

Otimização do Código Mach2D: Relatório 1

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Tabela 1: Configuração dos computadores utilizados nas simulações numéricas.

Hardware	Processador	Intel(R) Core(TM) i5-2310
	Frequência [GHz]	2,90
	Arquitetura [bits]	64
	Memória RAM [GB]	8,0
Software	Sistema operacional	Linux
	Descrição	Ubuntu 12.04 LTS
	Kernel	3.2.0-23-generic
	Compilador	GFortran
	Versão	4.6.3

Tabela 2: Parâmetros utilizados no arquivo de entrada de dados do Mach2D.

Descrição	Variável	Valor
Kind of grid (1=uniform; 2=Geometric Progression, 3=power law)	<i>kg</i>	1
Coordinate system (1=cylindrical; else cartesian)	<i>coord</i>	1
Perfect gas constant [$J/(kg \cdot K)$]	<i>Rg</i>	2.8690000E+02
Specific heat ratio (C_{po}/C_{vo} in the chamber)	<i>gamma</i>	1.4000000E+00
Stagnation pressure in the chamber [Pa]	<i>po</i>	1.7250680E+06
Stagnation temperature in the chamber [K]	<i>T0</i>	8.3333000E+02
Atmospheric pressure at the sea level [Pa]	<i>pr</i>	1.0132500E+05
Gravitational acceleration at the sea level [m/s^2]	<i>go</i>	9.8066500E+00
Viscosity model (0=Euler; 1=Navier-Stokes)	<i>modvis</i>	0
Turbulence model option (0=laminar; 1=Baldwin-Lomax)	<i>modtur</i>	0
Boundary condiction (0=adiabatic; 1=prescribed temperature)	<i>ccTw</i>	0
Maximum number of iterations of the time evolution	<i>itmax</i>	50000
Parada com base no valor do resíduo	<i>tolerance</i>	1.0000000E-06
Upload backup data and continue computation (0=no; 1=yes)	<i>reload</i>	0
Frequency of saving backup data	<i>wbcp</i>	50000
Frequency of printing in the listing file	<i>wlf</i>	1
Open result files (1=no; 0=yes)	<i>sem_a</i>	1
Visualize the plot (0=yes; 1=no)	<i>sem_g</i>	1
Frequency of writing data for graphics	<i>w_g</i>	1
Write the fields (1=yes; 0=no)	<i>w_cam</i>	1

Etapa 1a

Tabela 3: Informações gerais para simulações com diferentes tamanhos de malha.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0056	56	20	0.000	0.0	1.0E-05	5	2	2	187	4.150000E-01	1.0470353210E+00	9.7706786993E-01
Back1a0112	112	40	7.899	0.0	5.0E-06	5	2	2	471	4.114000E+00	1.0169523187E+00	9.7209710276E-01
Back1a0224	224	80	15.798	0.0	2.0E-06	5	2	2	1335	5.170500E+01	1.0008414958E+00	9.7025076007E-01
Back1a0448	448	160	63.192	0.0	2.0E-06	5	2	2	1601	3.476650E+02	9.9147113999E-01	9.6866696560E-01
Back1a0896	896	320	244.869	0.0	1.0E-06	5	2	2	3217	3.478781E+03	9.8646849822E-01	9.6779077703E-01
Back1a1792	1792	640	987.375	0.0	5.0E-07	5	2	2	7838	3.712445E+04	9.8391784746E-01	9.6736122299E-01

Tabela 4: Tempo de CPU para diferentes valores de $imax$.

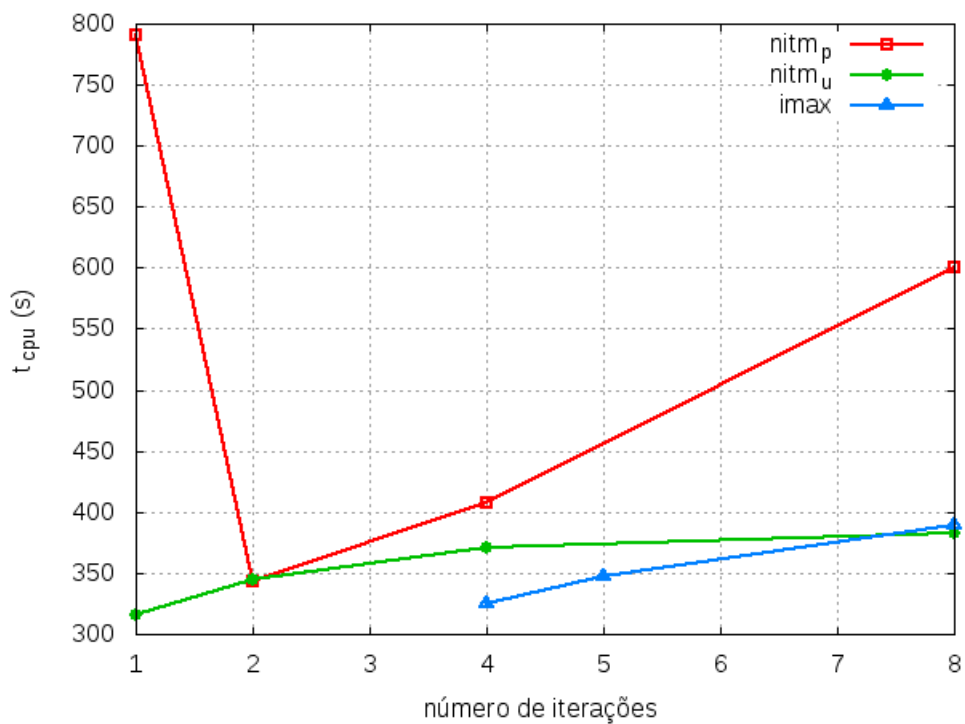
Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0448im04	448	160	63.192	0.0	2.0E-06	4	2	2	1607	3.248050E+02	9.9147215623E-01	9.6865778360E-01
Back1a0448	448	160	63.192	0.0	2.0E-06	5	2	2	1601	3.476650E+02	9.9147113999E-01	9.6866696560E-01
Back1a0448im08	448	160	63.192	0.0	2.0E-06	8	2	2	1513	3.895350E+02	9.9147655796E-01	9.6869009099E-01
Back1a0448im16	448	160	63.192	0.0	2.0E-06	16	2	2	1426	5.305010E+02	9.9147028890E-01	9.6868726506E-01

Tabela 5: Tempo de CPU para diferentes valores de $nitm_u$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0448nu1	448	160	63.192	0.0	2.0E-06	5	1	2	1693	3.157520E+02	9.9147492809E-01	9.6867332868E-01
Back1a0448nu2	448	160	63.192	0.0	2.0E-06	5	2	2	1601	3.440370E+02	9.9147113999E-01	9.6866696560E-01
Back1a0448nu4	448	160	63.192	0.0	2.0E-06	5	4	2	1336	3.713610E+02	9.9148135938E-01	9.6867998184E-01
Back1a0448nu8	448	160	63.192	0.0	2.0E-06	5	8	2	974	3.832020E+02	9.9152129541E-01	9.6872075004E-01

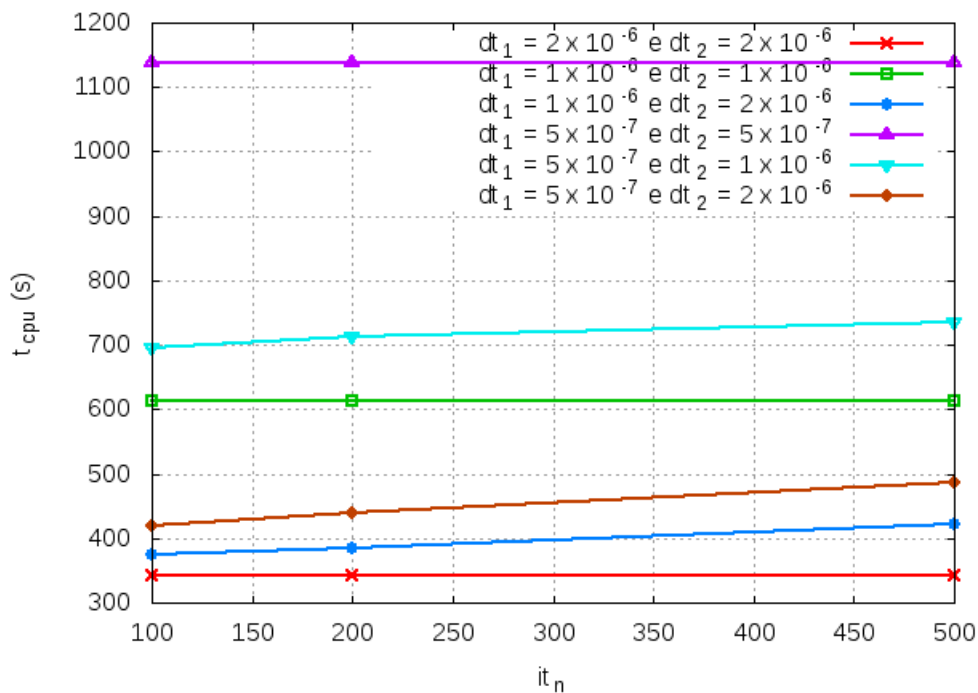
Tabela 6: Tempo de CPU para diferentes valores de $nitm_p$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0448np1	448	160	63.192	0.0	2.0E-06	5	2	1	4355	7.907520E+02	9.9147374398E-01	9.6862280156E-01
Back1a0448np2	448	160	63.192	0.0	2.0E-06	5	2	2	1601	3.433960E+02	9.9147113999E-01	9.6866696560E-01
Back1a0448np4	448	160	63.192	0.0	2.0E-06	5	2	4	1430	4.070910E+02	9.9147139953E-01	9.6868688426E-01
Back1a0448np8	448	160	63.192	0.0	2.0E-06	5	2	8	1426	5.998760E+02	9.9147033461E-01	9.6868764490E-01



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Figura 1: Comparação entre os tempos de CPU para diferentes valores de $imax$, $nitm_u$ e $nitm_p$.



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Figura 2: Comparação do tempo de CPU para diferentes valores de Δt_1 , Δt_2 e it_n ($it_n = it_1 = it_2$).

Tabela 7: Tempo de CPU para valores otimizados de $nitm_u$, $nitm_p$ e $imax$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0448otm	448	160	63.192	0.0	2.0E-06	4	1	2	1701	2.880950E+02	9.9147401595E-01	9.6866147475E-01

Tabela 8: Comparação do tempo de CPU para diferentes valores de Δt_1 , Δt_2 e it_n ($it_n = it_1 = it_2$).

Simulation	n_x	n_y	RAM	β	Δt_1	Δt_2	it_n	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1a0448d122	448	160	63.192	0.0	2.0E-06	2.0E-06	100	5	2	2	1601	3.421520E+02	9.9147113999E-01	9.6866696560E-01
Back1a0448d121	448	160	63.192	0.0	1.0E-06	1.0E-06	100	5	2	2	2838	6.142630E+02	9.9146681167E-01	9.6868219057E-01
Back1a0448d121	448	160	63.192	0.0	1.0E-06	2.0E-06	100	5	2	2	1743	3.739970E+02	9.9147490420E-01	9.6869216067E-01
Back1a0448d221	448	160	63.192	0.0	1.0E-06	2.0E-06	200	5	2	2	1793	3.848460E+02	9.9147494471E-01	9.6869273093E-01
Back1a0448d521	448	160	63.192	0.0	1.0E-06	2.0E-06	500	5	2	2	1942	4.211930E+02	9.9147498808E-01	9.6869296241E-01
Back1a0448d125	448	160	63.192	0.0	5.0E-07	5.0E-07	100	5	2	2	5288	1.137222E+03	9.9148879083E-01	9.6871376369E-01
Back1a0448d125	448	160	63.192	0.0	5.0E-07	1.0E-06	100	5	2	2	3258	6.962700E+02	9.9147188322E-01	9.6869016980E-01
Back1a0448d225	448	160	63.192	0.0	5.0E-07	1.0E-06	200	5	2	2	3308	7.119840E+02	9.9147186037E-01	9.6869021067E-01
Back1a0448d525	448	160	63.192	0.0	5.0E-07	1.0E-06	500	5	2	2	3458	7.361860E+02	9.9147185802E-01	9.6869024656E-01
Back1a0448d125	448	160	63.192	0.0	5.0E-07	2.0E-06	100	5	2	2	1952	4.187980E+02	9.9147397966E-01	9.6868825352E-01
Back1a0448d225	448	160	63.192	0.0	5.0E-07	2.0E-06	200	5	2	2	2027	4.384640E+02	9.9147399018E-01	9.6869106235E-01
Back1a0448d525	448	160	63.192	0.0	5.0E-07	2.0E-06	500	5	2	2	2252	4.866570E+02	9.9147398535E-01	9.6869244215E-01

Etapa 1b

Tabela 9: Informações gerais para simulações com diferentes tamanhos de malha.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1b0056	56	20	0.000	1.0	1.0E-05	5	2	2	883	1.972000E+00	9.7990913943E-01	9.6485938071E-01
Back1b0112	112	40	7.899	1.0	5.0E-06	5	2	2	1442	1.253500E+01	9.8080254704E-01	9.6609038390E-01
Back1b0224	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.932000E+01	9.8106736890E-01	9.6659650877E-01

Tabela 10: Tempo de CPU para diferentes valores de $imax$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1b0224im2	224	80	15.798	1.0	2.0E-06	2	2	2	2367	7.605900E+01	9.8106620835E-01	9.6659576980E-01
Back1b0224im4	224	80	15.798	1.0	2.0E-06	4	2	2	2282	8.381800E+01	9.8106729845E-01	9.6659642363E-01
Back1b0224	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.932000E+01	9.8106736890E-01	9.6659650877E-01
Back1b0224im8	224	80	15.798	1.0	2.0E-06	8	2	2	2261	1.022940E+02	9.8106740245E-01	9.6659656099E-01
Back1b0224im16	224	80	15.798	1.0	2.0E-06	16	2	2	2261	1.406240E+02	9.8106740279E-01	9.6659656134E-01

Tabela 11: Tempo de CPU para diferentes valores de $nitm_u$.

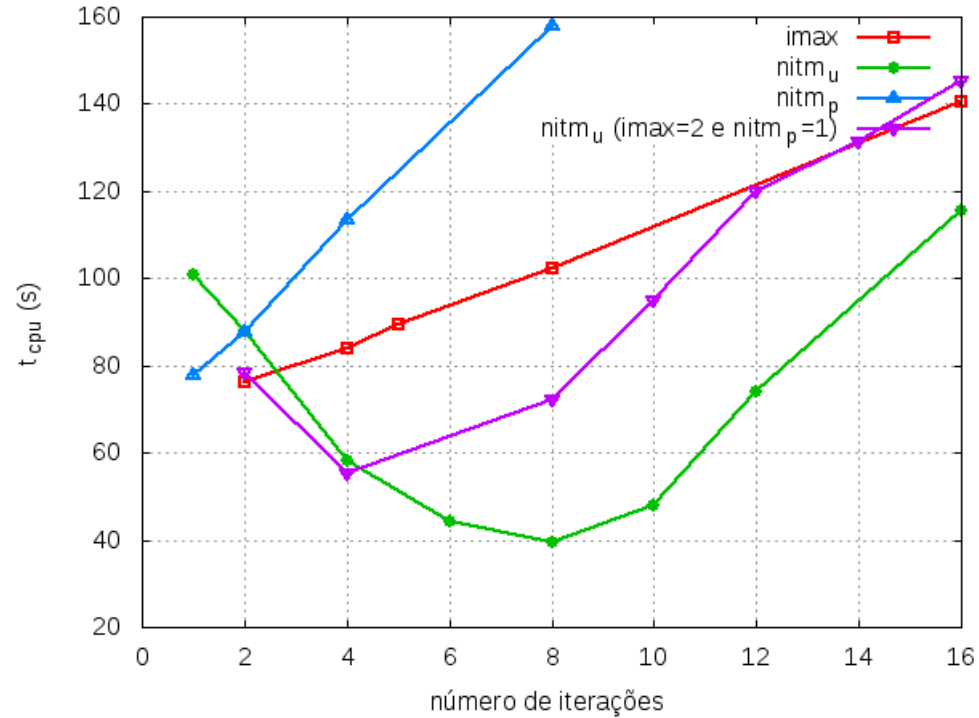
Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1b0224nu1	224	80	15.798	1.0	2.0E-06	5	1	2	2918	1.008950E+02	9.8106648875E-01	9.6659634687E-01
Back1b0224nu2	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.806500E+01	9.8106736890E-01	9.6659650877E-01
Back1b0224nu4	224	80	15.798	1.0	2.0E-06	5	4	2	1243	5.833200E+01	9.8105879707E-01	9.6658298909E-01
Back1b0224nu8	224	80	15.798	1.0	2.0E-06	5	8	2	619	3.946000E+01	9.8105169866E-01	9.6644935265E-01
Back1b0224nu10	224	80	15.798	1.0	2.0E-06	5	10	2	666	4.809100E+01	9.8030669152E-01	9.6527638111E-01
Back1b0224nu12	224	80	15.798	1.0	2.0E-06	5	12	2	918	7.392300E+01	9.8117182380E-01	9.6680608695E-01
Back1b0224nu16	224	80	15.798	1.0	2.0E-06	5	16	2	1189	1.155950E+02	9.8104581790E-01	9.6655610640E-01

Tabela 12: Tempo de CPU para diferentes valores de $nitm_p$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1b0224np1	224	80	15.798	1.0	2.0E-06	5	2	1	2323	7.756900E+01	9.8106679255E-01	9.6659599151E-01
Back1b0224np2	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.744400E+01	9.8106736890E-01	9.6659650877E-01
Back1b0224np4	224	80	15.798	1.0	2.0E-06	5	2	4	2261	1.132100E+02	9.8106740313E-01	9.6659656158E-01
Back1b0224np8	224	80	15.798	1.0	2.0E-06	5	2	8	2261	1.577270E+02	9.8106740282E-01	9.6659656137E-01

Tabela 13: Tempo de CPU para valores otimizados de $nitm_u$, $nitm_p$ e $imax$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back1b0224otm5	224	80	15.798	1.0	2.0E-06	2	2	1	2558	7.835700E+01	9.8106514415E-01	9.6659553710E-01
Back1b0224otm6	224	80	15.798	1.0	2.0E-06	2	4	1	1437	5.515100E+01	9.8106835167E-01	9.6660385690E-01
Back1b0224otm	224	80	15.798	1.0	2.0E-06	2	8	1	1305	7.232700E+01	9.8110679518E-01	9.6666460169E-01
Back1b0224otm2	224	80	15.798	1.0	2.0E-06	2	10	1	1490	9.482300E+01	9.8107944284E-01	9.6661917123E-01
Back1b0224otm3	224	80	15.798	1.0	2.0E-06	2	12	1	1641	1.200780E+02	9.8106611387E-01	9.6659989998E-01
Back1b0224otm4	224	80	15.798	1.0	2.0E-06	2	14	1	1642	1.313710E+02	9.8106623257E-01	9.6660006301E-01
Back1b0224otm1	224	80	15.798	1.0	2.0E-06	2	16	1	1643	1.454510E+02	9.8106636217E-01	9.6660023789E-01



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Figura 3: Comparação entre os tempos de CPU para diferentes valores de $imax$, $nitm_u$ e $nitm_p$.

Etapa 2a

Tabela 14: Informações gerais para simulações com diferentes tamanhos de malha.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0056	56	20	0.000	0.0	1.0E-05	5	2	2	187	4.070000E-01	1.0470353210E+00	9.7706786993E-01
Back2a0112	112	40	7.899	0.0	5.0E-06	5	2	2	471	4.064000E+00	1.0169523187E+00	9.7209710276E-01
Back2a0224	224	80	15.798	0.0	2.0E-06	5	2	2	1335	5.106600E+01	1.0008414958E+00	9.7025076007E-01
Back2a0448b	448	160	55.293	0.0	2.0E-06	5	2	2	1601	3.323420E+02	9.9147113999E-01	9.6866696560E-01
Back2a0448	448	160	55.293	0.0	1.0E-06	5	2	2	2838	5.981490E+02	9.9146681167E-01	9.6868219057E-01
Back2a0896b	896	320	221.172	0.0	1.0E-06	5	2	2	3217	3.416780E+03	9.8646849822E-01	9.6779077703E-01
Back2a0896	896	320	221.172	0.0	5.0E-07	5	2	2	6018	6.369461E+03	9.8647636527E-01	9.6781655700E-01
Back2a1792b	1792	640	860.991	0.0	5.0E-07	5	2	2	7838	3.617450E+04	9.8391784746E-01	9.6736122299E-01
Back2a1792	1792	640	860.991	0.0	2.0E-07	5	2	2	23609	1.086676E+05	9.8392017564E-01	9.6737536473E-01

Tabela 15: Tempo de CPU para diferentes valores de $imax$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0448im4	448	160	55.293	0.0	1.0E-06	4	2	2	2839	5.569320E+02	9.9146695368E-01	9.6868018897E-01
Back2a0448	448	160	55.293	0.0	1.0E-06	5	2	2	2838	5.981490E+02	9.9146681167E-01	9.6868219057E-01
Back2a0448im8	448	160	55.293	0.0	1.0E-06	8	2	2	2837	7.216810E+02	9.9146666687E-01	9.6868287530E-01
Back2a0448im16	448	160	55.293	0.0	1.0E-06	16	2	2	2837	1.041337E+03	9.9146668070E-01	9.6868292119E-01

Tabela 16: Tempo de CPU para diferentes valores de $nitm_u$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0448nu1	448	160	55.293	0.0	1.0E-06	5	1	2	3193	5.690060E+02	9.9147103754E-01	9.6868706490E-01
Back2a0448nu2	448	160	55.293	0.0	1.0E-06	5	2	2	2838	5.968960E+02	9.9146681167E-01	9.6868219057E-01
Back2a0448nu4	448	160	55.293	0.0	1.0E-06	5	4	2	2299	6.203480E+02	9.9150220552E-01	9.6872702023E-01
Back2a0448nu8	448	160	55.293	0.0	1.0E-06	5	8	2	960	3.742300E+02	9.8749115667E-01	9.6224500264E-01

Tabela 17: Tempo de CPU para diferentes valores de $nitm_p$.

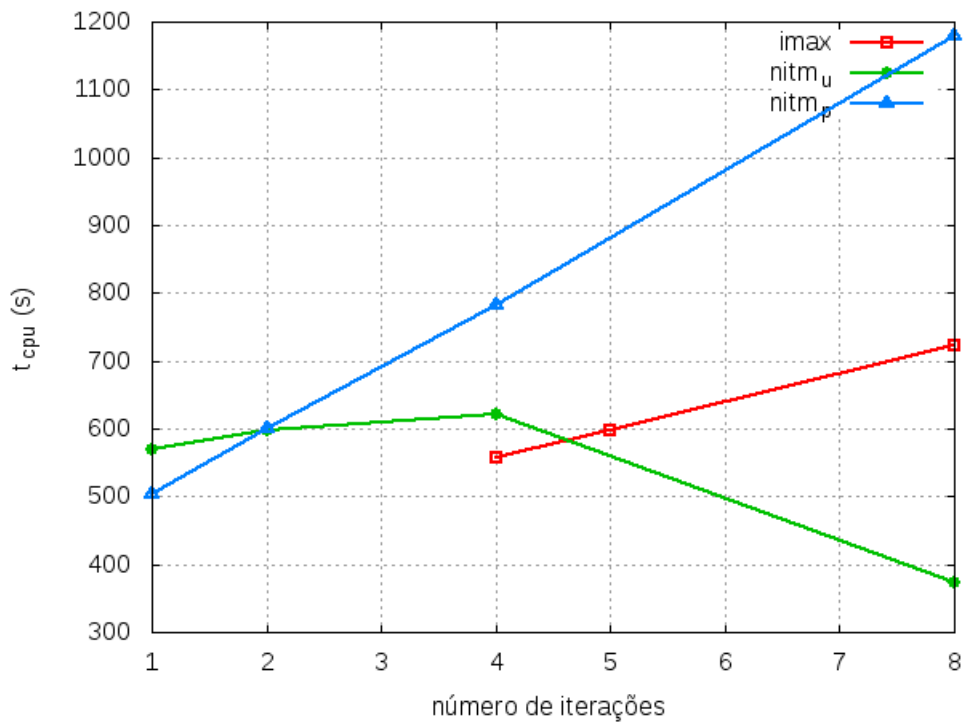
Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0448np1	448	160	55.293	0.0	1.0E-06	5	2	1	2846	5.039580E+02	9.9146828003E-01	9.6866711042E-01
Back2a0448np2	448	160	55.293	0.0	1.0E-06	5	2	2	2838	5.996650E+02	9.9146681167E-01	9.6868219057E-01
Back2a0448np4	448	160	55.293	0.0	1.0E-06	5	2	4	2837	7.826900E+02	9.9146667649E-01	9.6868292263E-01
Back2a0448np8	448	160	55.293	0.0	1.0E-06	5	2	8	2837	1.178849E+03	9.9146668083E-01	9.6868292267E-01

Tabela 18: Tempo de CPU para valores otimizados de $nitm_u$, $nitm_p$ e $imax$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0448otm1	448	160	55.293	0.0	1.0E-06	4	1	1	3207	4.349120E+02	9.9147214729E-01	9.6865612215E-01
Back2a0448otm8	448	160	55.293	0.0	1.0E-06	4	8	1	1754	5.998860E+02	9.9134241434E-01	9.6849709061E-01

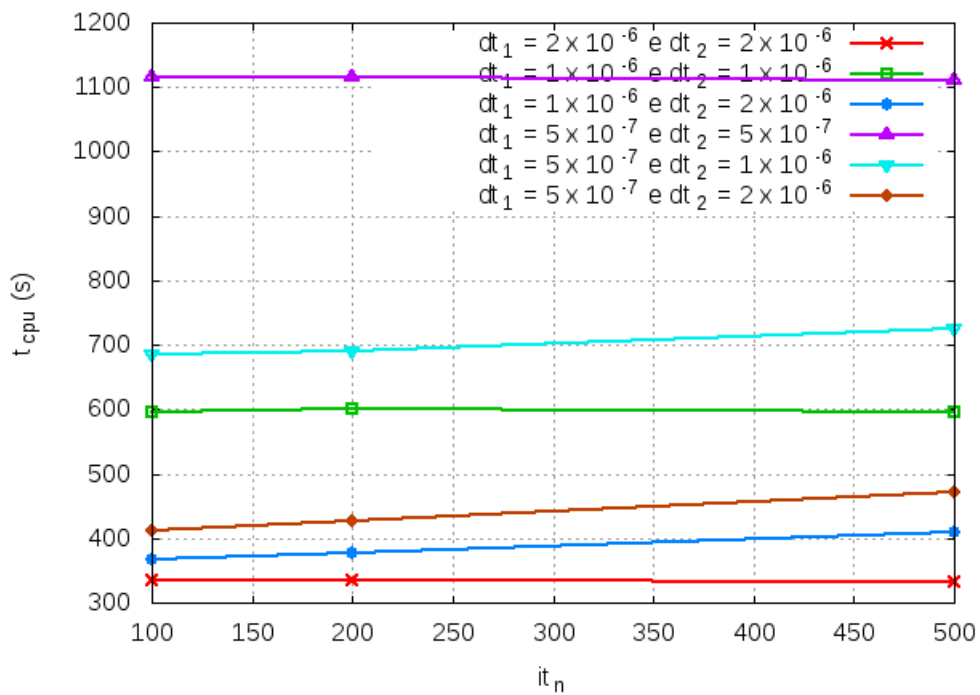
Tabela 19: Comparação do tempo de CPU para diferentes valores de Δt_1 , Δt_2 e it_n ($it_n = it_1 = it_2$).

Simulation	n_x	n_y	RAM	β	Δt_1	Δt_2	it_n	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2a0448d122	448	160	55.293	0.0	2.0E-06	2.0E-06	100	5	2	2	1601	3.359040E+02	9.9147113999E-01	9.6866696560E-01
Back2a0448d121	448	160	55.293	0.0	1.0E-06	1.0E-06	100	5	2	2	2838	5.959010E+02	9.9146681167E-01	9.6868219057E-01
Back2a0448d121	448	160	55.293	0.0	1.0E-06	2.0E-06	100	5	2	2	1743	3.670930E+02	9.9147490420E-01	9.6869216067E-01
Back2a0448d221	448	160	55.293	0.0	1.0E-06	2.0E-06	200	5	2	2	1793	3.776410E+02	9.9147494471E-01	9.6869273093E-01
Back2a0448d521	448	160	55.293	0.0	1.0E-06	2.0E-06	500	5	2	2	1942	4.087550E+02	9.9147498808E-01	9.6869296241E-01
Back2a0448d125	448	160	55.293	0.0	5.0E-07	5.0E-07	100	5	2	2	5288	1.114857E+03	9.9148879083E-01	9.6871376369E-01
Back2a0448d125	448	160	55.293	0.0	5.0E-07	1.0E-06	100	5	2	2	3258	6.851150E+02	9.9147188322E-01	9.6869016980E-01
Back2a0448d225	448	160	55.293	0.0	5.0E-07	1.0E-06	200	5	2	2	3308	6.906560E+02	9.9147186037E-01	9.6869021067E-01
Back2a0448d525	448	160	55.293	0.0	5.0E-07	1.0E-06	500	5	2	2	3458	7.247140E+02	9.9147185802E-01	9.6869024656E-01
Back2a0448d125	448	160	55.293	0.0	5.0E-07	2.0E-06	100	5	2	2	1952	4.106860E+02	9.9147397966E-01	9.6868825352E-01
Back2a0448d225	448	160	55.293	0.0	5.0E-07	2.0E-06	200	5	2	2	2027	4.258870E+02	9.9147399018E-01	9.6869106235E-01
Back2a0448d525	448	160	55.293	0.0	5.0E-07	2.0E-06	500	5	2	2	2252	4.710460E+02	9.9147398535E-01	9.6869244215E-01



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Figura 4: Comparação entre os tempos de CPU para diferentes valores de $imax$, $nitm_u$ e $nitm_p$.



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Figura 5: Comparação do tempo de CPU para diferentes valores de Δt_1 , Δt_2 e it_n ($it_n = it_1 = it_2$).

Etapa 2b

Tabela 20: Informações gerais para simulações com diferentes tamanhos de malha.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2b0056	56	20	0.000	1.0	1.0E-05	5	2	2	883	1.927000E+00	9.7990913943E-01	9.6485938071E-01
Back2b0112	112	40	7.899	1.0	5.0E-06	5	2	2	1442	1.256900E+01	9.8080254704E-01	9.6609038390E-01
Back2b0224	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.655400E+01	9.8106736890E-01	9.6659650877E-01

Tabela 21: Tempo de CPU para diferentes valores de $imax$.

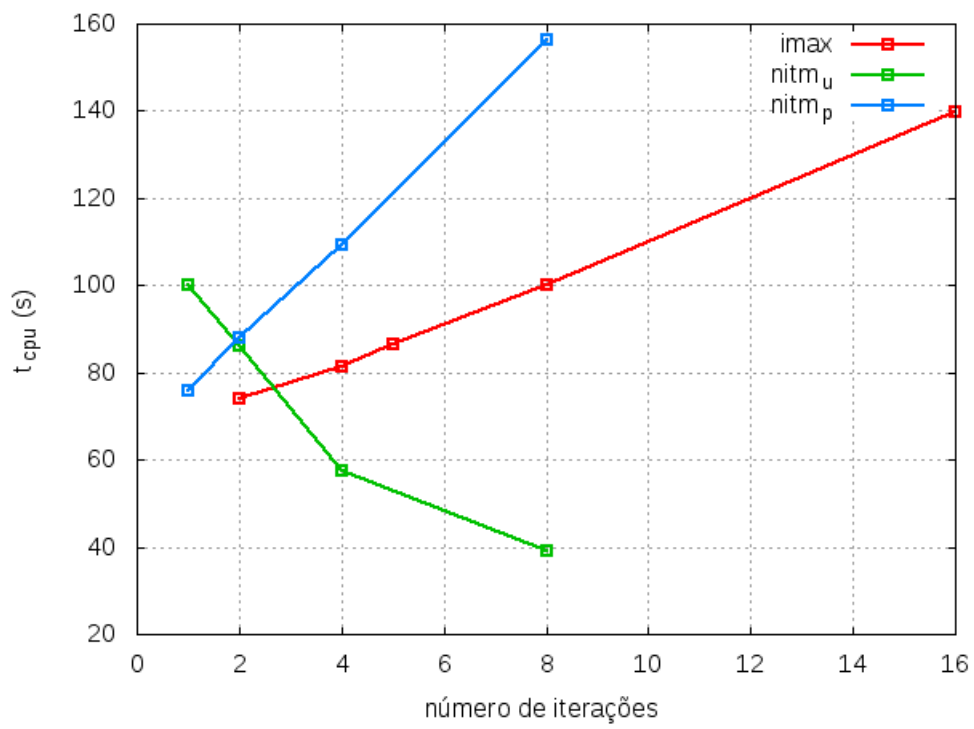
Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2b0224im2	224	80	15.798	1.0	2.0E-06	2	2	2	2367	7.408600E+01	9.8106620835E-01	9.6659576980E-01
Back2b0224im4	224	80	15.798	1.0	2.0E-06	4	2	2	2282	8.134900E+01	9.8106729845E-01	9.6659642363E-01
Back2b0224	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.655400E+01	9.8106736890E-01	9.6659650877E-01
Back2b0224im8	224	80	15.798	1.0	2.0E-06	8	2	2	2261	1.000520E+02	9.8106740245E-01	9.6659656099E-01
Back2b0224im16	224	80	15.798	1.0	2.0E-06	16	2	2	2261	1.396550E+02	9.8106740279E-01	9.6659656134E-01

Tabela 22: Tempo de CPU para diferentes valores de $nitm_u$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2b0224nu1	224	80	15.798	1.0	2.0E-06	5	1	2	2918	1.002770E+02	9.8106648875E-01	9.6659634687E-01
Back2b0224nu2	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.625000E+01	9.8106736890E-01	9.6659650877E-01
Back2b0224nu4	224	80	15.798	1.0	2.0E-06	5	4	2	1243	5.730800E+01	9.8105879707E-01	9.6658298909E-01
Back2b0224nu8	224	80	15.798	1.0	2.0E-06	5	8	2	619	3.915300E+01	9.8105169866E-01	9.6644935265E-01

Tabela 23: Tempo de CPU para diferentes valores de $nitm_p$.

Simulation	n_x	n_y	RAM	β	Δt	$imax$	$nitm_u$	$nitm_p$	it	t_{cpu}	C_d	Fd^*
Back2b0224np1	224	80	15.798	1.0	2.0E-06	5	2	1	2323	7.593800E+01	9.8106679255E-01	9.6659599151E-01
Back2b0224np2	224	80	15.798	1.0	2.0E-06	5	2	2	2271	8.781200E+01	9.8106736890E-01	9.6659650877E-01
Back2b0224np4	224	80	15.798	1.0	2.0E-06	5	2	4	2261	1.094530E+02	9.8106740313E-01	9.6659656158E-01
Back2b0224np8	224	80	15.798	1.0	2.0E-06	5	2	8	2261	1.563980E+02	9.8106740282E-01	9.6659656137E-01



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Figura 6: Comparação entre os tempos de CPU para diferentes valores de $imax$, $nitm_u$ e $nitm_p$.