

Relatório #1

Data: 22.Ago.12

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Objetivos Geral: redução do tempo de cpu usando o programa Mach 2D, tendo como critério de parada a tolerância 1.10^{-6} .

Objetivo específico 1: Usando o programa MACH2D original, manter “beta2=0” e alterar os valores de beta1, itb1, itb2, dt1, dt2, it1, it2, itmax, imax, nitm_u, nitm_p para conseguir a convergência em cada malha. Tentar obter o menor tcpu em cada malha. Usar malhas de 56x20, 112x40, 224x80, 448x160, etc.

Objetivo específico 2: Usando o programa MACH 2D original, manter “beta2=1” e alterar os valores de beta1, itb1, itb2, dt1, dt2, it1, it2, itmax, imax, nitm_u, nitm_p para conseguir a convergência em cada malha. Tentar obter o menor tcpu em cada malha. Usar malhas de 56x20, 112x40, 224x80, 448x160, etc.

Objetivo específico 3: Alterando o programa MACH2D para escoamento invíscido (Euler), manter “beta2=0” e alterar os valores de beta1, itb1, itb2, dt1, dt2, it1, it2, itmax, imax, nitm_u, nitm_p para conseguir a convergência em cada malha. Tentar obter o menor tcpu em cada malha. Usar malhas de 56x20, 112x40, 224x80, 448x160, etc.

Objetivo específico 4: Alterando o programa MACH2D para escoamento invíscido (Euler), manter “beta2=1” e alterar os valores de beta1, itb1, itb2, dt1, dt2, it1, it2, itmax, imax, nitm_u, nitm_p para conseguir a convergência em cada malha. Tentar obter o menor tcpu em cada malha. Usar malhas de 56x20, 112x40, 224x80, 448x160, etc.

Dados constantes em todas as simulações: kg=1; a1=1.d-6; coord=1; Rg=2.869E+02; gamma=1.4d0; p0=1725068.d0; T0=833.33d0; pr=101325.d0; g0=9.80665d0; modvis=0; modtur=0; ccTw=0; tolerance=1d-6; reload=0; wbkp=50000; wlf=1; sem_a=1; sem_g=1; w_g=1; w_cam=1; vertela=0; num=1.

Hardware: CFD-9 LENA-1 (8GB RAM, 64bit, Intel Core2 Quad, 2.4GHz)

Sistema operacional: Windows 7

Compilador: Intel Visual Fortran 11.1.065 [Intel 64].

Resultados:

As simulações conduzidas para os objetivos específicos 1 e 3 encontram-se na tabela 1; para os objetivos 2 e 4 na tabela 2.

Durante o trabalho considerou-se que a tolerância seria o critério de parada da simulação, e não houve preocupação com os resultados dos parâmetros “Cd” e “Fd*”.

Em todas as simulações, os dois grupos mais influentes no tempo de cpu foram os que definem as aproximações (UDS/CDS) e que define a relaxação (dt1 e dt2).

No primeiro grupo estão “itb1”, “itb2”, “beta1” e “beta2”, sendo que “beta” no programa assume o valor de “beta1” até que as iterações cheguem a “itb1”; assume um valor que cresce/decrece linearmente até “beta2” para iterações entre “itb1” e “itb2”; e assume o valor “beta2” para iterações maiores que “itb2”.

Neste grupo, os processos foram mais rápidos quando beta1=0 e beta2=0, ou seja, com aproximação puramente UDS. Sempre que o CDS foi ativado o processo se tornou mais lento.

No segundo grupo estão “it1”, “it2”, “dt1” e “dt2”, sendo que “dt” no programa assume o valor de “dt1” até que as iterações cheguem a “it1”; assume um valor que cresce/decresce linearmente até “dt2” para iterações entre “it1” e “it2”; e assume o valor “dt2” para iterações maiores que “it2”.

Estes fatores parecem ser os mais influentes na simulação. Verificou-se que não existe um valor ideal para todas as simulações, mas aparentemente a redução linear de “dt” à medida que o processo iterativo avança, reduz o tempo computacional e as iterações necessárias para atingimento da tolerância. Isto pode ser verificado nas simulações de 35 a 37.

Deve-se observar que houve muita variação nos valores de Cd e Fd* ainda que usando a mesma malha. Não houve preocupação quanto à acurácia destes resultados.

Como o critério de parada foi a tolerância, não houve variação de “itmax”. Verificou-se que mesmo definindo um valor para este parâmetro, a simulação ultrapassou o valor em alguns casos.

Tabela 1 – BETA2 = 0

Beta 2=0														Inviscido (programa original)						Euler (programa alterado)					
#	nx2	ny2	beta1	beta2	itb1	itb2	it1	it2	dt1	dt2	itmax	nitm_u	nitm_p	RAM	it	tcpu	Cd	Fd*	RAM	it	tcpu	Cd	Fd*		
1	56	20	0.00	0.00	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	3,2	186	3,58999999938532E-01	1,04703532100968E+00	9,77067869932445E-01	3	186	3,44000000040978E-01	1,04703532100968E+00	9,77067869932445E-01	
2	56	20	1.00	0.00	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	3,2	187	3,590000000171363E-01	1,04703547779303E+00	9,77067821473445E-01	3	187	1,65699999989010E+00	9,7990913942990E-01	9,64858380712935E-01	
3	56	20	0.50	0.00	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	3,2	187	3,58999999938532E-01	1,04703659449920E+00	9,77069586037917E-01	3	187	3,44000000040978E-01	1,01841610679130E+00	9,73556241046027E-01	
4	56	20	0.80	0.00	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	3,2	187	3,58999999938532E-01	1,04703592975970E+00	9,77068403710344E-01	3	205	3,75000000000000E-01	9,97068547733759E-01	9,69321368856657E-01	
5	56	20	1.00	0.00	80	80	5	5	1d-5	1d-5	1200	5	2	2	3,2	242	4,609999999893829E-01	1,04705089031526E+00	9,77081916701694E-01	3	242	4,52999999979510E-01	1,04705089031526E+00	9,77081916701694E-01	
6	56	20	1.00	0.00	5	240	5	5	1d-5	1d-5	1200	5	2	2	3,2	332	6,41000000061467E-01	1,04703874209901E+00	9,7707019727744E-01	3	332	6,25000000000000E-01	1,04703874209901E+00	9,7707019727744E-01	
7	56	20	0.50	0.00	5	240	5	5	1d-5	1d-5	1200	5	2	2	3,2	760	1,46100000012665E+00	9,79905250381349E-01	9,64858942930951E-01	3	296	5,470000000020489E-01	1,04702855294560E+00	9,77064722391573E-01	
8	56	20	0.00	0.00	1000	1000	5	5	1d-5	1d-6	1200	5	2	2	3,2	2100	4,03999999995902E+00	1,04696983482326E+00	9,76997456586947E-01	3	2100	4,00000000000000E+00	1,04696983482326E+00	9,76997456586947E-01	
9	56	20	0.00	0.00	1000	1000	5	5	1d-5	1d-6	1200	5	2	2	3,2	731	1,39800000004470E+00	1,05062948001992E+00	9,83667952409381E-01	3	731	1,37500000000000E+00	1,05062948001993E+00	9,83667952409381E-01	
10	56	20	0.00	0.00	1000	1000	5	5	1d-5	1d-7	1200	5	2	2	3,2	5	7,99999991431832E-03	9,6257787930338E-01	9,42861080167263E-01	3	5	1,60000000614672E-02	9,6257787930338E-01	9,42861080167263E-01	
11	56	20	0.00	0.00	1000	1000	5	5	1d-6	1d-7	1200	5	2	2	3,2	1013	1,9529999997951E+00	8,7448810817546E-01	8,27701420037400E-01	3	1013	1,89100000006146E+00	8,7448810817547E-01	8,27701420037401E-01	
12	56	20	0.00	0.00	1000	1000	5	5	1d-5	4d-6	1200	5	2	2	3,2	439	8,359999999893829E-01	1,04697458734139E+00	9,77002643614771E-01	3	439	8,28999999910593E-01	1,04697458734138E+00	9,77002643614770E-01	
13	56	20	0.00	0.00	1000	1000	5	5	4d-6	4d-6	1200	5	2	2	3,2	491	9,4599999996274E-01	1,04707414074689E+00	9,77107114391078E-01	3	491	9,21999999787658E-01	1,04707414074689E+00	9,77107114391078E-01	
14	56	20	0.00	0.00	1000	1000	50	200	1d-5	1d-6	1200	5	2	2	3,2	170	3,27999999979510E-01	1,04725820263850E+00	9,77310417398374E-01	3	170	3,27999999979510E-01	1,04725820263851E+00	9,77310417398374E-01	
15	56	20	0.00	0.00	1000	1000	5	170	1d-5	1d-6	1200	5	2	2	3,2	166	3,20000000065192E-01	1,04652825082596E+00	9,75926935670542E-01	3	166	3,11999999918043E-01	1,04652825082596E+00	9,75926935670542E-01	
16	56	20	0.00	0.00	1000	1000	5	170	1d-5	1d-7	1200	5	2	2	3,2	150	2,88999999873340E-01	1,04873028249034E+00	9,79115457173428E-01	3	150	2,81999999989010E-01	1,04873028249034E+00	9,79115457173429E-01	
17	56	20	0.00	0.00	1000	1000	5	170	1d-5	1d-10	1200	5	2	2	3,2	150	2,89000000106170E-01	1,04887923966697E+00	9,79381546549541E-01	3	150	2,80999999950224E-01	1,04887923966697E+00	9,79381546549541E-01	
18	56	20	0.00	0.00	1000	1000	5	170	1d-5	1d-7	1200	3	2	2	3,2	151	2,42000000085681E-01	1,04880541485503E+00	9,79157940510381E-01	3	151	2,35000000102445E-01	1,04880541485503E+00	9,79157940510381E-01	
19	56	20	0.00	0.00	1000	1000	5	170	1d-5	1d-7	1200	3	2	2	3,2	151	2,42000000085681E-01	1,04880541485503E+00	9,79157940510381E-01	3	151	2,35000000102445E-01	1,04880541485503E+00	9,79157940510381E-01	
20	112	40	0.00	0.00	1000	1000	5	170	1d-5	1d-7	1200	3	2	2	6,3	163	1,03900000010617E+00	1,01941640043831E+00	9,75031357501064E-01	5,8	163	1,01600000006146E+00	1,01941640043831E+00	9,75031357501065E-01	
21	112	40	0.50	0.00	80	80	5	170	1d-5	1d-7	1200	3	2	2	6,3	163	1,03900000010617E+00	1,00523639590771E+00	9,65560450351362E-01	5,8	163	1,01599999982863E+00	1,00523639590771E+00	9,65560450351362E-01	
22	112	40	0.50	0.00	5	160	5	170	1d-5	1d-7	1200	3	2	2	6,3	165	1,06199999991804E+00	1,00646040945725E+00	9,68551822315409E-01	5,8	165	1,04600000008940E+00	1,00646040945725E+00	9,68551822315409E-01	
23	112	40	1.00	0.00	80	80	5	170	1d-5	1d-7	1200	3	2	2	6,3	162	1,032000000995920E+00	9,90071000739678E-01	9,5510285544687E-01	5,8	162	1,01599999982863E+00	9,9031000739678E-01	9,5510285544687E-01	
24	112	40	1.00	0.00	5	160	5	170	1d-5	1d-7	1200	3	2	2	6,3	166	1,0629999998912E+00	9,92323945042091E-01	9,61074185119212E-01	5,8	166	1,04600000008940E+00	9,92323945042091E-01	9,61074185119212E-01	
25	112	40	1.00	0.00	500	500	5	170	1d-5	1d-7	1200	3	2	2	6,3	164	1,04599999985657E+00	9,82013235539507E-01	9,68028497286648E-01	5,8	164	1,01499999989755E+00	9,82013235539507E-01	9,68028497286648E-01	
26	112	40	0.00	0.00	1000	1000	5	5	1d-5	1d-7	1200	3	2	2	6,3	5	3,09999999590218E-02	9,70842062373167E-01	9,54710101513412E-01	5,8	5	3,09999999590218E-02	9,70842062373167E-01	9,54710101513412E-01	
27	112	40	0.00	0.00	1000	1000	5	160	1d-5	1d-7	1200	3	2	2	6,3	154	9,84000000171363E-01	1,02243987802435E+00	9,80557846007358E-01	5,8	154	9,69000000040978E-01	1,02243987802435E+00	9,80557846007358E-01	
28	112	40	0.00	0.00	1000	1000	5	160	1d-5	1d-7	1200	3	2	2	6,3	154	9,84000000171363E-01	1,02243987802435E+00	9,80557846007358E-01	5,8	154	1,06199999991804E+00	1,02243987802435E+00	9,80557846007358E-01	
29	224	80	0.00	0.00	1000	1000	5	160	1d-5	1d-7	1200	3	2	2	NR				NR						
30	224	80	0.00	0.00	1000	1000	5	5	1d-5	1d-7	1200	3	2	2	2										
31	224	80	0.00	0.00	1000	1000	5	5	1d-6	1d-6	1200	3	2	2	19	2653	8,39140000001061E+01	1,0008470727400E+00	9,70259760470232E-01	16,9	2653	8,05940000000409E+01	1,0008470727400E+00	9,70259760470232E-01	
32	224	80	0.00	0.00	1000	1000	5	5	1d-6	1d-6	1200	3	2	2	18,5	4730	1,50054999999934E+02	9,83123240062690E-01	9,45958916916257E-01	16,9	4730	1,47158999999985E+02	9,83123240062690E-01	9,45958916916257E-01	
33	224	80	0.00	0.00	1000	1000	5	2000	1d-6	1d-7	1200	3	2	2	18,5	1803	8,359999999893829E-01	9,97700317049779E-01	9,6272880648338E-01	16,9	1803	5,65300000000819E+02	9,97700317049779E-01	9,6272880648338E-01	
34	224	80	0.00	0.00	1000	1000	5	2000	1d-6	1d-6	1200	3	2	2	18,5	2653	8,4141000000614E+01	1,0008470727400E+00	9,70259760470232E-01	16,9	2653	8,32580000001471E+01	1,0008470727400E+00	9,70259760470232E-01	
35	224	80	0.00	0.00	1000	1000	5	2000	4d-6	4d-6	1200	3	2	2	18,5	951	3,06300000001210E+01	1,00083484648359E+00	9,7017379975087E-01	16,9	951	3,00819999999366E+01	1,00083484648359E+00	9,7017379975087E-01	
36	224	80	0.00	0.00	1000	1000	5	900	4d-6	4d-6	1200	3	2	2	18,5	739	2,33750000000000E+01	1,00079583132770E+00	9,70170326485342E-01	16,9	806	2,53979999998118E+01	1,00095802899510E+00	9,7034932194592E-01	
37	224	80	0.00	0.00	1000	1000	5	900	4d-6	4d-7	1200	3	2												

TABELA 2 – BETA2 = 1

#	Beta2=1												Inviscido (programa original)						Euler (programa alterado)							
	nx2	ny2	beta1	beta2	itb1	itb2	it1	it2	dt1	dt2	itmax	imax	nitm_u	nitm_p	RAM	it	tcpu	Cd		Fd*	RAM	it	tcpu	Cd		Fd*
																		Cd	Fd*					Cd	Fd*	
67	56	20	0.0d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	1,31	186	3,58999999938532E-01	1,04703532100968E+00	9,77067869932445E-01	3	186	3,5199999995296E-01	1,04703532100968E+00	9,77067869932445E-01		
68	56	20	1.0d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	1,3	882	3,28629417633010E+03	9,79909139429990E-01	9,64859380712992E-01	3	882	1,66399999987334E+00	9,79909139429990E-01	9,64859380712992E-01		
69	56	20	0.5d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	1,3	186	3,58999999986961E-01	1,01841610679130E+00	9,73556241064027E-01	3	187	3,5199999995296E-01	1,01841610679130E+00	9,73556241064027E-01		
70	56	20	0.2d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	1,3	186	3,58999999986961E-01	1,03636152512137E+00	9,76026628626071E-01	3	186	3,60000000102445E-01	1,03636152512137E+00	9,76026628626071E-01		
71	56	20	0.7d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	3	205	3,90999999828636E-01	1,0466983774718E+00	9,7095982346795E-01	3	205	3,91000000061467E-01	1,0466983774718E+00	9,7095982346795E-01		
72	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-3	1d-5	1200	5	2	2	3	170	3,2899999910593E-01	1,04698710501869E+00	9,77015598318704E-01	3	170	3,20000000065192E-01	1,04698710501869E+00	9,77015598318704E-01		
73	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	5	2	2	3	170	3,2899999910593E-01	1,04705144956268E+00	9,77059209564217E-01	3	170	3,2099999996274E-01	1,04705144956268E+00	9,77059209564217E-01		
74	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-6	1d-5	1200	5	2	2	3	301	5,77999999979510E-01	1,04704339240126E+00	9,77074655439673E-01	3	301	5,70000000065192E-01	1,04704339240126E+00	9,77074655439673E-01		
75	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-6	1200	5	2	2	3	191	3,75000000000000E-01	9,7402769804267E-01	9,17753717860503E-01	3	191	3,60000000102445E-01	9,7402769804267E-01	9,17753717860503E-01		
76	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-4	1200	5	2	2	3	3	1,5999999828636E-02	8,79705700276456E-01	8,41595018437565E-01	3	NR					
77	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	2	2	2	3	187	2,80999999959021E-01	1,04702501261229E+00	9,77004589356255E-01	3	187	2,64999999897554E-01	1,04702501261229E+00	9,77004589356255E-01		
78	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	2	2	3	170	2,80999999959021E-01	1,04705648727677E+00	9,77045191914540E-01	3	170	2,60000000061467E-01	1,04705648727677E+00	9,77045191914540E-01		
79	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	4	2	2	3	170	2,80999999959021E-01	1,04705334365687E+00	9,77054192913209E-01	3	170	2,97000000020489E-01	1,04705334365687E+00	9,77054192913209E-01		
80	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	6	2	2	3	169	3,58999999938532E-01	1,04705272543353E+00	9,77065866981921E-01	3	169	3,44000000040978E-01	1,04705272543353E+00	9,77065866981921E-01		
81	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	2	2	3	131	2,33999999938532E-01	1,04713716120619E+00	9,77119739905101E-01	3	131	2,35000000102445E-01	1,04713716120619E+00	9,77119739905101E-01		
82	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	4	2	3	74	1,57000000122934E-01	1,0460169918488E+00	9,7692044798776E-01	3	74	1,48000000044703E-01	1,0460169918488E+00	9,7692044798776E-01		
83	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	5	2	3	55	1,25000000000000E-01	1,0489473494921E+00	9,78897697374821E-01	3	55	1,1699999952851E-01	1,0489473494921E+00	9,78897697374821E-01		
84	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	6	2	3	53	1,25000000000000E-01	1,05000154113607E+00	9,80870871879367E-01	3	53	1,25000000000000E-01	1,05000154113607E+00	9,80870871879367E-01		
85	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	5	3	3	55	1,25000000000000E-01	1,04843305930492E+00	9,78475775737044E-01	3	55	1,3300000147148E-01	1,04843305930492E+00	9,78475775737044E-01			
86	56	20	0.0d0	1.0d0	1000	1000	3	3	1d-4	1d-5	1200	3	5	4	3	55	1,55999999959021E-01	1,04818512905087E+00	9,78195852657643E-01	3	55	1,48999999102445E-01	1,04818512905087E+00	9,78195852657643E-01		
87	56	20	0.0d0	1.0d0	1000	1000	4	3	1d-4	1d-5	1200	3	5	3	3	55	1,25000000000000E-01	1,04843305930492E+00	9,78475775737044E-01	3	55	1,1699999852851E-01	1,04843305930492E+00	9,78897697374821E-01		
88	112	40	0.0d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	5,8	298	2,25000000000000E+00	1,01694404819777E+00	9,72050442780095E-01	5,8	298	2,2190000004097E+00	1,01694404819777E+00	9,72050442780095E-01		
89	112	40	1.0d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	5,8	789	5,8910000006146E+00	9,80801898921614E-01	9,66088836168738E-01	5,8	789	5,80500000016763E+00	9,80801898921614E-01	9,66088836168738E-01		
90	112	40	0.5d0	1.0d0	1000	1000	5	5	1d-5	1d-5	1200	5	2	2	5,8	316	2,40599999995902E+00	1,00043035137330E+00	9,69782394881854E-01	5,8	316	2,3359999998382E+00	1,00043035137330E+00	9,69782394881854E-01		
91	112	40	0.0d0	1.0d0	150	150	5	5	1d-5	1d-5	1200	5	2	2	5,8	655	4,9099999995902E+00	9,80803347500881E-01	9,66088710895567E-01	5,8	655	4,8289999991059E+00	9,80803347500881E-01	9,66088710895567E-01		
92	112	40	0.5d0	1.0d0	150	150	5	5	1d-5	1d-5	1200	5	2	2	5,8	655	4,9099999991804E+00	9,80803347500881E-01	9,66088710895567E-01	5,8	655	4,8289999991059E+00	9,80803347500881E-01	9,66088710895567E-01		
93	112	40	0.0d0	1.0d0	200	300	5	5	1d-5	1d-5	1200	5	2	2	5,8	787	5,9059999995902E+00	9,8080247225948E-01	9,66088890315034E-01	5,8	787	5,76600000006146E+00	9,8080247225948E-01	9,66088890315034E-01		
94	112	40	0.0d0	1.0d0	300	300	5	5	1d-5	1d-5	1200	5	2	2	5,8	298	2,25000000010244E+00	1,01694404819777E+00	9,72050442780095E-01	5,8	298	2,2190000004097E+00	1,01694404819777E+00	9,72050442780095E-01		
95	112	40	0.0d0	1.0d0	1000	1000	5	5	1d-4	1d-6	1200	5	2	2	5,8	900	6,7599999991431E+00	1,01643397235147E+00	9,70803819988506E-01	5,8	900	6,5859999989382E+00	1,01643397235147E+00	9,70803819988506E-01		
96	112	40	0.0d0	1.0d0	1000	1000	10	10	1d-4	1d-6	1200	5	2	2	5,8	1797	1,35470000000204E+00	9,8080035296501E-01	9,66048688847092E-01	5,8	1797	1,3159999999590E+00	9,8080035296501E-01	9,66048688847092E-01		
97	112	40	0.0d1	1.0d1	1000	1000	5	5	1d-4	1d-7	1200	5	2	2	5,8	5	4,00000000372529E-02	9,07455474636425E-01	9,6600062532940E-01	5,8	5	3,8999999873401E-02	9,07455474636425E-01	9,6600062532940E-01		
98	112	40	0.0d0	1.0d0	1000	1000	300	300	1d-5	1d-8	1200	5	2	2	5,8	298	2,25000000000000E+00	1,01694404819777E+00	9,72050442780095E-01	5,8	298	2,18800000000195E+00	1,01694404819777E+00	9,72050442780095E-01		
99	112	40	0.0d0	1.0d0	1000	1000	150	150	1d-5	1d-8	1200	5	2	2	5,8	150	1,15600000009185E+00	1,01694404819777E+00	9,72050442780095E-01	5,8	150	1,12000000000000E+00	1,01694404819777E+00	9,72050442780095E-01		
100	112	40	0.0d0	1.0d0	1000	1000	100	100	1d-5	1d-8	1200	5	2	2	5,8	100	7,56999999983236E-01	1,01458224145405E+00	9,6825243698326E-01	5,8	100	7,50000000097951E-01	1,01458224145405E+00	9,6825243698326E-01		
101	112	40	0.0d0	1.0d0	1000	1000	80	100	1d-5	1d-8	1200	5	2	2	5,8	99	7,50000000000000E-01	1,01838043448794E+00	9,73407968349975E-01	5,8	99	7,43000000016763E-01	1,01838043448794E+00	9,73407968349975E-01		
102	112	40	0.0d0	1.0d0	1000	1000	100	100	1d-5	1d-8	1200	5	2	2	5,8	96	7,4200000008581E-01	1,01626116089329E+00	9,68876005111934E-01	5,8	96	7,269999995296E-01	1,01626116089329E+00	9,68876005111934E-01		
103	112	40	0.0d0	1.0d0	1000	1000	100	95	1d-5	1d-9	1200	5	2	2	5,8	91	7,02999999979510E-01	1,0245509320957E+00	9,82179636755298E-01	5,8	90	6,72000000020489E-01	1,0245509320957E+00	9,82179636755298E-01		
104	112	40	0.0d0	1.0d0	1000	1000	100	5	1d-5	1d-9	1200	5	2	2	5,8	5	3,90000001061707E-02	9,67149411279134E-01	9,8008390153038E-01	5,8	5	4,00000000372529E-02	9,67149411279134E-01	9,8008390153038E-01		
105	112	40	0.0d0	1.0d0	1000	1000	100	95	1d-5	1d-9	1200	3	2	2	5,8	90	6,099999998614E-01	9,6544758027826E-01	9,40110976147694E-01	5,8	91	5,70000000065192E-01	1,02036482704139E+00	9,74711361190536E-01		
106	112	40	0.0d0	1.0d0	1000	1000	100	95	1d-5	1d-9	1200	10	2	2	5,8	80	9,2999999934807E-01	9,663015717448E-01	9,41395570385726E-01	5,8	80	9,2999999934807E-01	1,01968777020672E+00	9,74711361190		

