80	77.39 ± 8.50	0.1450
	Vm at 50% Ca^{2+} Relaxation (%)	8.61 ± 4.96	10.26 ± 5.20	0.4947
18°C	APD_{50} (ms)	86.30 ± 14.08	98.34 ± 12.08	0.1250
	$CaTD_{50}$ (ms)	114.01 ± 27.38	134.08 ± 21.16	0.1639
	Ca^{2+} at 50% Vm Upstroke (%)	3.17 ± 1.56	4.29 ± 2.73	0.3935
	Ca^{2+} at Vm Peak (%)	59.88 ± 11.20	62.01 ± 12.21	0.7511
	Vm at Ca^{2+} Peak (%)	74.33 ± 8.25	73.35 ± 9.44	0.8475
	Ca^{2+} at 50% Vm Repolarization (%)	76.80 ± 9.57	79.71 ± 6.06	0.5197
	Vm at 50% Ca^{2+} Relaxation (%)	6.40 ± 4.73	7.37 ± 3.68	0.6857

Supplementary Table 4 - ventricular

		Fast	Slow	p-value
28°C	APD_{50} (ms)	98.09 ± 12.70	107.86 ± 12.16	0.0012
	$CaTD_{50}$ (ms)	103.37 ± 12.80	118.64 ± 16.22	0.0000
	Ca^{2+} at 50% Vm Upstroke (%)	6.58 ± 5.76	4.12 ± 3.77	0.0296
	Ca^{2+} at Vm Peak (%)	77.74 ± 9.76	75.08 ± 10.65	0.2792
	Vm at Ca^{2+} Peak (%)	87.27 ± 3.92	84.82 ± 4.88	0.0250
	Ca^{2+} at 50% Vm Repolarization (%)	49.77 ± 6.18	56.54 ± 8.65	0.0004
	Vm at 50% Ca^{2+} Relaxation (%)	23.69 ± 8.40	16.00 ± 10.81	0.0016
23°C	APD_{50} (ms)	143.70 ± 23.39	174.59 ± 15.07	0.0001
	$CaTD_{50}$ (ms)	156.95 ± 37.47	191.95 ± 17.03	0.0015
	Ca^{2+} at 50% Vm Upstroke (%)	5.27 ± 4.64	2.86 ± 2.21	0.0696
	Ca^{2+} at Vm Peak (%)	72.84 ± 10.02	70.10 ± 13.39	0.5389
	Vm at Ca^{2+} Peak (%)	86.35 ± 5.40	85.51 ± 4.93	0.6540
	Ca^{2+} at 50% Vm Repolarization (%)	55.69 ± 11.31	61.51 ± 7.78	0.1001
	Vm at 50% Ca^{2+} Relaxation (%)	18.85 ± 12.85	9.06 ± 6.46	0.0109
18°C	APD_{50} (ms)	183.39 ± 21.09	256.35 ± 17.02	0.0000
	$CaTD_{50}$ (ms)	205.52 ± 29.86	274.38 ± 15.02	0.0000
	Ca^{2+} at 50% Vm Upstroke (%)	3.26 ± 2.29	2.29 ± 0.93	0.2495
	Ca^{2+} at Vm Peak (%)	71.56 ± 7.22	70.42 ± 13.66	0.8536
	Vm at Ca^{2+} Peak (%)	84.40 ± 2.74	85.09 ± 5.79	0.7891
	Ca^{2+} at 50% Vm Repolarization (%)	63.18 ± 9.62	59.60 ± 7.17	0.4087
	Vm at 50% Ca^{2+} Relaxation (%)	10.02 ± 8.90	10.77 ± 8.97	0.8728

Supplementary Table 5 - atrial

		Equation of line	r	r^2
28°C	APD_{50} (ms)	y = -0.0447252x + 43.6469	0.29	0.08
	$CaTD_{50}$ (ms)	y = -0.0815573x + 65.1149	0.35	0.12
	Ca^{2+} at 50% Vm Upstroke (%)	y = -0.00919684x + 8.34507	0.2	0.04
	Ca^{2+} at Vm Peak (%)	y = -0.0137015x + 85.6235	0.08	0.01
	Vm at Ca^{2+} Peak (%)	y = -0.00525941x + 76.5812	0.03	0
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.0425526x + 79.0614	0.2	0.04
	Vm at 50% Ca^{2+} Relaxation (%)	y = 0.0415257x + 6.15746	0.31	0.1
23°C	APD_{50} (ms)	y = -0.158874x + 78.1258	0.33	0.11
	$CaTD_{50}$ (ms)	y = -0.296028x + 116.952	0.48	0.23
	Ca^{2+} at 50% Vm Upstroke (%)	y = -0.00234388x + 6.35024	0.03	0
	Ca^{2+} at Vm Peak (%)	y = -0.0819652x + 76.5575	0.31	0.1
	Vm at Ca^{2+} Peak (%)	y = -0.0271707x + 78.2374	0.14	0.02
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.0698083x + 81.5605	0.41	0.17
	Vm at 50% Ca^{2+} Relaxation (%)	y = -0.00480513x + 10.0075	0.04	0
18°C	APD_{50} (ms)	y = -0.165686x + 105.025	0.43	0.18
	$CaTD_{50}$ (ms)	y = -0.299090x + 147.063	0.43	0.18
	Ca^{2+} at 50% Vm Upstroke (%)	y = -0.0121243x + 4.67637	0.2	0.04
	Ca^{2+} at Vm Peak (%)	y = -0.0351437x + 63.6435	0.11	0.01
	Vm at Ca^{2+} Peak (%)	y = 0.0116423x + 72.9375	0.05	0
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.0739324x + 83.8640	0.35	0.12
	Vm at 50% Ca^{2+} Relaxation (%)	y = 0.00762354x + 6.35168	0.07	0

Supplementary Table 6 - Ventricles

		Equation of line	r	r^2
28°C	APD_{50} (ms)	y = -0.0998119x + 115.735	0.41	0.1681
	$CaTD_{50}$ (ms)	y = -0.163350x + 132.077	0.53	0.2809
	Ca^{2+} at 50% Vm Upstroke (%)	y = 0.0229173x + 2.36231	0.26	0.0676
	Ca^{2+} at Vm Peak (%)	y = 0.0359563x + 71.8349	0.19	0.0361
	Vm at Ca^{2+} Peak (%)	y = 0.0253448x + 82.7715	0.3	0.09
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.0726062x + 62.5208	0.47	0.2209
	Vm at 50% Ca^{2+} Relaxation (%)	y = 0.0822691x + 9.23070	0.42	0.1764
23°C	APD_{50} (ms)	y = -0.494508x + 202.094	0.8	0.64
	$CaTD_{50}$ (ms)	y = -0.635529x + 229.700	0.78	0.6084
	Ca^{2+} at 50% Vm Upstroke (%)	y = 0.0150380x + 2.65841	0.17	0.0289
	Ca^{2+} at Vm Peak (%)	y = 0.0256448x + 69.1317	0.08	0.0064
	Vm at Ca^{2+} Peak (%)	y = 0.0206078x + 84.1620	0.16	0.0256
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.135918x + 70.2817	0.55	0.3025
	Vm at 50% Ca^{2+} Relaxation (%)	y = 0.189753x + -2.40891	0.71	0.5041
18°C	APD_{50} (ms)	y = -1.12091x + 304.127	0.9	0.81
	$CaTD_{50}$ (ms)	y = -1.08462x + 322.529	0.9	0.81
	Ca^{2+} at 50% Vm Upstroke (%)	y = 0.00624247x + 2.22815	0.13	0.0169
	Ca^{2+} at Vm Peak (%)	y = 0.0497621x + 67.4531	0.15	0.0225
	Vm at Ca^{2+} Peak (%)	y = -0.00778983x + 85.3657	0.05	0.0025
	Ca^{2+} at 50% Vm Repolarization (%)	y = -0.0104785x + 61.6550	0.04	0.0016
	Vm at 50% Ca^{2+} Relaxation (%)	y = 0.0559441x + 6.67649	0.22	0.0484