ASSIGMENT 10

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SOLVING 2D STEADY STATE HEAT CONDUCTION EQUATION BY:

1. POINT GAUSS SIEDEL WITH SOR
2. LINE GAUSS SIEDEL WITH SOR
3. ADI

LEGEND USED

SET	1	2	3
DX	0.01	0.01	0.02
DY	0.01	0.02	0.01

INITIAL CONDITION	IC A	IC B	IC C
TEMP	0 K	200 K	10X+100Y K

OBSERVATIONS CONSOLIDATED

A) POINT GAUSS SIEDEL WITH SOR

ITERATIONS	SET 1	SET 2	SET 3
IC A	4699	3126	3113
IC B	4368	2920	2912

B) LINE GAUSS SIEDEL WITH SOR

INITIAL CONDITION	A	B
0.01, 0.01	2017	1898

C) ADI

INITIAL CONDITION	A	B
0.01, 0.01	3081	2990

CONCLUSIONS

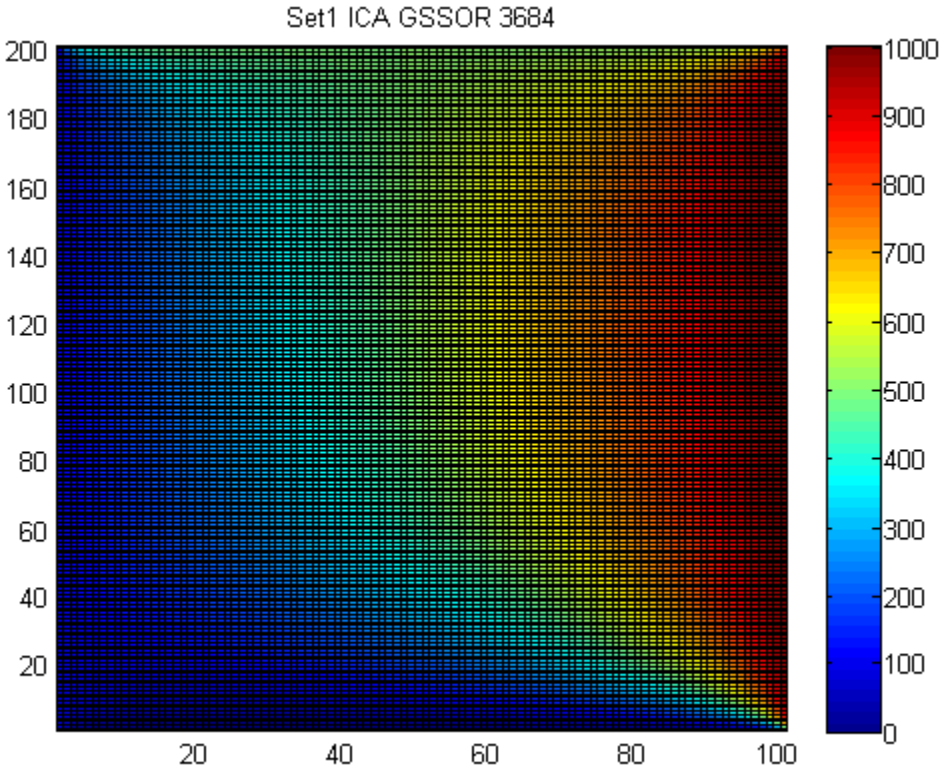
1) The initial condition of T= 0 K is requiring the highest number of iterations as compared to the other IC
2) The IC of T=200 K is requiring least number of iterations for most of the methods
3) The Point Gauss Siedel SOR Method requires the highest number of iterations as compared to all the other Methods
4) The Line Gauss Siedel with SOR Method required least number of iterations than other methods
5) However, the computation time is much more for ADI and Line Gauss Siedel compared to Point Gauss Siedel as it involves solving the tridiagonal matrix using TDMA in every iteration.
6) The set of dx=0.01 and dy=0.01 require the highest number of iterations as the number of node points in the systems are the largest in this case. Also the computational time required is significantly more as expected
7) 1.3*Beta opt resulted in the least number of iteration for Gauss Siedel SOR method
8) 1.21*Beta opt resulted in the least number of iteration for Gauss Siedel Line SOR method

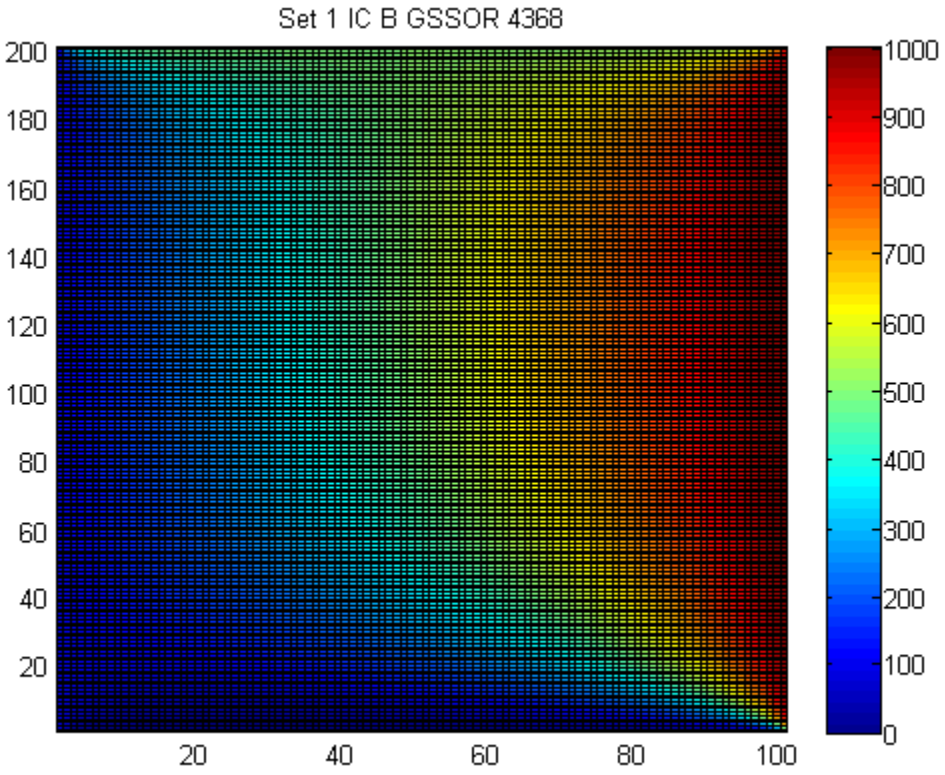
PONT GAUSS SIEDEL WITH SOR

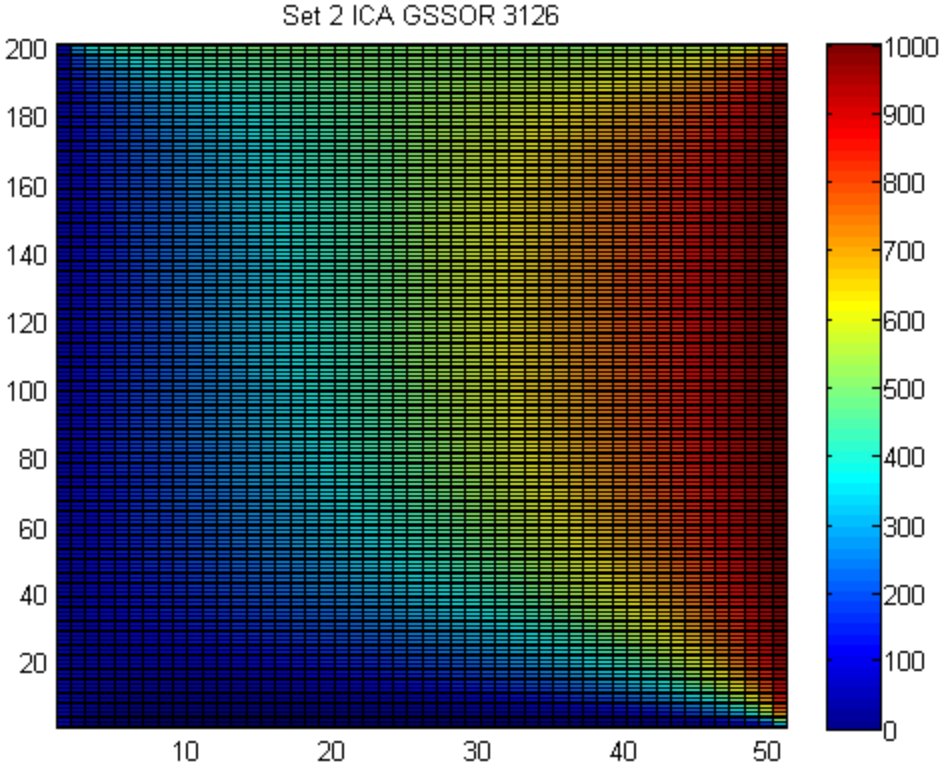
BETA	NO OF STEPS
0.8*BOPT	199
0.9*BOPT	160
BOPT	129
1.1*BOPT	102
1.2*BOPT	78
1.3*BOPT	56
1.4*BOPT	41
1.5*BOPT	55
DX	DY
.1	0.1

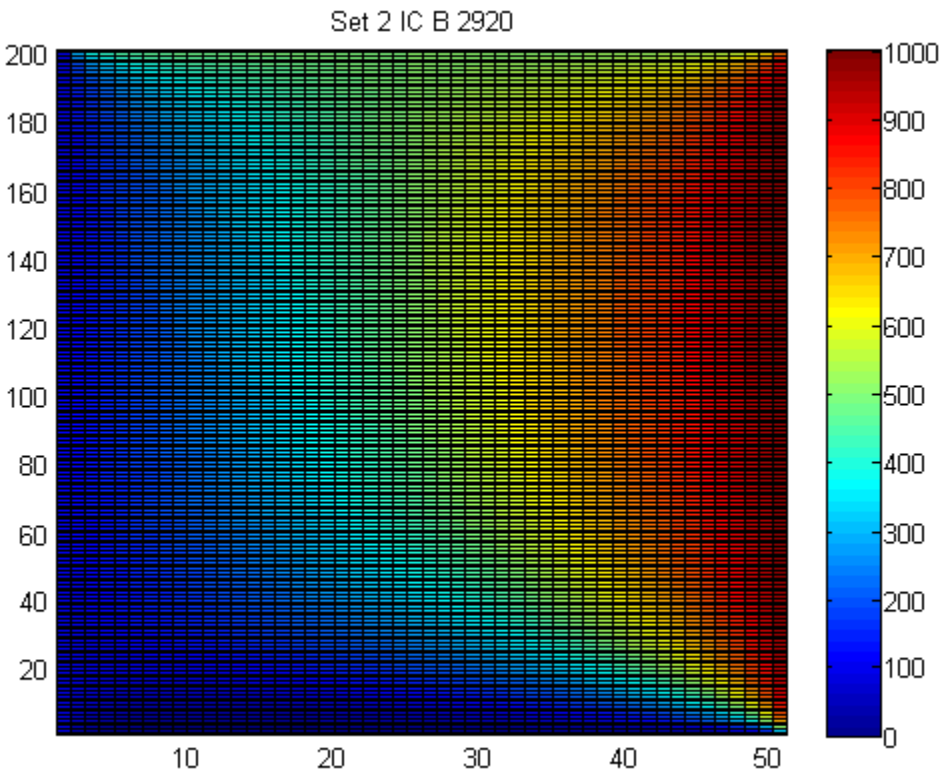
BETA	NO OF STEPS
0.8*BOPT	123
0.9*BOPT	98
BOPT	77
1.1*BOPT	60
1.2*BOPT	43
1.3*BOPT	31
1.4*BOPT	42
1.5*BOPT	71
DX	DY
0.2	0.1

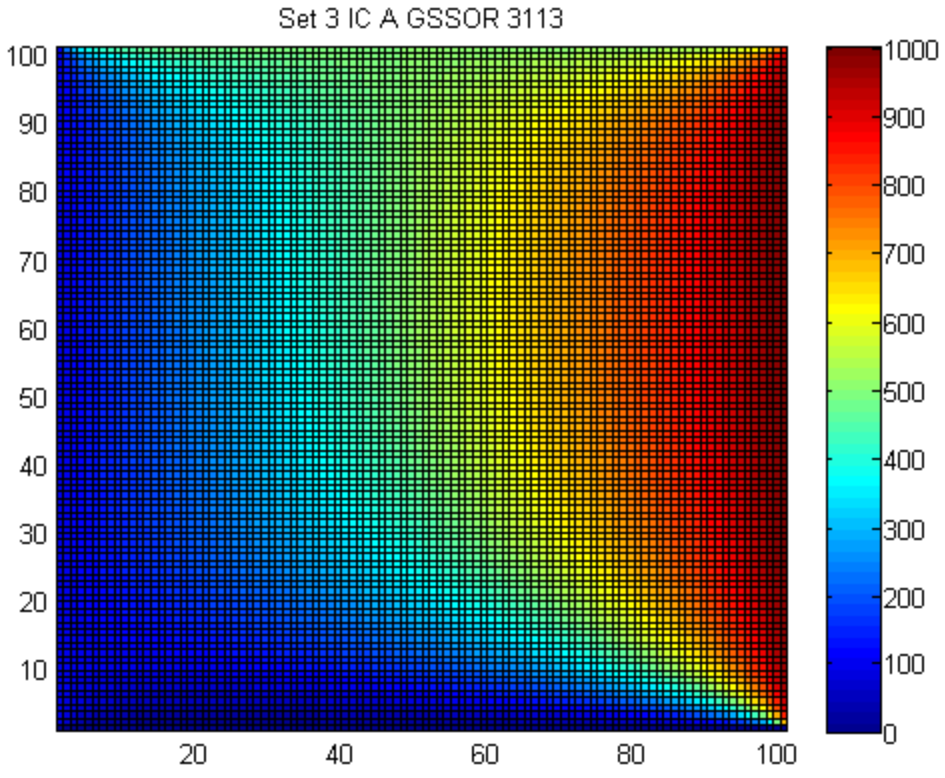
ITERATIONS	SET 1	SET 2	SET 3
IC A	4699	3126	3113
IC B	4368	2920	2912

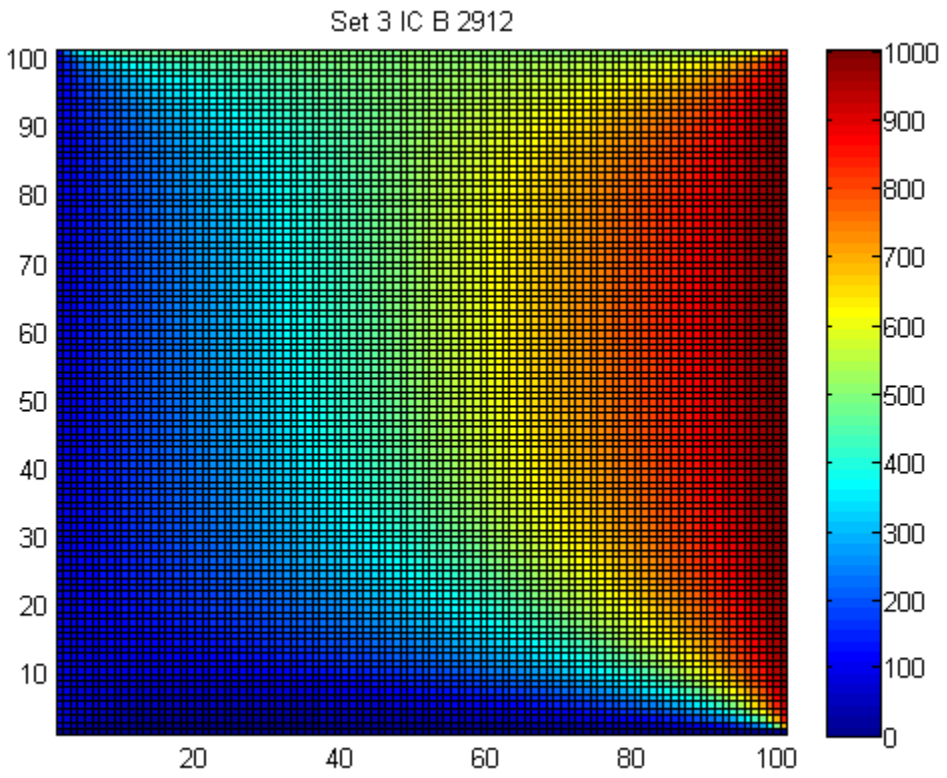



Set 1 IC B GSSOR 4368
200
180
160
140
120
100
80
60
40
20
20
40
60
80
100
1000
900
800
700
600
500
400
300
200
100
0


Set 2 ICA GSSOR 3126
200
180
160
140
120
100
80
60
40
20
10
20
30
40
50
1000
900
800
700
600
500
400
300
200
100
0


Set 2 IC B 2920
200
180
160
140
120
100
80
60
40
20
10
20
30
40
50
1000
900
800
700
600
500
400
300
200
100
0


Set 3 IC A GSSOR 3113
100
90
80
70
60
50
40
30
20
10
20
40
60
80
100
1000
900
800
700
600
500
400
300
200
100
0

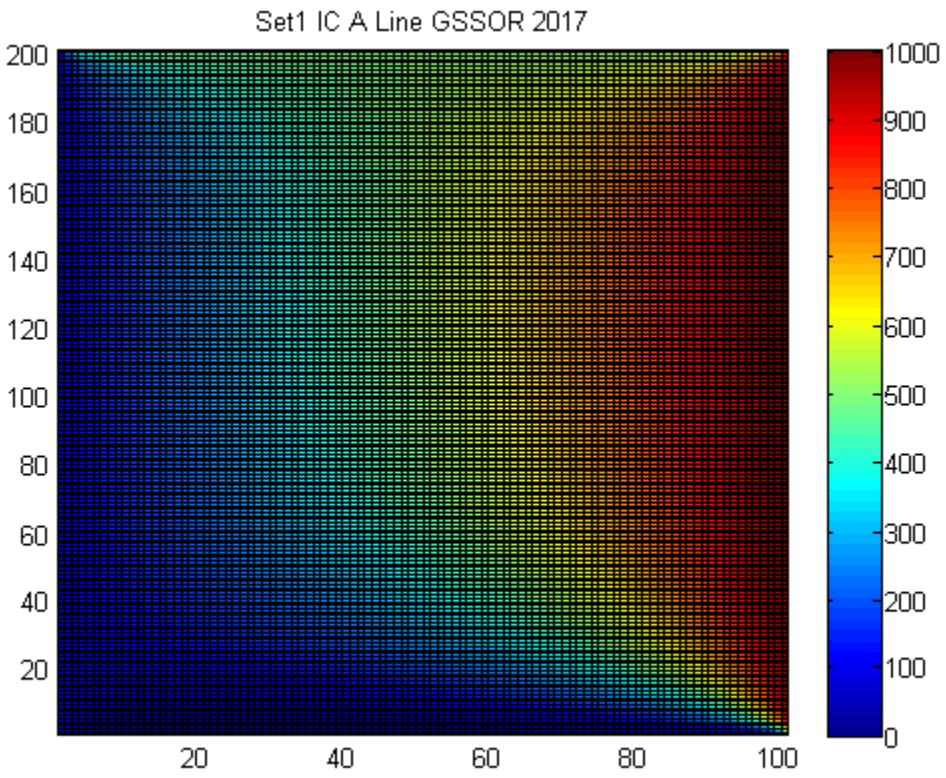


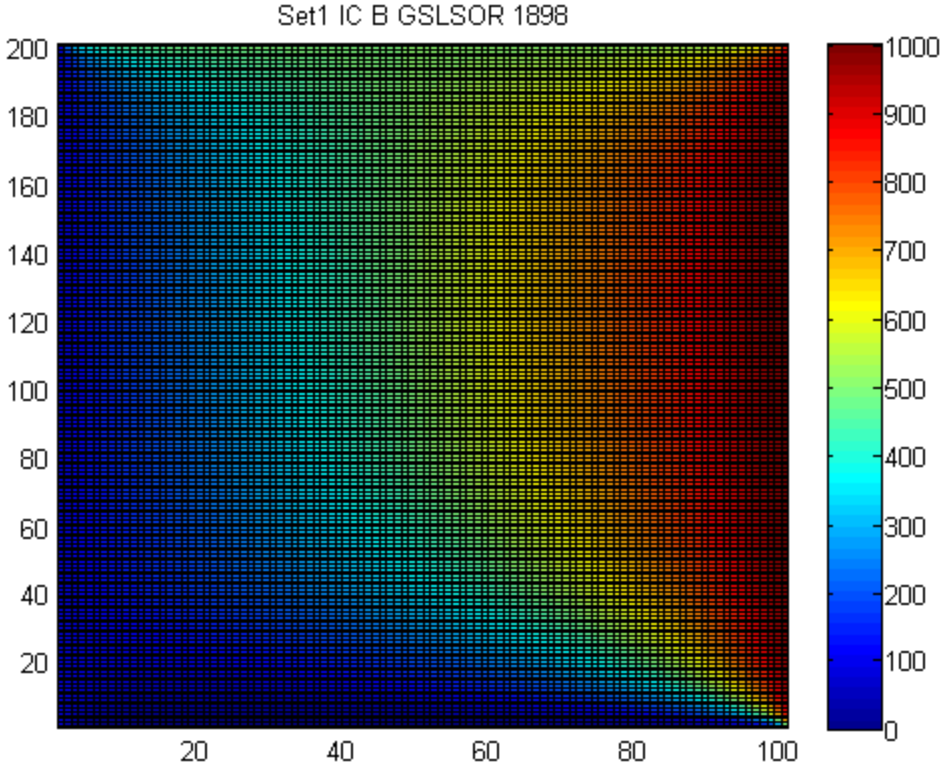
GAUSS SIEDEL LINE SOR

DX=0.1 DY=0.1 IC A

BETA	NO OF STEPS
1	95
1.1	62
1.2	26
1.3	82
1.21	24
1.22	29

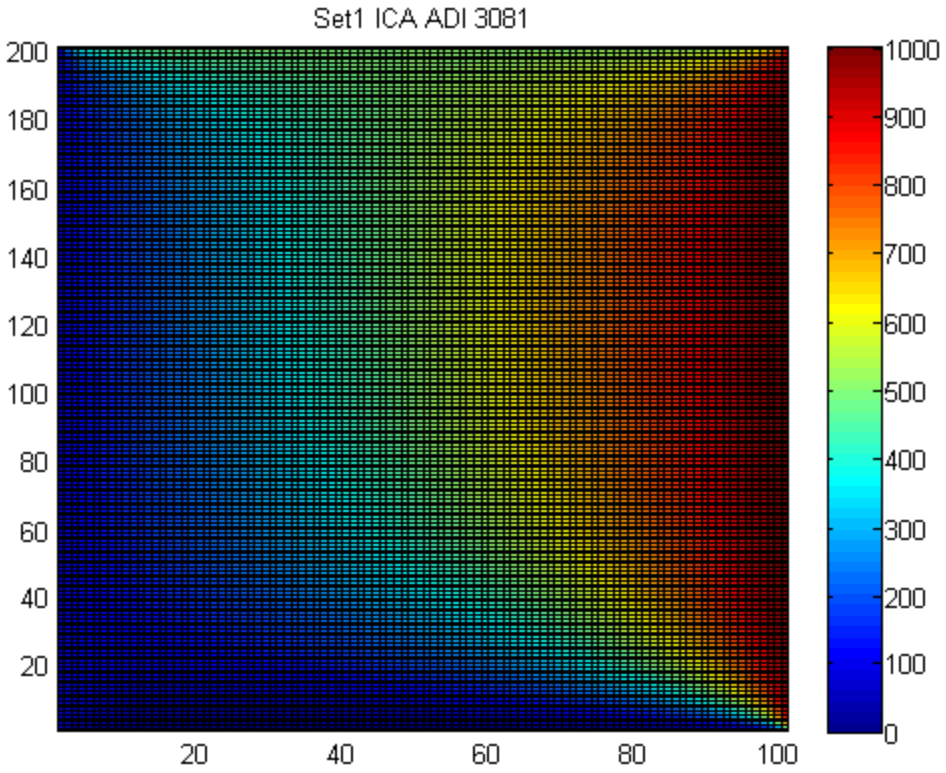
INITIAL CONDITION	A	B
0.01, 0.01	2017	1898

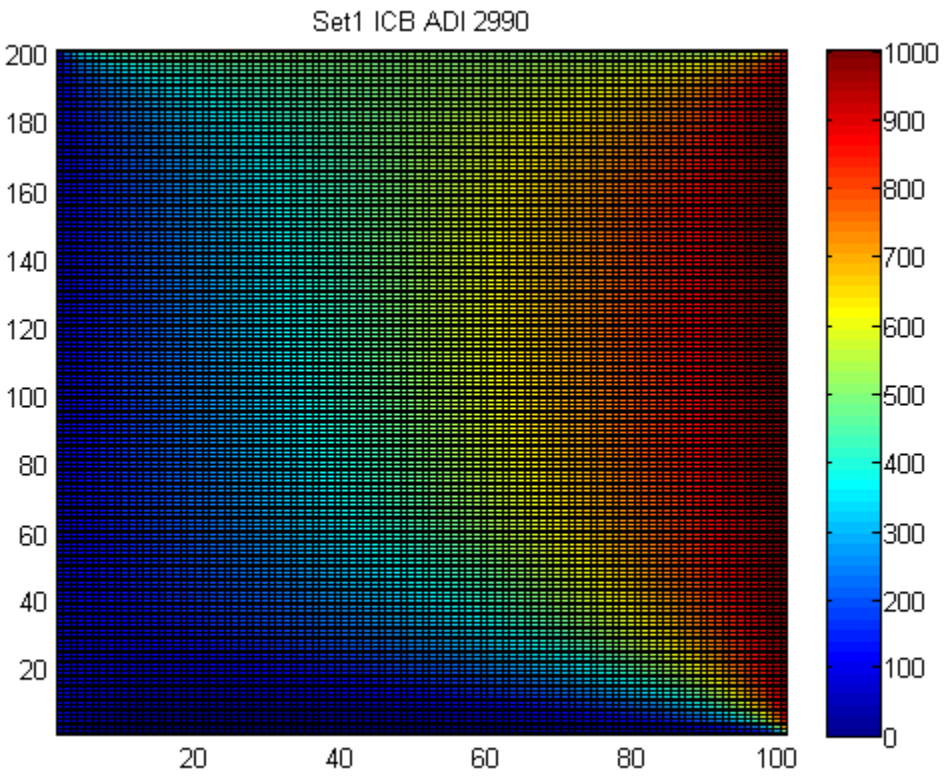

Set1 IC A Line GSSOR 2017
200
180
160
140
120
100
80
60
40
20
20
40
60
80
100
1000
900
800
700
600
500
400
300
200
100
0


Set1 IC B GSLSOR 1898
200
180
160
140
120
100
80
60
40
20
20
40
60
80
100
1000
900
800
700
600
500
400
300
200
100
0

ADI

Initial Condition	A	B	C
0.01, 0.01	3081	2990	3028




Set1 ICB ADI 2990
200
180
160
140
120
100
80
60
40
20
20
40
60
80
100
1000
900
800
700
600
500
400
300
200
100
0