Reunião do Grupo de Raios Cósmicos – divisão PDPD

- Informes
- Apresentação: Raios Cósmicos e Origem da Vida (partes)
- Instalação Dev-C++
- Instalação do ROOT
- Aula 1 de Astropartículas
- Instalação do Anaconda (Python)

Prof. Marcelo Leigui

21/8/25

Inseguro professor.ufabc.edu.br/~leigui/pesquisa/index.html

Entrada (8.967) - ma... Google Google Agenda Traduzir Maps Notícias Home / Twitter Facebook YouTube ChatGPT Bookmarks UFABC My

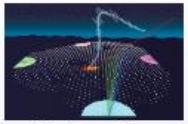
Leia mais

Laboratório de Astropartículas:

L 1101, 11° andar, Bloco B
Campus de Santo André - UFABC.
F: (11) 4996-0095

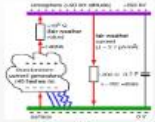
Arquivos:

Projetos:

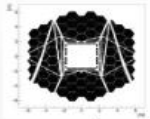


Medida do perfil longitudinal de chuveiros atmosféricos extensos

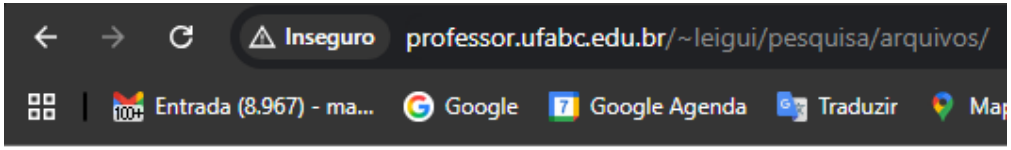
Propagação de raios cósmicos em campos magnéticos galácticos e extragalácticos



Circuito elétrico global



Raytracing do MST/CTA



Index of /~leigui/pesquisa/arquivos

Name	Last modified	Size	Description
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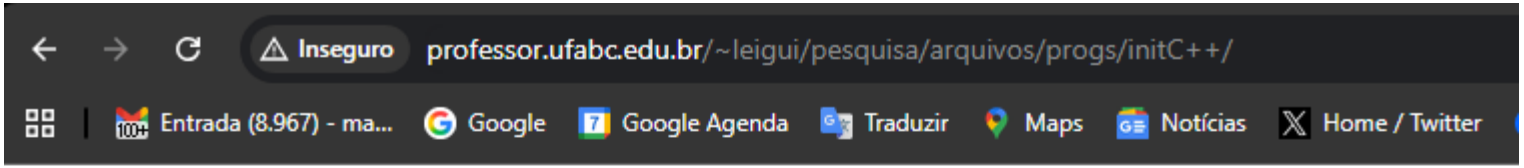
AulasFisicaAstrop.pdf	2025-08-21 11:00	2.9M	
AulasROOT/	2025-08-21 11:23	-	
CircEletrGlobal.pdf	2020-04-30 16:00	395K	
ComposiRCs.pdf	2020-05-13 17:15	531K	
HistÃ³ria AstropartÃ..>	2024-10-27 12:14	4.1M	
IC_2017_CTA.pdf	2017-05-17 17:58	352K	
Introduction-to-Astr..>	2025-06-02 12:07	1.3M	
PDPD_Auger.pdf	2019-07-12 12:19	310K	
Projeto_IC___DistorÃ..>	2025-08-07 12:50	532K	
Projeto_PDPD___A_for..>	2025-08-10 21:05	115K	
Projeto_PDPD___Disto..>	2025-08-10 11:23	587K	
Projeto_PDPD___Estud..>	2025-08-07 12:50	346K	
Projeto_PDPD___Impac..>	2025-08-10 19:17	597K	
Projeto_PDPD___Medid..>	2025-08-06 18:25	695K	
Projeto_PDPD___Rast..>	2025-08-07 11:27	221K	
PropagRCs.pdf	2020-05-14 13:31	248K	
RCs e a origem da vi..>	2025-08-20 22:21	109M	
progs/	2025-08-21 10:43	-	


Raios cósmicos e a origem
da vida na Terra
Universidade Federal do ABC
04/08/2025
Prof. Marcelo A. Leigui de Oliveira
Universidade Federal do ABC
leigui@ufabc.edu.br



Index of /~leigui/pesquisa/arquivos/progs/initC++

Name	Last modified	Size	Description
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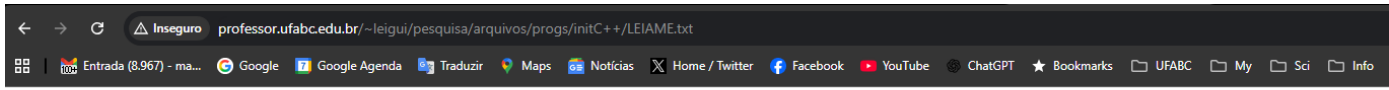
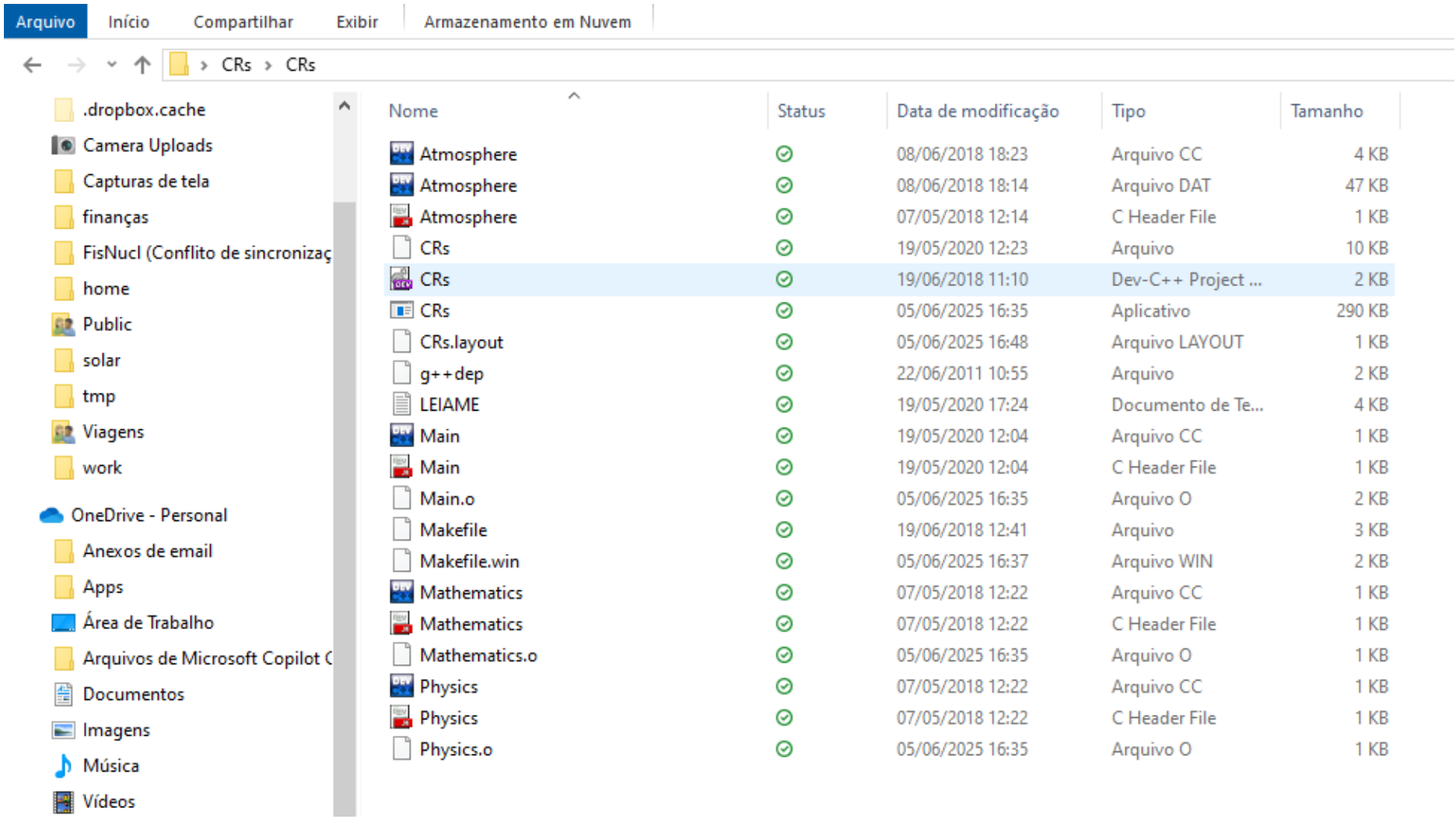
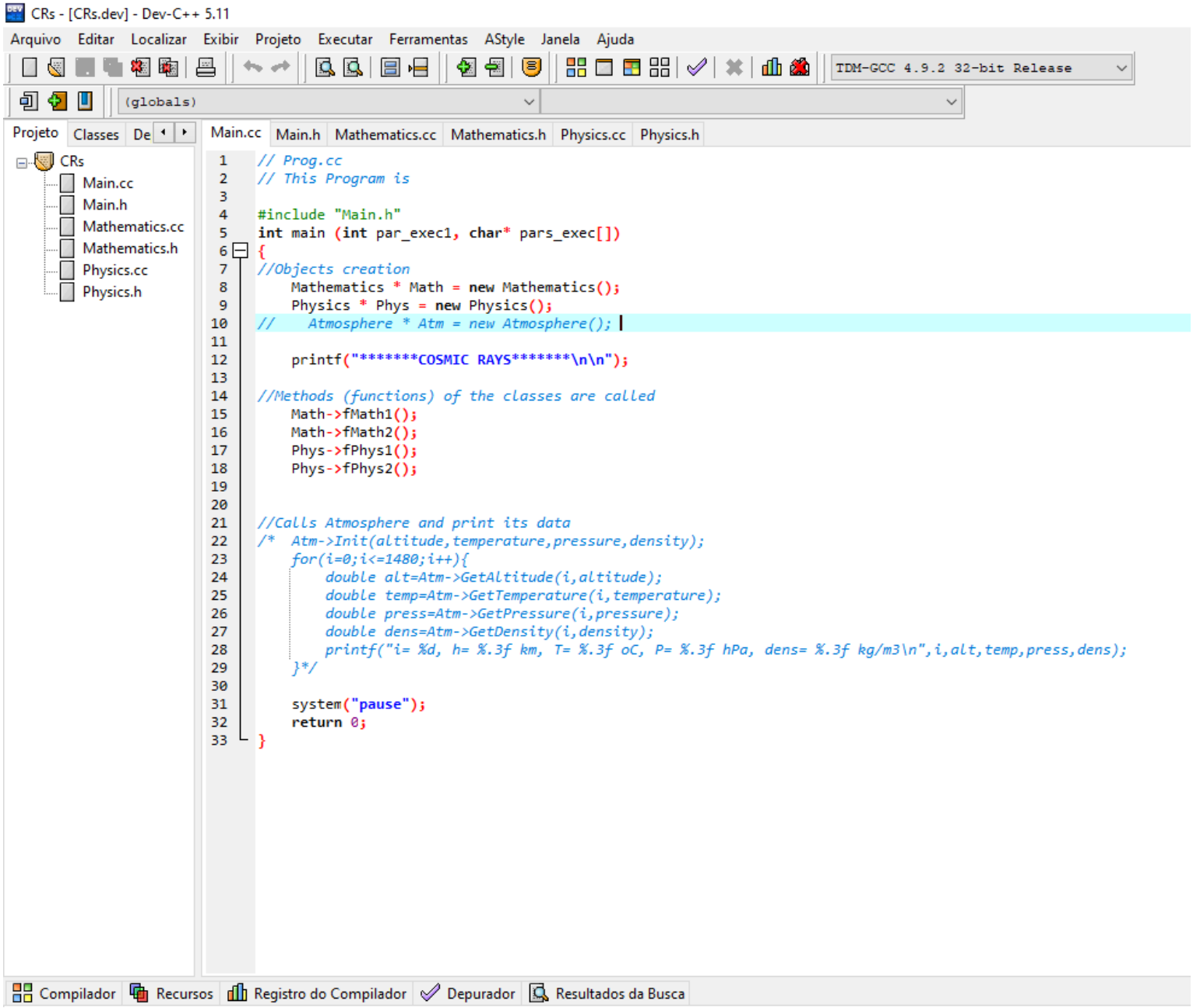
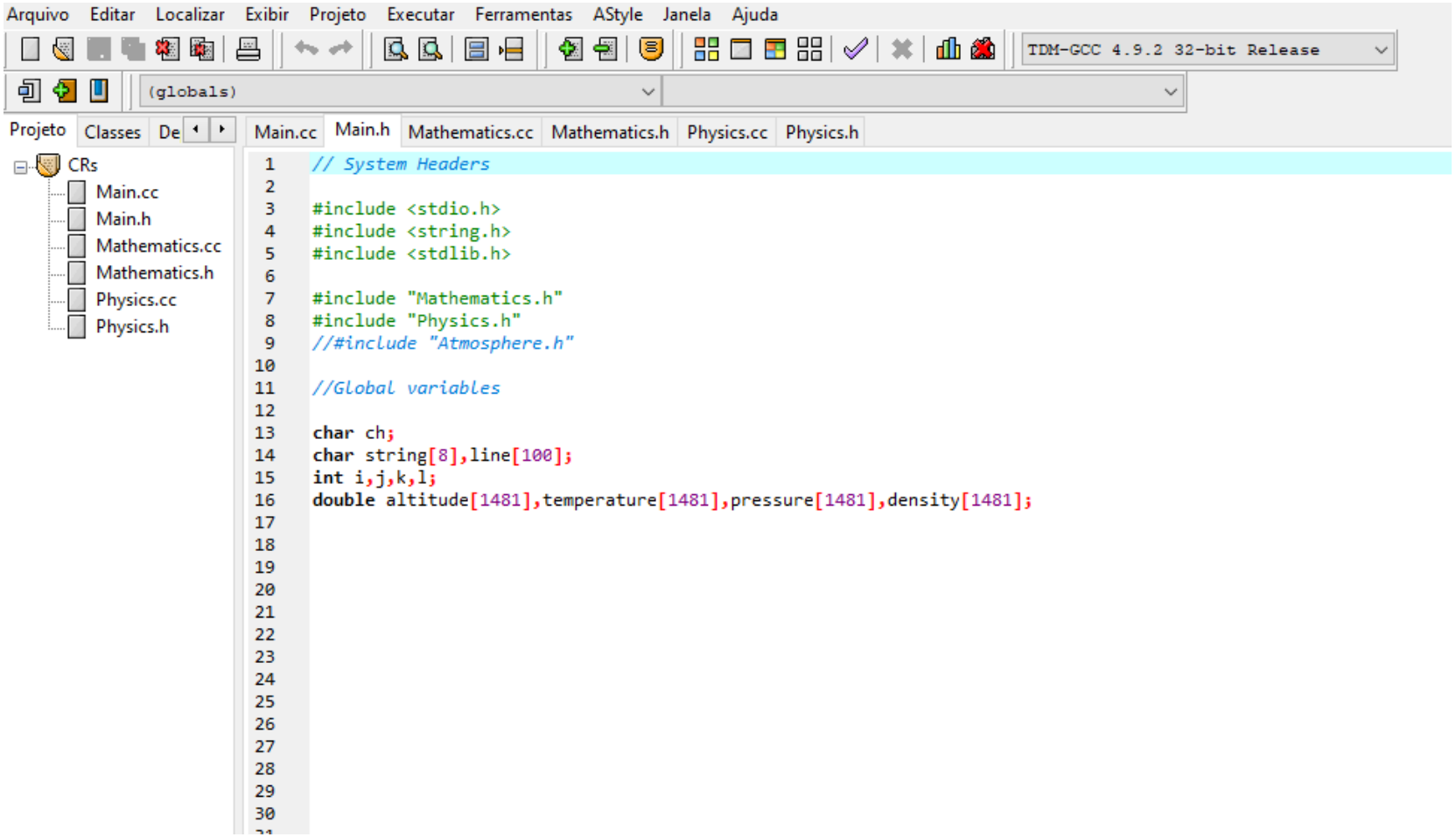
LEIAME.txt	2024-04-03 14:54	3.7K	

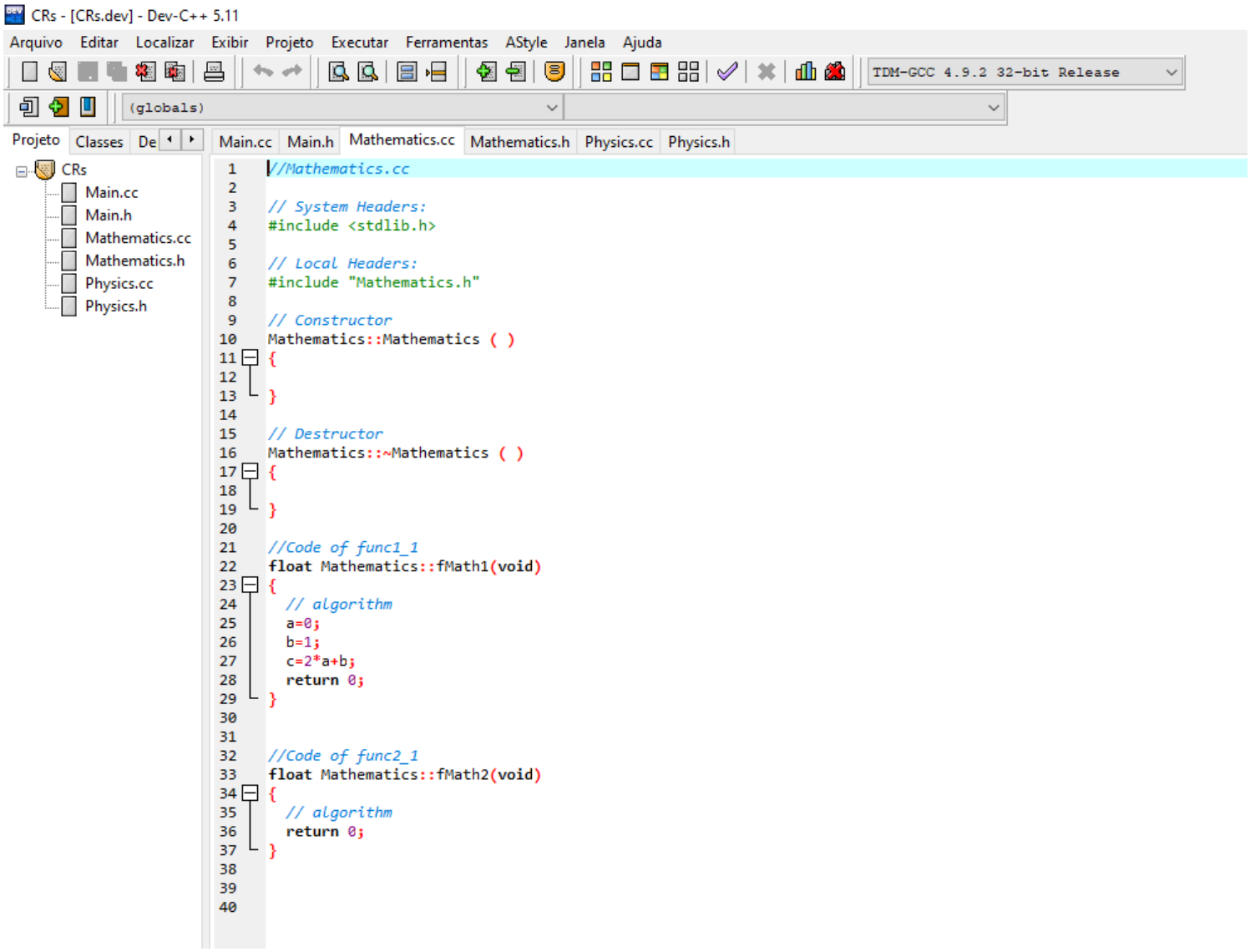


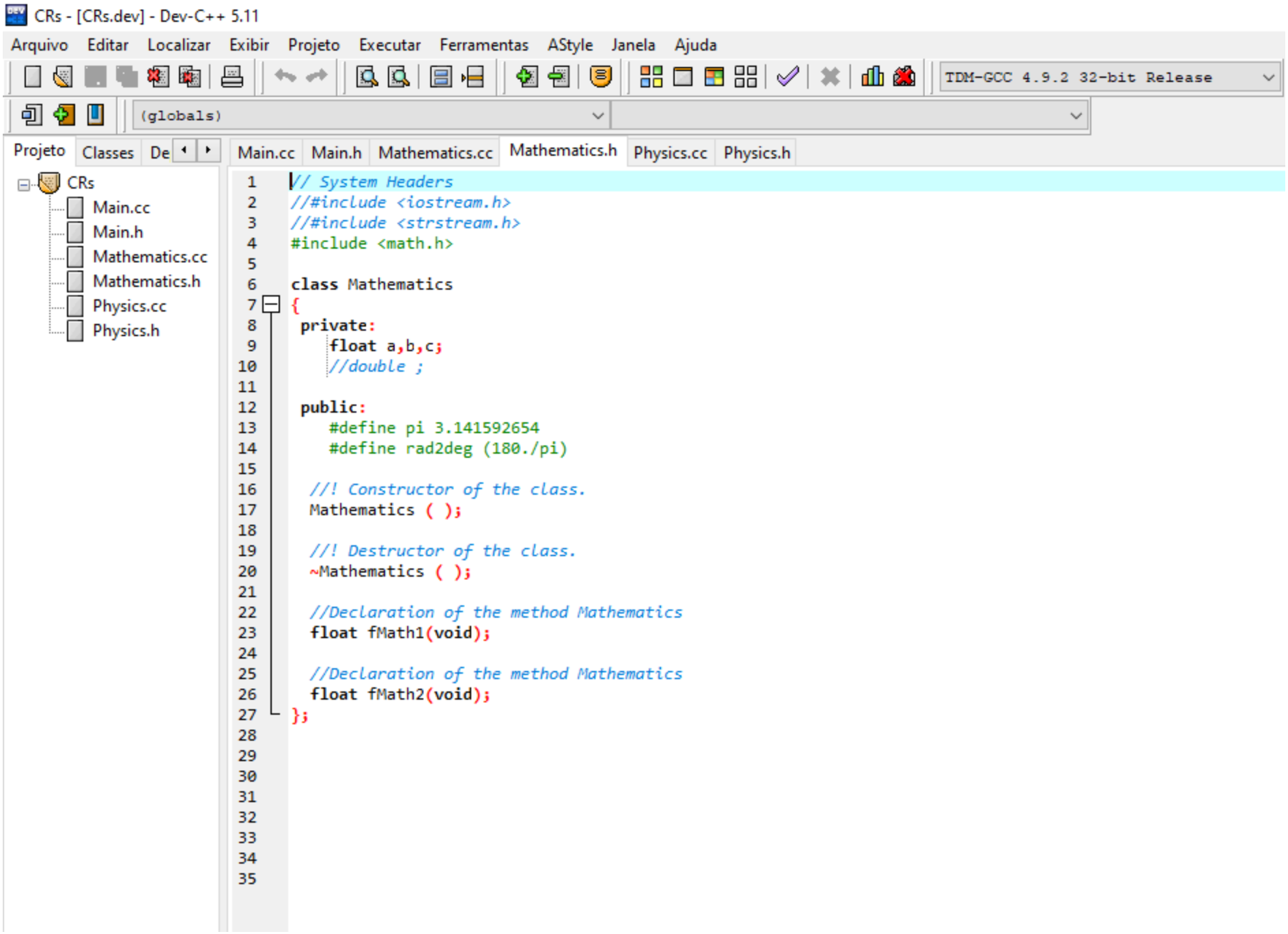

```
Arquivos para desenvolver um projeto em C++ orientado a objetos.

Esta pasta contem este arquivo (LEIAME.txt) e um arquivo contendo o pacote (CRs.tgz).

O pacote consiste em um programa principal (Main) com tres classes (Atmosphere, Mathematics e Physics), em cada caso, os codigos (*.cc) estao acompanhados dos cabecalhos, ou "headers", (*.h)

Main.cc
Main.h
Atmosphere.cc
Atmosphere.h
Atmosphere.dat
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h

Rodando em Windows:
1- baixe e instale o Dev-C++ IDE em seu computador: https://sourceforge.net/projects/orwelldevcpp/
2- baixe o tarball CRs.tgz e descompacte-o completamente
3- clique 2 vezes em CRs.dev: o Dev-C++ IDE ira carregar os arquivos Main.*, Mathematics.* e Physics.*.
4- Clique em "Compilar & Executar (F11)": o compilador vai gerar um aplicativo "CRs.exe" e executa-lo. Voce pode tambem executar o programa clicando duas vezes no aplicativo.

Rodando em Linux/IOS:
1- baixe o arquivo Makefile e o tarball CRs.tgz e descompacte-o: "tar xzvf CRs.tgz" ou "make install" (sem as aspas)
2- entre na pasta "CRs": "cd CRs"
3- (opcional) comentar a linha 31 do arquivo Main.cc, ou seja, inserir 2 barras "//" (sem as aspas) antes de: system("pause");
4- compile digitando "make" (sem as aspas)
   em caso de erro de compilacao, digite antes "make clean" e depois "make" (sem as aspas)
5- Execute o programa, digitando: "./CRs" (sem as aspas)

Neste ponto, ao ser executado, o programa escreve no terminal:

*******COSMIC RAYS*******

Pressione qualquer tecla para continuar ...
(Press any key to continue ...)

Tudo certo? Prontos para o primeiro exercicio?

Ex.1) Incluir a classe Atmosphere

No DeV:
1- na aba Projeto(Project) a esquerda clique com o botao da direita sobre CRs e adicione ao projeto (Add to Project) os arquivos: Atmosphere.cc e Atmosphere.h

2- no arquivo Main.h:
descomente a linha 9 (delete as barras "//"):
#include "Atmosphere.h"
```

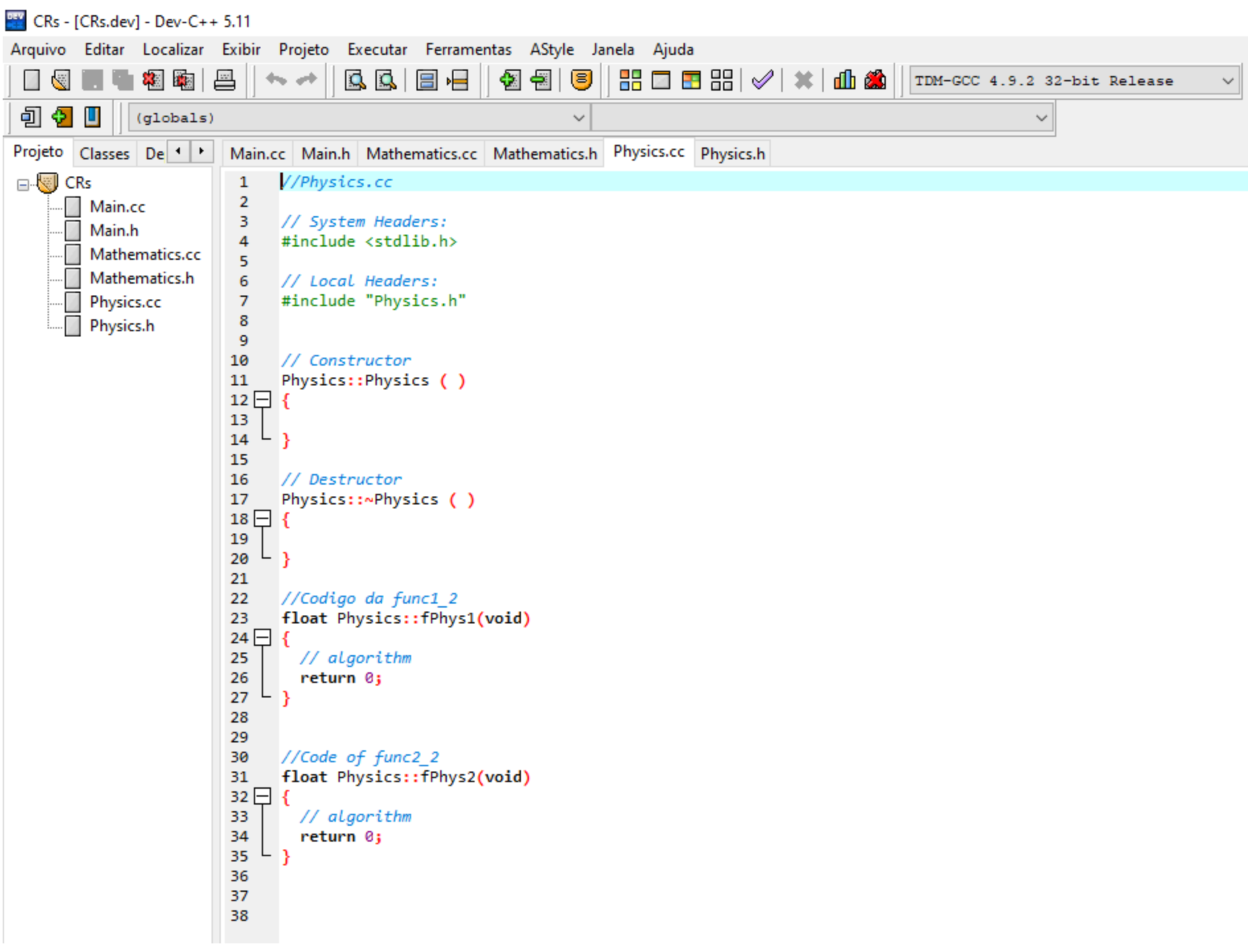

Arquivo
Início
Compartilhar
Exibir
Armazenamento em Nuvem
CRs › CRs
.dropbox.cache
Camera Uploads
Capturas de tela
finanças
FisNucl (Conflito de sincronizaç
home
Public
solar
tmp
Viagens
work
OneDrive - Personal
Anexos de email
Apps
Área de Trabalho
Arquivos de Microsoft Copilot C
Documentos
Imagens
Música
Vídeos
Nome
Status
Data de modificação
Tipo
Tamanho
Atmosphere 08/06/2018 18:23 Arquivo CC 4 KB
Atmosphere 08/06/2018 18:14 Arquivo DAT 47 KB
Atmosphere 07/05/2018 12:14 C Header File 1 KB
CRs 19/05/2020 12:23 Arquivo 10 KB
CRs 19/06/2018 11:10 Dev-C++ Project ... 2 KB
CRs 05/06/2025 16:35 Aplicativo 290 KB
CRs.layout 05/06/2025 16:48 Arquivo LAYOUT 1 KB
g++dep 22/06/2011 10:55 Arquivo 2 KB
LEIAME 19/05/2020 17:24 Documento de Te... 4 KB
Main 19/05/2020 12:04 Arquivo CC 1 KB
Main 19/05/2020 12:04 C Header File 1 KB
Main.o 05/06/2025 16:35 Arquivo O 2 KB
Makefile 19/06/2018 12:41 Arquivo 3 KB
Makefile.win 05/06/2025 16:37 Arquivo WIN 2 KB
Mathematics 07/05/2018 12:22 Arquivo CC 1 KB
Mathematics 07/05/2018 12:22 C Header File 1 KB
Mathematics.o 05/06/2025 16:35 Arquivo O 1 KB
Physics 07/05/2018 12:22 Arquivo CC 1 KB
Physics 07/05/2018 12:22 C Header File 1 KB
Physics.o 05/06/2025 16:35 Arquivo O 1 KB


CRs - [CRs.dev] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
CRs
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
1 // Prog.cc
2 // This Program is
3
4 #include "Main.h"
5 int main (int par_exec1, char* pars_exec[])
6 {
7 //Objects creation
8 Mathematics * Math = new Mathematics();
9 Physics * Phys = new Physics();
10 // Atmosphere * Atm = new Atmosphere();
11
12 printf("*******COSMIC RAYS*******\n\n");
13
14 //Methods (functions) of the classes are called
15 Math->fMath1();
16 Math->fMath2();
17 Phys->fPhys1();
18 Phys->fPhys2();
19
20
21 //Calls Atmosphere and print its data
22 /* Atm->Init(altitude,temperature,pressure,density);
23 for(i=0;i<=1480;i++){
24 double alt=Atm->GetAltitude(i,altitude);
25 double temp=Atm->GetTemperature(i,temperature);
26 double press=Atm->GetPressure(i,pressure);
27 double dens=Atm->GetDensity(i,density);
28 printf("i= %d, h= %.3f km, T= %.3f oC, P= %.3f hPa, dens= %.3f kg/m3\n",i,alt,temp,press,dens);
29 }*/
30
31 system("pause");
32 return 0;
33 }
Compilador Recursos Registro do Compilador Depurador Resultados da Busca


Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
CRs
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 // System Headers
2
3 #include <stdio.h>
4 #include <string.h>
5 #include <stdlib.h>
6
7 #include "Mathematics.h"
8 #include "Physics.h"
9 //#include "Atmosphere.h"
10
11 //Global variables
12
13 char ch;
14 char string[8],line[100];
15 int i,j,k,l;
16 double altitude[1481],temperature[1481],pressure[1481],density[1481];
17
18
19
20
21
22
23
24
25
26
27
28
29
30


CRs - [CRs.dev] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
CRs
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 //Mathematics.cc
2
3 // System Headers:
4 #include <stdlib.h>
5
6 // Local Headers:
7 #include "Mathematics.h"
8
9 // Constructor
10 Mathematics::Mathematics ( )
11 {
12
13 }
14
15 // Destructor
16 Mathematics::~Mathematics ( )
17 {
18
19 }
20
21 //Code of func1_1
22 float Mathematics::fMath1(void)
23 {
24 // algorithm
25 a=0;
26 b=1;
27 c=2*a+b;
28 return 0;
29 }
30
31
32 //Code of func2_1
33 float Mathematics::fMath2(void)
34 {
35 // algorithm
36 return 0;
37 }
38
39
40


CRs - [CRs.dev] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
CRs
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 // System Headers
2 //#include <iostream.h>
3 //#include <strstream.h>
4 #include <math.h>
5
6 class Mathematics
7 {
8 private:
9 float a,b,c;
10 //double ;
11
12 public:
13 #define pi 3.141592654
14 #define rad2deg (180./pi)
15
16 //! Constructor of the class.
17 Mathematics ( );
18
19 //! Destructor of the class.
20 ~Mathematics ( );
21
22 //Declaration of the method Mathematics
23 float fMath1(void);
24
25 //Declaration of the method Mathematics
26 float fMath2(void);
27 };
28
29
30
31
32
33
34
35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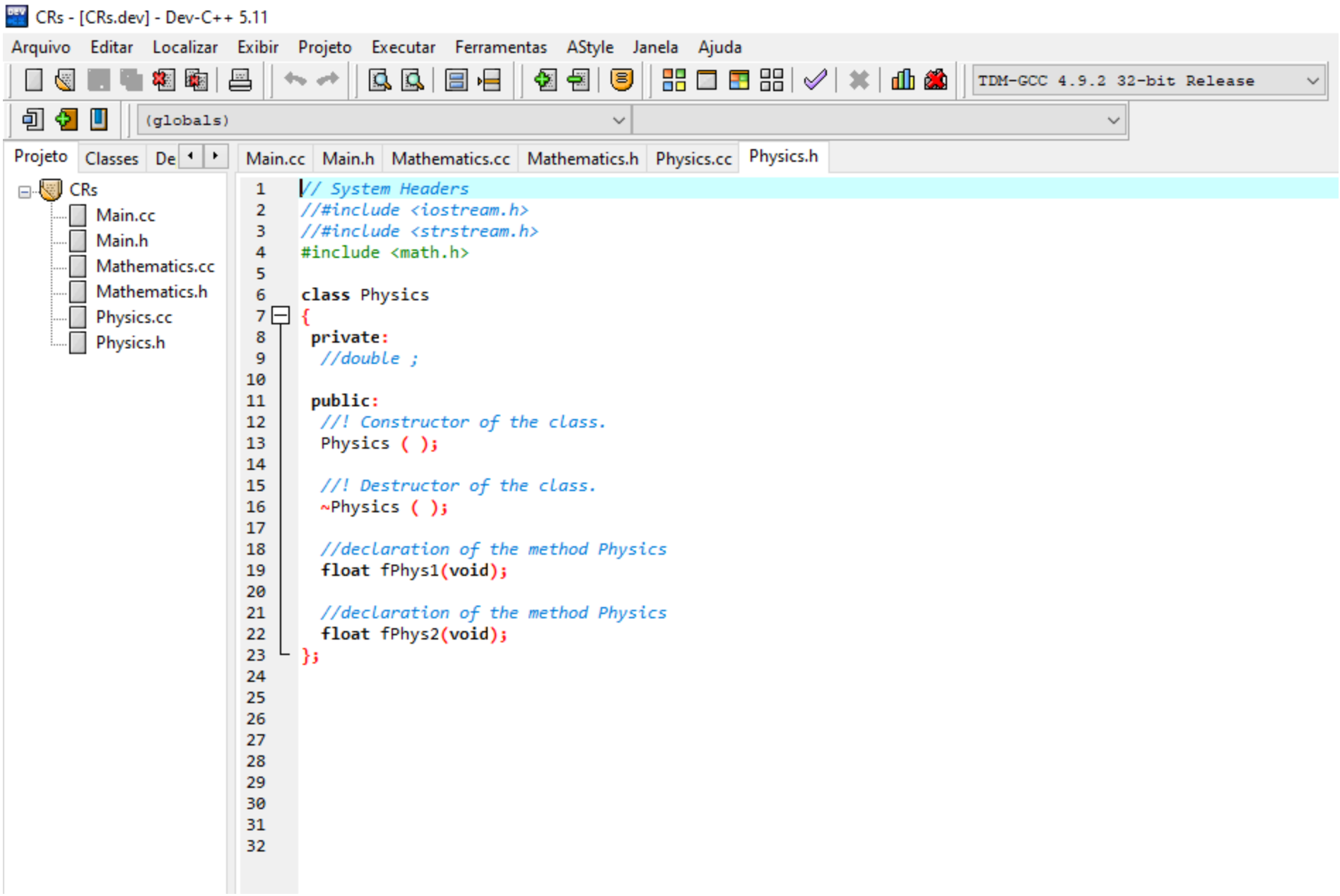
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
CRs
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 //Physics.cc
2
3 // System Headers:
4 #include <stdlib.h>
5
6 // Local Headers:
7 #include "Physics.h"
8
9
10 // Constructor
11 Physics::Physics ( )
12 {
13
14 }
15
16 // Destructor
17 Physics::~Physics ( )
18 {
19
20 }
21
22 //Codigo da func1_2
23 float Physics::fPhys1(void)
24 {
25 // algorithm
26 return 0;
27 }
28
29
30 //Code of func2_2
31 float Physics::fPhys2(void)
32 {
33 // algorithm
34 return 0;
35 }
36
37
38


CRs - [CRs.dev] - Dev-C++ 5.11
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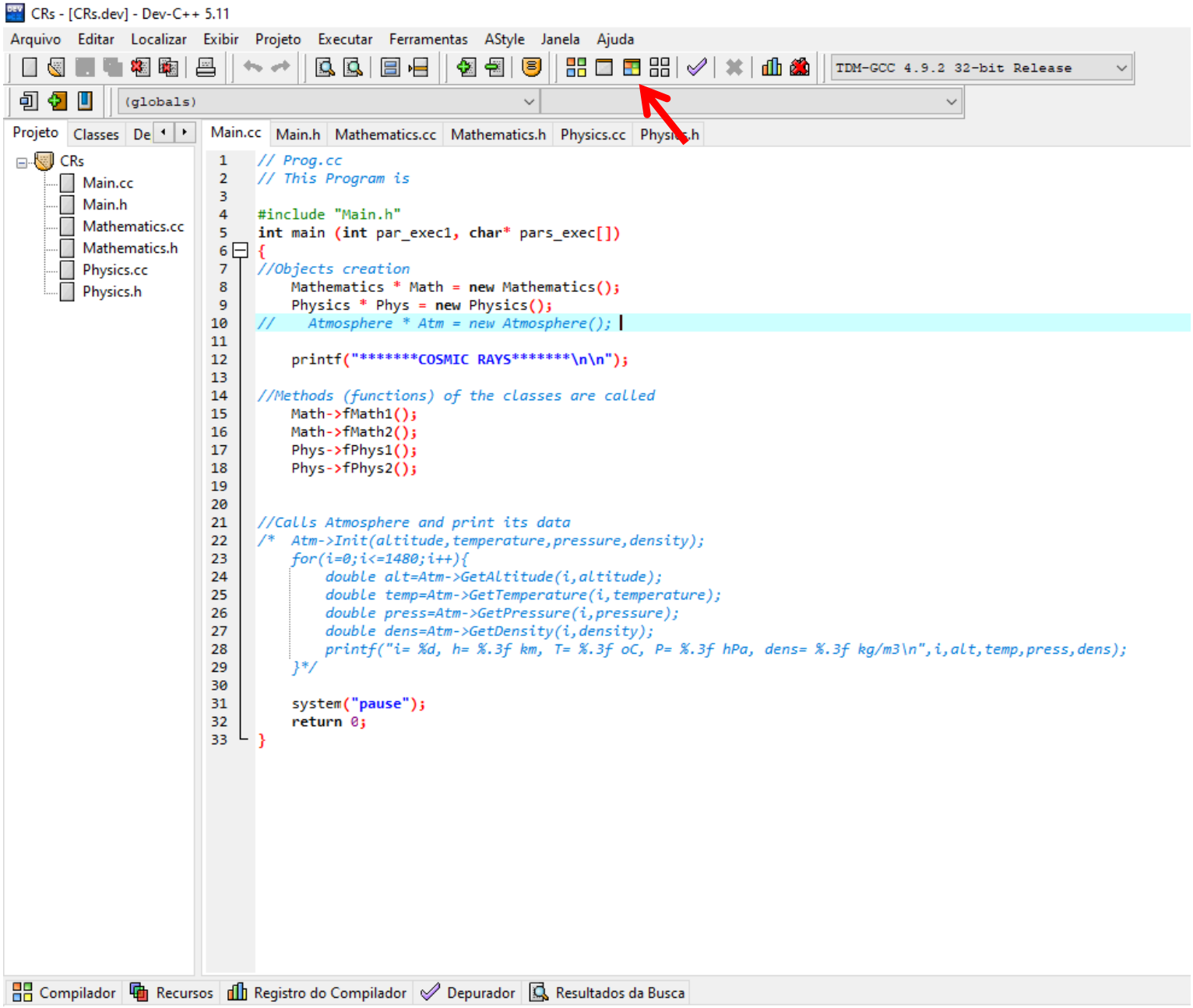
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 // System Headers
2 //#include <iostream.h>
3 //#include <strstream.h>
4 #include <math.h>
5
6 class Physics
7 {
8 private:
9 //double ;
10
11 public:
12 //! Constructor of the class.
13 Physics ( );
14
15 //! Destructor of the class.
16 ~Physics ( );
17
18 //declaration of the method Physics
19 float fPhys1(void);
20
21 //declaration of the method Physics
22 float fPhys2(void);
23 };
24
25
26
27
28
29
30
31
32


CRs - [CRs.dev] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
CRs
Main.cc
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Physics.cc
Physics.h
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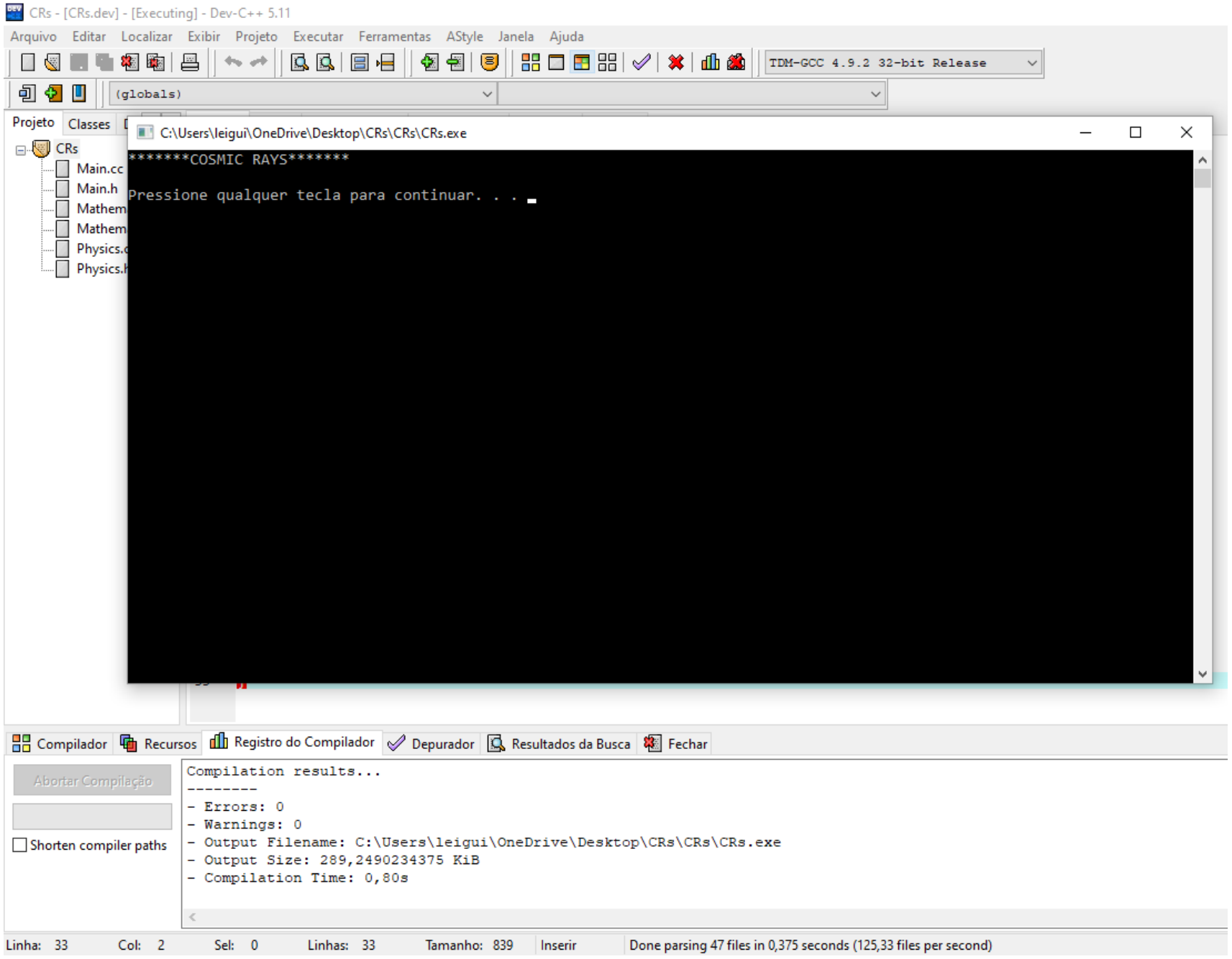
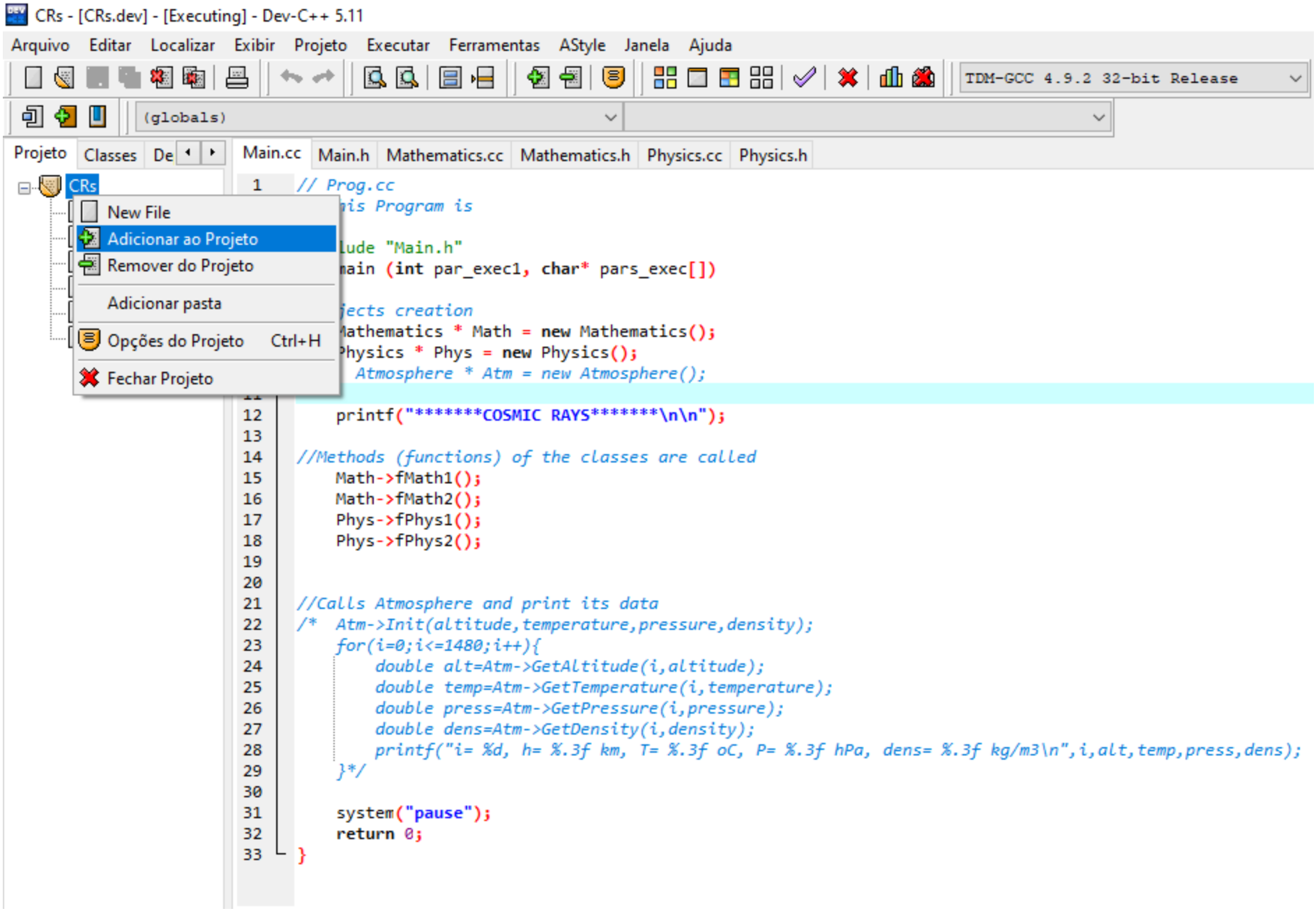
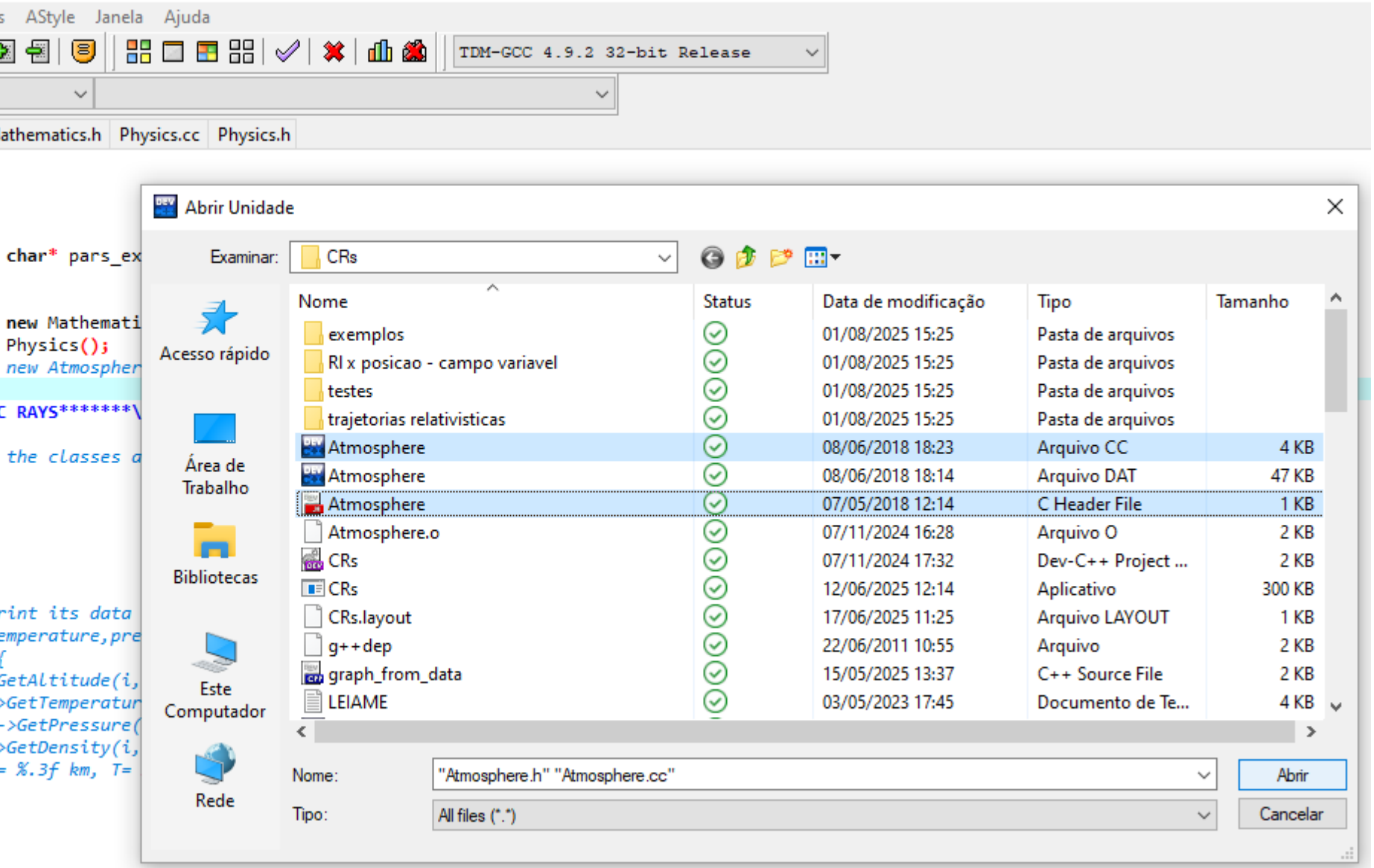
16 Math->fMath2();
17 Phys->fPhys1();
18 Phys->fPhys2();
19
20
21 //Calls Atmosphere and print its data
22 /* Atm->Init(altitude,temperature,pressure,density);
23 for(i=0;i<=1480;i++){
24 double alt=Atm->GetAltitude(i,altitude);
25 double temp=Atm->GetTemperature(i,temperature);
26 double press=Atm->GetPressure(i,pressure);
27 double dens=Atm->GetDensity(i,density);
28 printf("i= %d, h= %.3f km, T= %.3f oC, P= %.3f hPa, dens= %.3f kg/m3\n",i,alt,temp,press,dens);
29 }*/
30
31 system("pause");
32 return 0;
33 }
Compilador Recursos Registro do Compilador Depurador Resultados da Busca


CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes
CRs
Main.cc
Main.h
Mathem
Mathem
Physics.c
Physics.h
C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
*******COSMIC RAYS*******
Pressione qualquer tecla para continuar. . .
Compilador Recursos Registro do Compilador Depurador Resultados da Busca Fechar
Abortar Compilação
Shorten compiler paths
Compilation results...

- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
- Output Size: 289,2490234375 KiB
- Compilation Time: 0,80s
Linha: 33 Col: 2 Sel: 0 Linhas: 33 Tamanho: 839 Inserir
Done parsing 47 files in 0,375 seconds (125,33 files per second)


CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h
CRs
New File
Adicionar ao Projeto
Remover do Projeto
Adicionar pasta
Opções do Projeto Ctrl+H
Fechar Projeto
1 // Prog.cc
is Program is
lude "Main.h"
ain (int par_exec1, char* pars_exec[])
jects creation
athematics * Math = new Mathematics();
hysics * Phys = new Physics();
Atmosphere * Atm = new Atmosphere();
12 printf("*******COSMIC RAYS*******\n\n");
13
14 //Methods (functions) of the classes are called
15 Math->fMath1();
16 Math->fMath2();
17 Phys->fPhys1();
18 Phys->fPhys2();
19
20
21 //Calls Atmosphere and print its data
22 /* Atm->Init(altitude,temperature,pressure,density);
23 for(i=0;i<=1480;i++){
24 double alt=Atm->GetAltitude(i,altitude);
25 double temp=Atm->GetTemperature(i,temperature);
26 double press=Atm->GetPressure(i,pressure);
27 double dens=Atm->GetDensity(i,density);
28 printf("i= %d, h= %.3f km, T= %.3f oC, P= %.3f hPa, dens= %.3f kg/m3\n",i,alt,temp,press,dens);
29 }*/
30
31 system("pause");
32 return 0;
33 }


AStyle
Janela
Ajuda
TDM-GCC 4.9.2 32-bit Release
athematics.h
Physics.cc
Physics.h
char* pars_ex
new Mathemati
Physics();
new Atmospher
RAYS*******\
the classes a
rint its data
emperature,pre
{
GetAltitude(i,
>GetTemperatur
->GetPressure(
>GetDensity(i,
= %.3f km, T=
Abrir Unidade
Examinar:
CRs
Acesso rápido
Área de Trabalho
Bibliotecas
Este Computador
Rede
Nome
Status
Data de modificação
Tipo
Tamanho
exemplos
01/08/2025 15:25
Pasta de arquivos
RI x posicao - campo variavel
01/08/2025 15:25
Pasta de arquivos
testes
01/08/2025 15:25
Pasta de arquivos
trajetorias relativisticas
01/08/2025 15:25
Pasta de arquivos
Atmosphere
08/06/2018 18:23
Arquivo CC
4 KB
Atmosphere
08/06/2018 18:14
Arquivo DAT
47 KB
Atmosphere
07/05/2018 12:14
C Header File
1 KB
Atmosphere.o
07/11/2024 16:28
Arquivo O
2 KB
CRs
07/11/2024 17:32
Dev-C++ Project ...
2 KB
CRs
12/06/2025 12:14
Aplicativo
300 KB
CRs.layout
17/06/2025 11:25
Arquivo LAYOUT
1 KB
g++dep
22/06/2011 10:55
Arquivo
2 KB
graph_from_data
15/05/2025 13:37
C++ Source File
2 KB
LEIAME
03/05/2023 17:45
Documento de Te...
4 KB
Nome:
"Atmosphere.h" "Atmosphere.cc"
Abrir
Tipo:
All files (*.*)
Cancelar

CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11

Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda

TDM-GCC 4.9.2 32-bit Release

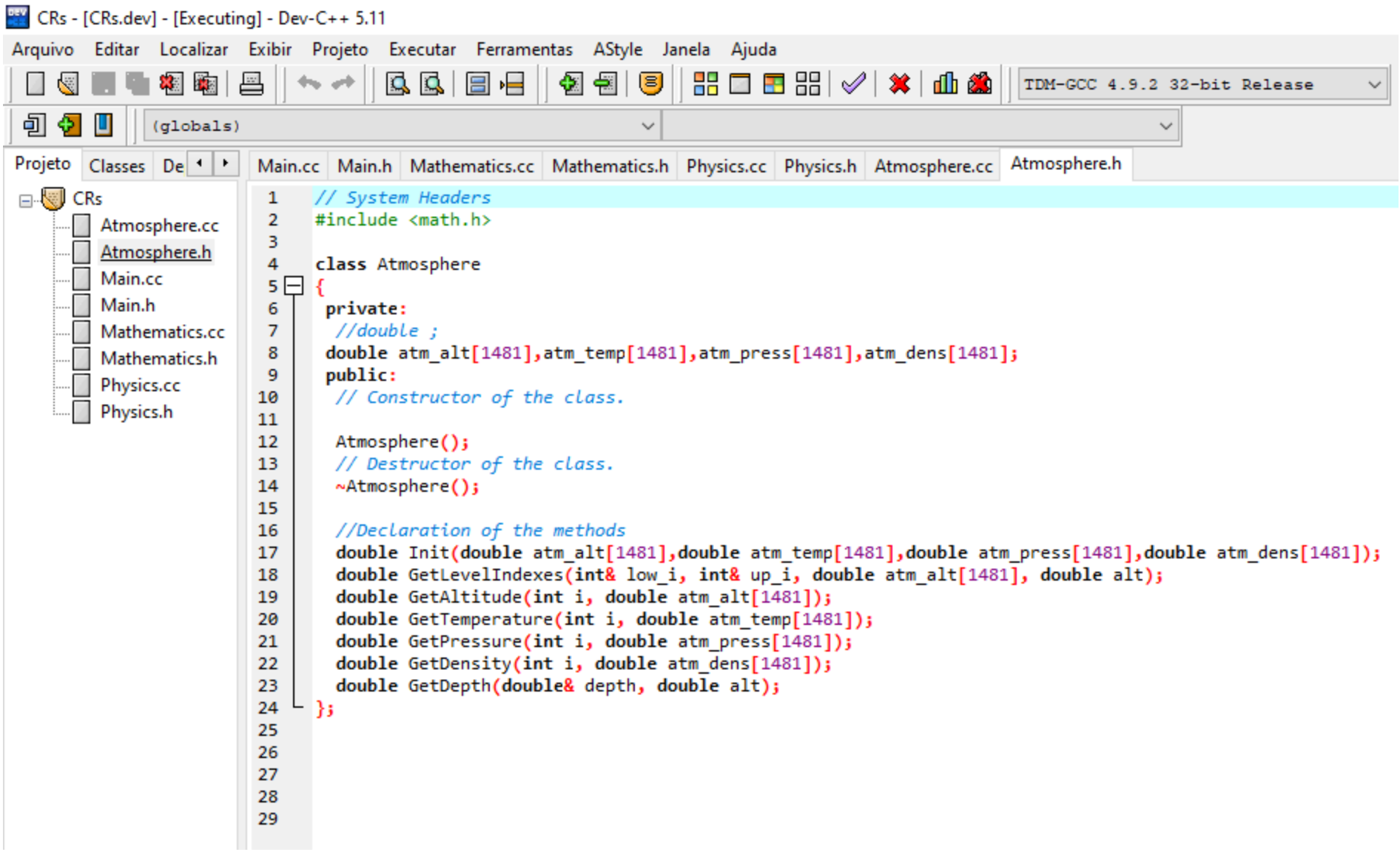
(globals)

Projeto Classes De

- CRs
  - Atmosphere.cc
  - Atmosphere.h
  - Main.cc
  - Main.h
  - Mathematics.cc
  - Mathematics.h
  - Physics.cc
  - Physics.h

Main.cc | Main.h | Mathematics.cc | Mathematics.h | Physics.cc | Physics.h | Atmosphere.cc

```
1  //Class to describe and calculate atmospheric parameters
2
3  // System Headers:
4  #include <stdio.h>
5
6  // Local Headers:
7  #include "Atmosphere.h"
8  //  altitude kilometers
9  //  temperature degrees celcius
10 //  pressure mbar
11 //  density kg/m3
12
13 // Constructor
14 Atmosphere::Atmosphere(){}
15 // Destructor
16 Atmosphere::~Atmosphere(){}
17
18 //Method for initialization of the atmosphere from file
19 double Atmosphere::Init(double atm_alt[1481],double atm_temp[1481],double atm_press[1481],double atm_dens[1481]) {
20
21 FILE *atm_file;
22 char ch,line[100];
23 int i;
24
25 atm_file=fopen("Atmosphere.dat","r");
26 if (atm_file==NULL) {
27   (void)printf("Can't open atmosphere file\n");
28   return -1;}
29 i=0;
30 ch=fgetc(atm_file);
31 while (ch!=EOF){
32 //while(i<=1481){
33 //        (void)printf("%c",ch);
34     (void)ungetc(ch,atm_file);
35     (void)fgets(line,sizeof(line),atm_file);
```


CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h Atmosphere.cc Atmosphere.h
CRs
Atmosphere.cc
Atmosphere.h
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
1 // System Headers
2 #include <math.h>
3
4 class Atmosphere
5 {
6 private:
7 //double ;
8 double atm_alt[1481],atm_temp[1481],atm_press[1481],atm_dens[1481];
9 public:
10 // Constructor of the class.
11
12 Atmosphere();
13 // Destructor of the class.
14 ~Atmosphere();
15
16 //Declaration of the methods
17 double Init(double atm_alt[1481],double atm_temp[1481],double atm_press[1481],double atm_dens[1481]);
18 double GetLevelIndexes(int& low_i, int& up_i, double atm_alt[1481], double alt);
19 double GetAltitude(int i, double atm_alt[1481]);
20 double GetTemperature(int i, double atm_temp[1481]);
21 double GetPressure(int i, double atm_press[1481]);
22 double GetDensity(int i, double atm_dens[1481]);
23 double GetDepth(double& depth, double alt);
24 };
25
26
27
28
29

CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11

Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda

TDM-GCC 4.9.2 64-bit Release

(globals)

Projeto Classes De

- CRs
  - Atmosphere.cc
  - Atmosphere.h
  - Main.cc
  - Main.h
  - Mathematics.cc
  - Mathematics.h
  - Physics.cc
  - Physics.h

[*] Main.cc [*] Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h Atmosphere.cc Atmosphere.h Atmosphere.dat

```
0   15 1013.25  1.225
0.025 14.8375 1010.250317 1.222063
0.05 14.675 1007.25783 1.219131
0.075 14.5125 1004.272523 1.216204
0.1 14.35 1001.294386 1.213283
0.125 14.1875 998.323403 1.210367
0.15 14.025 995.359563 1.207456
0.175 13.8625 992.402852 1.204551
0.2 13.7 989.453256 1.201651
0.225 13.5375 986.510764 1.198757
0.25 13.375 983.575361 1.195868
0.275 13.2125 980.647034 1.192984
0.3 13.05 977.725771 1.190106
0.325 12.8875 974.811559 1.187233
0.35 12.725 971.904384 1.184365
0.375 12.5625 969.004233 1.181502
0.4 12.4 966.111094 1.178645
0.425 12.2375 963.224954 1.175793
0.45 12.075 960.345799 1.172946
0.475 11.9125 957.473616 1.170105
0.5 11.75 954.608393 1.167269
0.525 11.5875 951.750117 1.164438
0.55 11.425 948.898775 1.161612
0.575 11.2625 946.054354 1.158792
0.6 11.1 943.216841 1.155977
0.625 10.9375 940.386223 1.153167
0.65 10.775 937.562487 1.150362
0.675 10.6125 934.745622 1.147563
0.7 10.45 931.935613 1.144769
0.725 10.2875 929.132448 1.14198
0.75 10.125 926.336114 1.139196
0.775 9.9625 923.546599 1.136417
0.8 9.8 920.76389 1.133644
0.825 9.6375 917.987974 1.130876
0.85 9.475 915.218838 1.128113
```

CRs - [CRs.dev] - Dev-C++ 5.11

Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda

TDM-GCC 4.9.2 32-bit Release

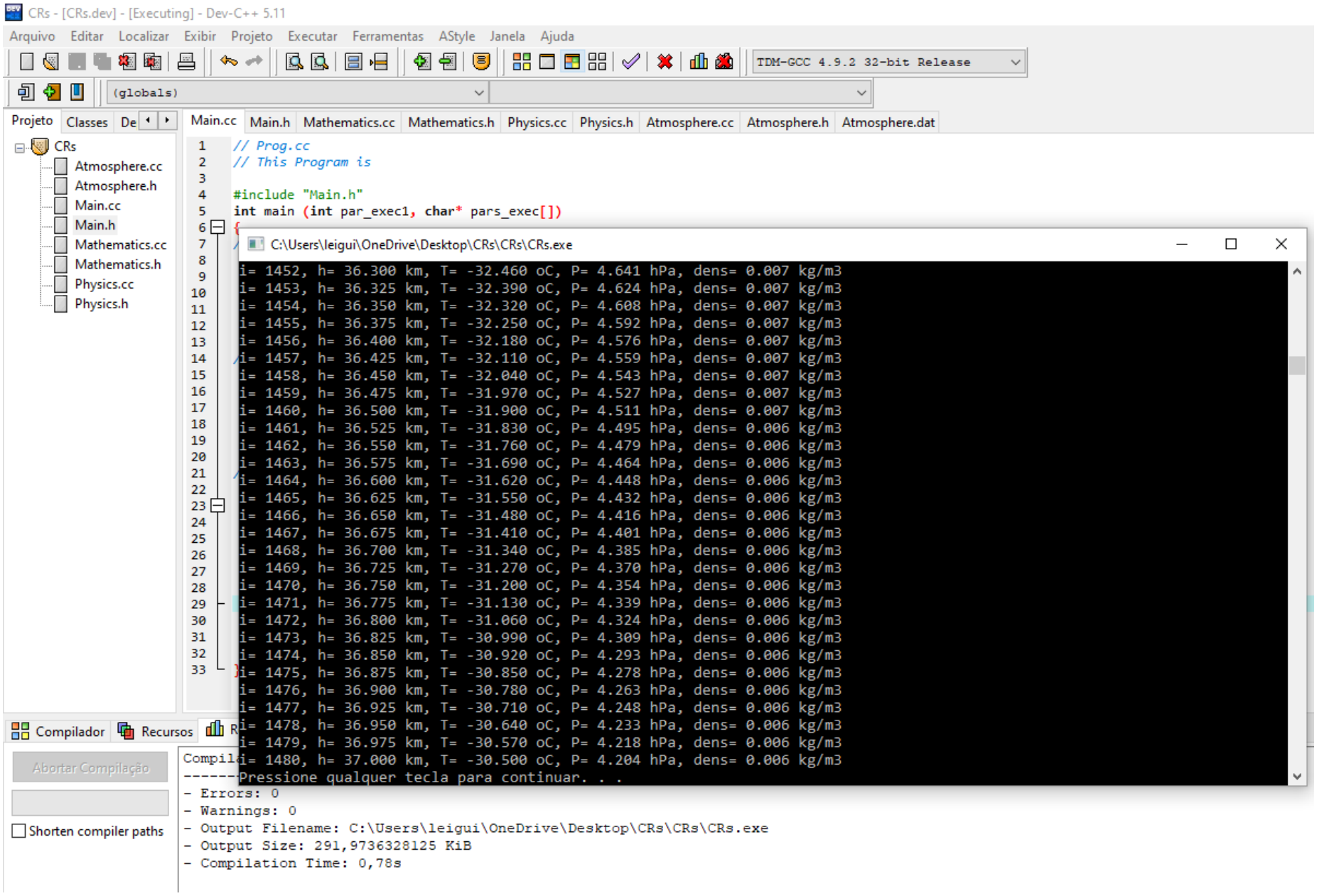
(globals)

Projeto Classes De

- CRs
  - Atmosphere.cc
  - Atmosphere.h
  - Main.cc
  - Main.h
  - Mathematics.cc
  - Mathematics.h
  - Physics.cc
  - Physics.h

Main.cc | Main.h | Mathematics.cc | Mathematics.h | Physics.cc | Physics.h | Atmosphere.cc | Atmosphere.h | Atmosphere.dat

```
1  // Prog.cc
2  // This Program is
3
4  #include "Main.h"
5  int main (int par_exec1, char* pars_exec[])
6  {
7  //Objects creation
8      Mathematics * Math = new Mathematics();
9      Physics * Phys = new Physics();
10     Atmosphere * Atm = new Atmosphere();
11
12     printf("*******COSMIC RAYS******\n\n");
13
14 //Methods (functions) of the classes are called
15     Math->fMath1();
16     Math->fMath2();
17     Phys->fPhys1();
18     Phys->fPhys2();
19
20
21 //Calls Atmosphere and print its data
22     Atm->Init(altitude,temperature,pressure,density);
23     for(i=0;i<=1480;i++){
24         double alt=Atm->GetAltitude(i,altitude);
25         double temp=Atm->GetTemperature(i,temperature);
26         double press=Atm->GetPressure(i,pressure);
27         double dens=Atm->GetDensity(i,density);
28         printf("i= %d, h= %.3f km, T= %.3f oC, P= %.3f hPa, dens= %.3f kg/m3\n",i,alt,temp,press,dens);
29     }
30
31     system("pause");
32     return 0;
33 }
```


CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes De
CRs
Atmosphere.cc
Atmosphere.h
Main.cc
Main.h
Mathematics.cc
Mathematics.h
Physics.cc
Physics.h
Main.cc Main.h Mathematics.cc Mathematics.h Physics.cc Physics.h Atmosphere.cc Atmosphere.h Atmosphere.dat
1 // Prog.cc
2 // This Program is
3
4 #include "Main.h"
5 int main (int par_exec1, char* pars_exec[])
6 {
7 /
8
9
10
11
12
13
14 /
15
16
17
18
19
20
21 /
22
23
24
25
26
27
28
29
30
31
32
33 }
C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
i= 1452, h= 36.300 km, T= -32.460 oC, P= 4.641 hPa, dens= 0.007 kg/m3
i= 1453, h= 36.325 km, T= -32.390 oC, P= 4.624 hPa, dens= 0.007 kg/m3
i= 1454, h= 36.350 km, T= -32.320 oC, P= 4.608 hPa, dens= 0.007 kg/m3
i= 1455, h= 36.375 km, T= -32.250 oC, P= 4.592 hPa, dens= 0.007 kg/m3
i= 1456, h= 36.400 km, T= -32.180 oC, P= 4.576 hPa, dens= 0.007 kg/m3
i= 1457, h= 36.425 km, T= -32.110 oC, P= 4.559 hPa, dens= 0.007 kg/m3
i= 1458, h= 36.450 km, T= -32.040 oC, P= 4.543 hPa, dens= 0.007 kg/m3
i= 1459, h= 36.475 km, T= -31.970 oC, P= 4.527 hPa, dens= 0.007 kg/m3
i= 1460, h= 36.500 km, T= -31.900 oC, P= 4.511 hPa, dens= 0.007 kg/m3
i= 1461, h= 36.525 km, T= -31.830 oC, P= 4.495 hPa, dens= 0.006 kg/m3
i= 1462, h= 36.550 km, T= -31.760 oC, P= 4.479 hPa, dens= 0.006 kg/m3
i= 1463, h= 36.575 km, T= -31.690 oC, P= 4.464 hPa, dens= 0.006 kg/m3
i= 1464, h= 36.600 km, T= -31.620 oC, P= 4.448 hPa, dens= 0.006 kg/m3
i= 1465, h= 36.625 km, T= -31.550 oC, P= 4.432 hPa, dens= 0.006 kg/m3
i= 1466, h= 36.650 km, T= -31.480 oC, P= 4.416 hPa, dens= 0.006 kg/m3
i= 1467, h= 36.675 km, T= -31.410 oC, P= 4.401 hPa, dens= 0.006 kg/m3
i= 1468, h= 36.700 km, T= -31.340 oC, P= 4.385 hPa, dens= 0.006 kg/m3
i= 1469, h= 36.725 km, T= -31.270 oC, P= 4.370 hPa, dens= 0.006 kg/m3
i= 1470, h= 36.750 km, T= -31.200 oC, P= 4.354 hPa, dens= 0.006 kg/m3
i= 1471, h= 36.775 km, T= -31.130 oC, P= 4.339 hPa, dens= 0.006 kg/m3
i= 1472, h= 36.800 km, T= -31.060 oC, P= 4.324 hPa, dens= 0.006 kg/m3
i= 1473, h= 36.825 km, T= -30.990 oC, P= 4.309 hPa, dens= 0.006 kg/m3
i= 1474, h= 36.850 km, T= -30.920 oC, P= 4.293 hPa, dens= 0.006 kg/m3
i= 1475, h= 36.875 km, T= -30.850 oC, P= 4.278 hPa, dens= 0.006 kg/m3
i= 1476, h= 36.900 km, T= -30.780 oC, P= 4.263 hPa, dens= 0.006 kg/m3
i= 1477, h= 36.925 km, T= -30.710 oC, P= 4.248 hPa, dens= 0.006 kg/m3
i= 1478, h= 36.950 km, T= -30.640 oC, P= 4.233 hPa, dens= 0.006 kg/m3
i= 1479, h= 36.975 km, T= -30.570 oC, P= 4.218 hPa, dens= 0.006 kg/m3
i= 1480, h= 37.000 km, T= -30.500 oC, P= 4.204 hPa, dens= 0.006 kg/m3
Pressione qualquer tecla para continuar. . .
Compilador Recursos
Abortar Compilação
Shorten compiler paths
Compil
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
- Output Size: 291,9736328125 KiB
- Compilation Time: 0,78s

CRs - [CRs.dev] - Dev-C++ 5.11

Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda

TDM-GCC 4.9.2 32-bit Release

(globals)

Projeto Classes De

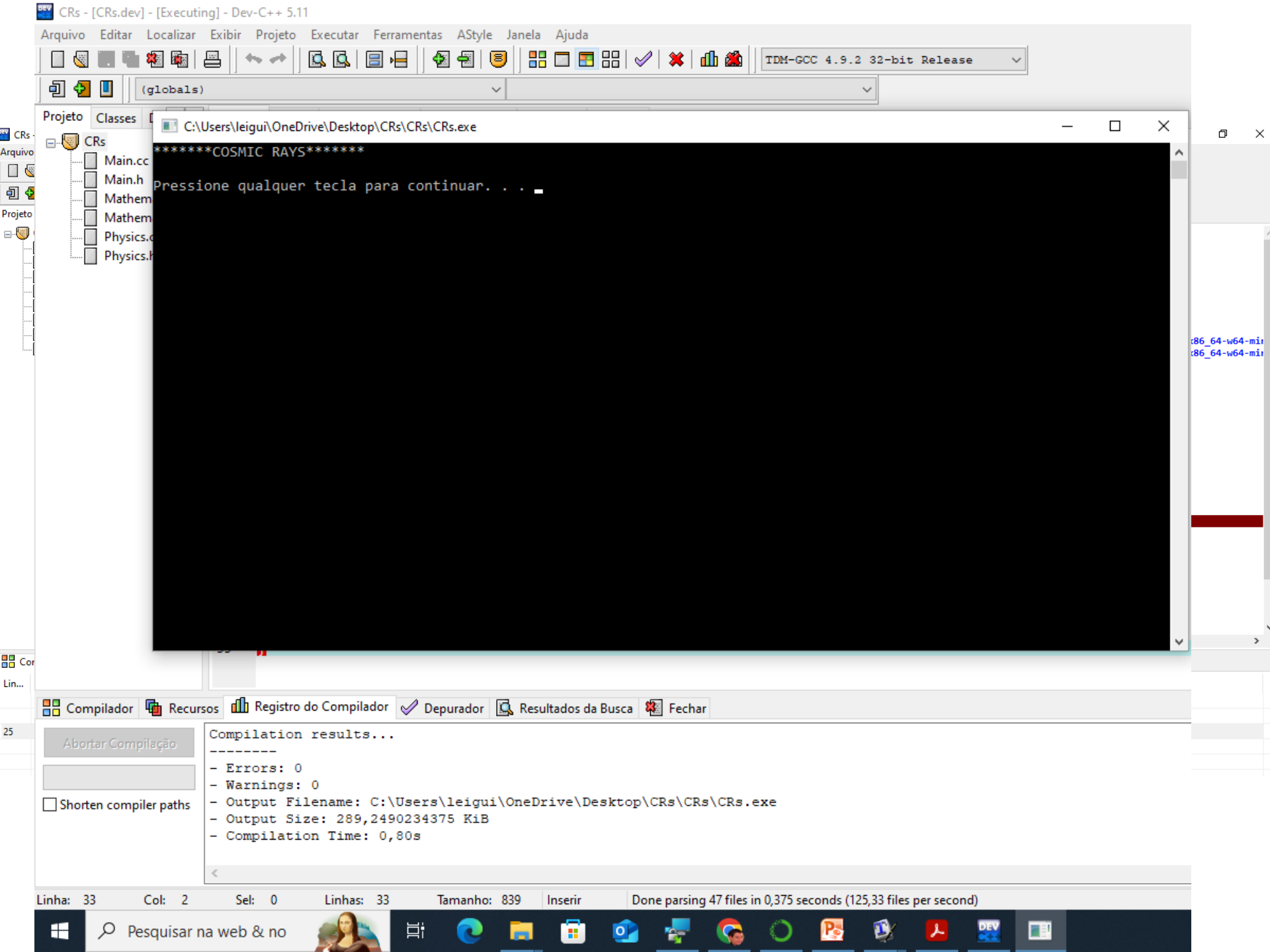
- CRs
  - Atmosphere.cc
  - Atmosphere.h
  - Main.cc
  - Main.h
  - Mathematics.cc
  - Mathematics.h
  - Physics.cc
  - Physics.h

Main.cc | Main.h | Mathematics.cc | Mathematics.h | Physics.cc | Physics.h | Atmosphere.cc | Atmosphere.h | Atmosphere.dat | Makefile.win

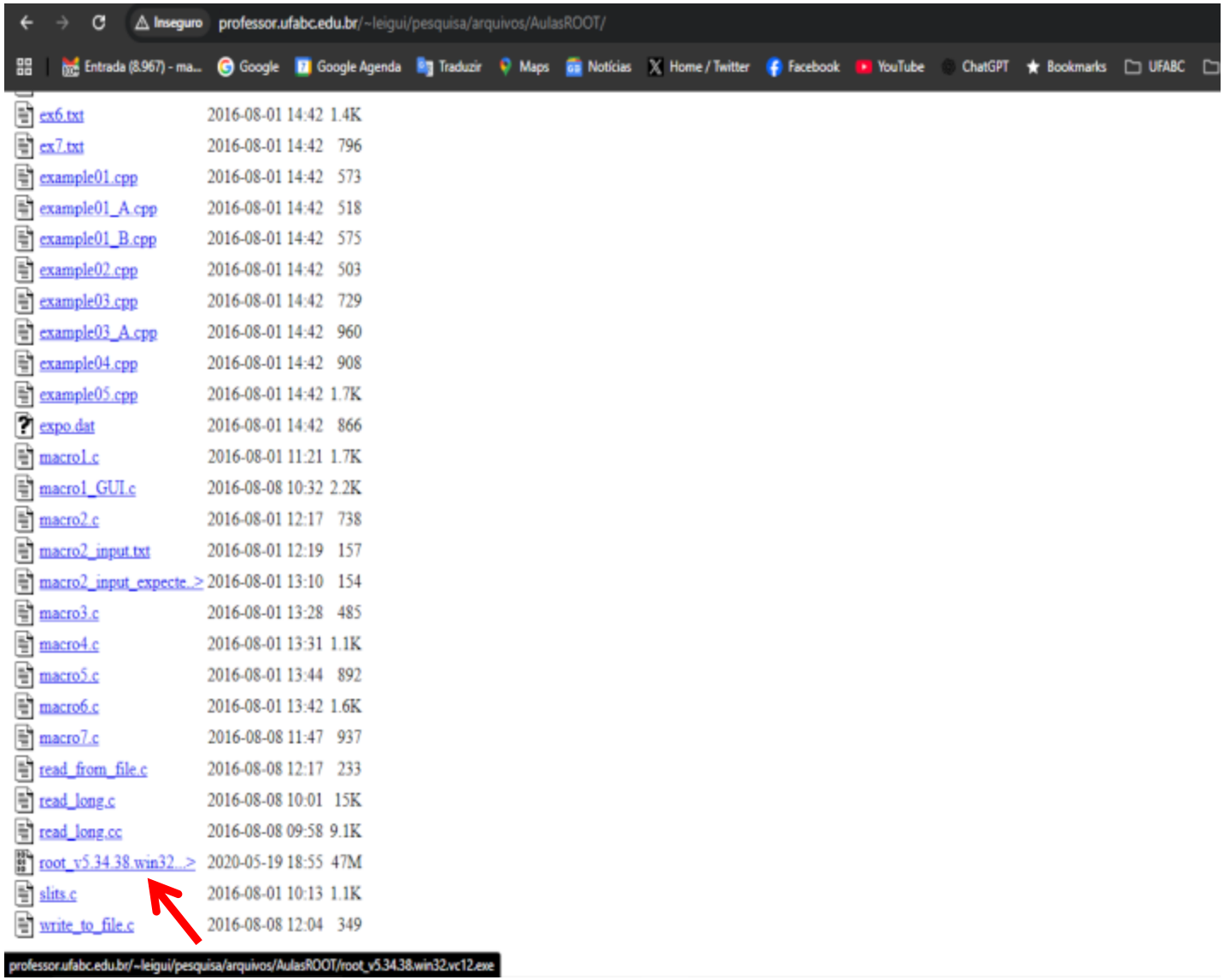
```
1  # Project: CRs
2  # Makefile created by Dev-C++ 5.11
3
4  CPP      = g++.exe
5  CC       = gcc.exe
6  WINDRES  = windres.exe
7  OBJ      = Mathematics.o Physics.o Main.o ../../../../Dropbox/work/alunos/IC/Raissa/CRs/Atmosphere.o
8  LINKOBJ  = Mathematics.o Physics.o Main.o ../../../../Dropbox/work/alunos/IC/Raissa/CRs/Atmosphere.o
9  LIBS     = -L"C:/Program Files (x86)/Dev-Cpp/MinGW64/lib32" -L"C:/Program Files (x86)/Dev-Cpp/MinGW64/x86_64-w64-mingw32/lib32" -static-libgcc -m32
10 INCS     = -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/include" -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/x86_64-w64-mingw32/include" -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/lib/gcc/x86_64-w64-mi
11 CXXINCS  = -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/include" -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/x86_64-w64-mingw32/include" -I"C:/Program Files (x86)/Dev-Cpp/MinGW64/lib/gcc/x86_64-w64-mi
12 BIN      = CRs.exe
13 CXXFLAGS = $(CXXINCS) -m32
14 CFLAGS   = $(INCS) -m32
15 RM       = rm.exe -f
16
17 .PHONY: all all-before all-after clean clean-custom
18
19 all: all-before $(BIN) all-after
20
21 clean: clean-custom
22     ${RM} $(OBJ) $(BIN)
23
24 $(BIN): $(OBJ)
25     $(CPP) $(LINKOBJ) -o $(BIN) $(LIBS)
26
27 Mathematics.o: Mathematics.cc
28     $(CPP) -c Mathematics.cc -o Mathematics.o $(CXXFLAGS)
29
30 Physics.o: Physics.cc
31     $(CPP) -c Physics.cc -o Physics.o $(CXXFLAGS)
32
33 Main.o: Main.cc
34     $(CPP) -c Main.cc -o Main.o $(CXXFLAGS)
```

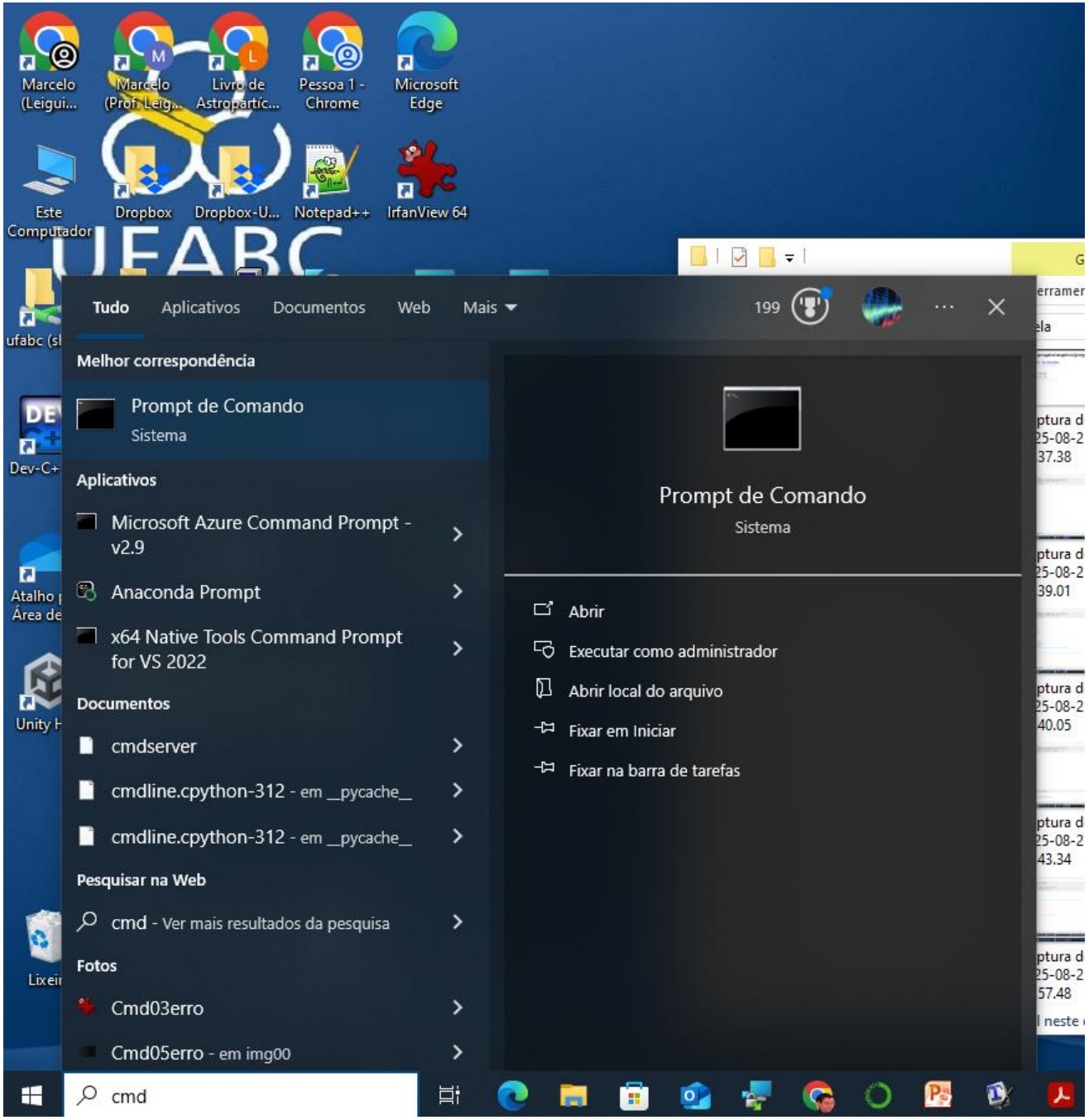
Compilador (3) | Recursos | Registro do Compilador | Depurador | Resultados da Busca | Fechar

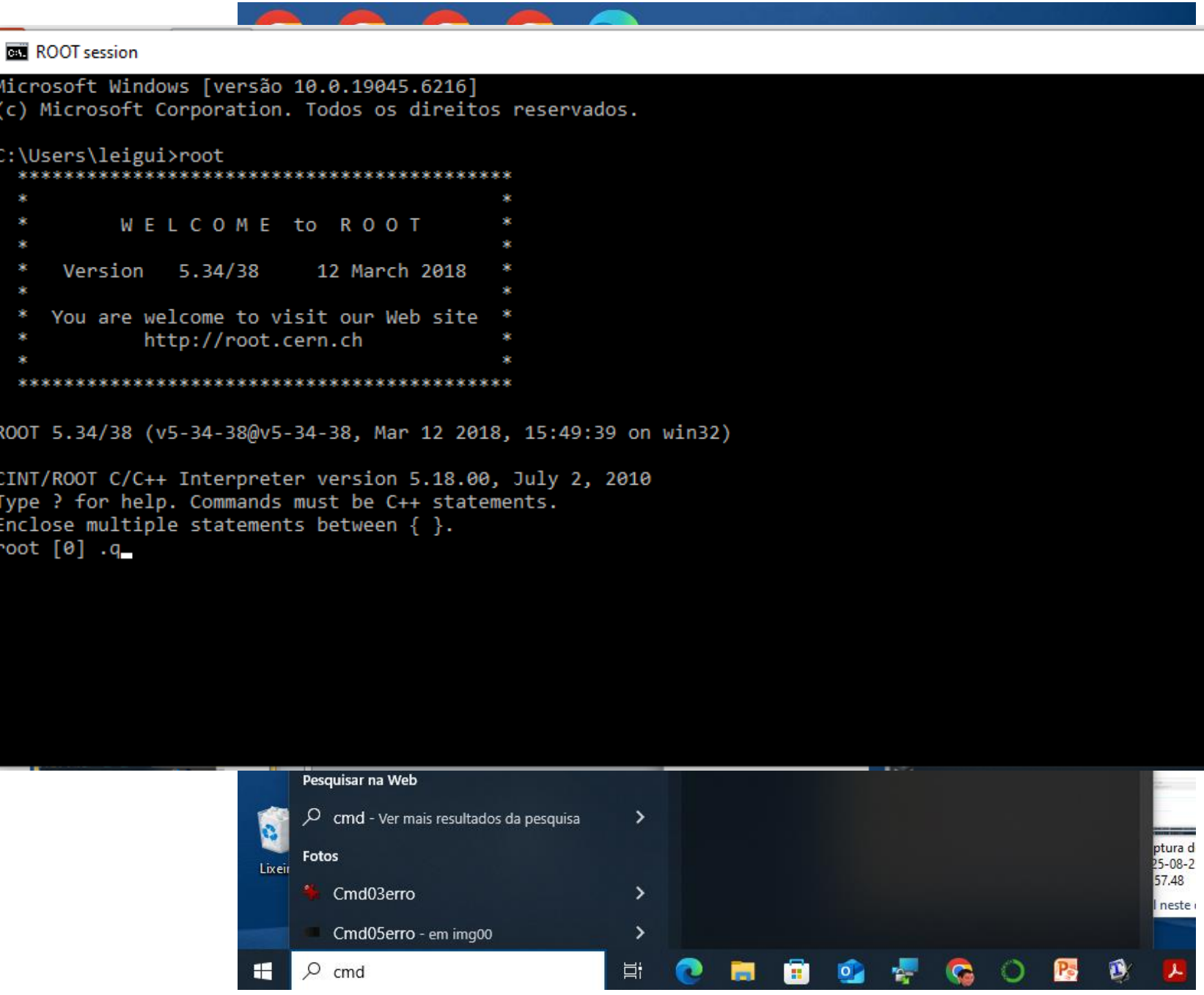
Lin...	Col...	Unidade	Mensagem
		C:\Program Files (x86)\Dev-Cpp\MinGW64\x86_64-w64-...	cannot open output file CRs.exe: Permission denied
		C:\Users\leigui\OneDrive\Desktop\CRs\CRs\collect2.exe	[Error] ld returned 1 exit status
25		C:\Users\leigui\OneDrive\Desktop\CRs\CRs\Makefile.win	recipe for target 'CRs.exe' failed


CRs - [CRs.dev] - [Executing] - Dev-C++ 5.11
Arquivo Editar Localizar Exibir Projeto Executar Ferramentas AStyle Janela Ajuda
TDM-GCC 4.9.2 32-bit Release
(globals)
Projeto Classes
CRs
Main.cc
Main.h
Mathem
Mathem
Physics.c
Physics.h
C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
*******COSMIC RAYS*******
Pressione qualquer tecla para continuar. . .
Compilador Recursos Registro do Compilador Depurador Resultados da Busca Fechar
Abortar Compilação
Shorten compiler paths
Compilation results...

- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\leigui\OneDrive\Desktop\CRs\CRs\CRs.exe
- Output Size: 289,2490234375 KiB
- Compilation Time: 0,80s
Linha: 33 Col: 2 Sel: 0 Linhas: 33 Tamanho: 839 Inserir
Done parsing 47 files in 0,375 seconds (125,33 files per second)
Pesquisar na web & no


Inseguro
professor.ufabc.edu.br/~leigui/pesquisa/arquivos/AulasROOT/
Entrada (8.967) - ma...
Google
Google Agenda
Traduzir
Maps
Notícias
Home / Twitter
Facebook
YouTube
ChatGPT
Bookmarks
UFABC
ex6.txt 2016-08-01 14:42 1.4K
ex7.txt 2016-08-01 14:42 796
example01.cpp 2016-08-01 14:42 573
example01_A.cpp 2016-08-01 14:42 518
example01_B.cpp 2016-08-01 14:42 575
example02.cpp 2016-08-01 14:42 503
example03.cpp 2016-08-01 14:42 729
example03_A.cpp 2016-08-01 14:42 960
example04.cpp 2016-08-01 14:42 908
example05.cpp 2016-08-01 14:42 1.7K
expo.dat 2016-08-01 14:42 866
macro1.c 2016-08-01 11:21 1.7K
macro1_GUI.c 2016-08-08 10:32 2.2K
macro2.c 2016-08-01 12:17 738
macro2_input.txt 2016-08-01 12:19 157
macro2_input_expecte..> 2016-08-01 13:10 154
macro3.c 2016-08-01 13:28 485
macro4.c 2016-08-01 13:31 1.1K
macro5.c 2016-08-01 13:44 892
macro6.c 2016-08-01 13:42 1.6K
macro7.c 2016-08-08 11:47 937
read_from_file.c 2016-08-08 12:17 233
read_long.c 2016-08-08 10:01 15K
read_long.cc 2016-08-08 09:58 9.1K
root_v5.34.38.win32...> 2020-05-19 18:55 47M
slits.c 2016-08-01 10:13 1.1K
write_to_file.c 2016-08-08 12:04 349
professor.ufabc.edu.br/~leigui/pesquisa/arquivos/AulasROOT/root_v5.34.38.win32.vc12.exe


Marcelo (Leigui...
Marcelo (Prof. Leig...
Livro de Astropartíc...
Pessoa 1 - Chrome
Microsoft Edge
Este Computador
Dropbox
Dropbox-U...
Notepad++
IrfanView 64
UFABC
Tudo
Aplicativos
Documentos
Web
Mais
199
Melhor correspondência
Prompt de Comando
Sistema
Aplicativos
Microsoft Azure Command Prompt - v2.9
Anaconda Prompt
x64 Native Tools Command Prompt for VS 2022
Documentos
cmdserver
cmdline.cpython-312 - em __pycache__
cmdline.cpython-312 - em __pycache__
Pesquisar na Web
cmd - Ver mais resultados da pesquisa
Fotos
Cmd03erro
Cmd05erro - em img00
Prompt de Comando
Sistema
Abrir
Executar como administrador
Abrir local do arquivo
Fixar em Iniciar
Fixar na barra de tarefas
cmd


ROOT session
Microsoft Windows [versão 10.0.19045.6216]
(c) Microsoft Corporation. Todos os direitos reservados.
C:\Users\leigui>root
W E L C O M E to R O O T
Version 5.34/38 12 March 2018
You are welcome to visit our Web site
http://root.cern.ch
ROOT 5.34/38 (v5-34-38@v5-34-38, Mar 12 2018, 15:49:39 on win32)
CINT/ROOT C/C++ Interpreter version 5.18.00, July 2, 2010
Type ? for help. Commands must be C++ statements.
Enclose multiple statements between { }.
root [0] .q
Pesquisar na Web
cmd - Ver mais resultados da pesquisa
Fotos
Cmd03erro
Cmd05erro - em img00
cmd

An Introduction to ROOT

ROOT

An Object-Oriented
Data Analysis Framework

Aula 1: Introdução à Física de Astropartículas

Prof. Dr. Marcelo Augusto Leigui de Oliveira

1. Física de Astropartículas: Uma Ciência Interdisciplinar

A **Física de Astropartículas** é um campo científico moderno e profundamente interdisciplinar. Ela surge da necessidade de compreender fenômenos cósmicos extremos por meio da detecção de partículas subatômicas e radiações altamente energéticas que chegam à Terra vindas do Universo.

Por unir técnicas e conceitos da física de partículas, astrofísica, cosmologia e relatividade geral, esse campo representa uma fronteira natural entre o muito pequeno e o muito grande — entre os constituintes fundamentais da matéria e as estruturas do cosmos.

1.1 Impacto na Astrofísica

Na astrofísica, a física de astropartículas oferece ferramentas para investigar eventos de altíssima energia, como:

- Supernovas, pulsares e buracos negros.
- Galáxias ativas e explosões de raios gama (GRBs).
- Ambientes com campos magnéticos e gravitacionais intensos.

A detecção de partículas cósmicas fornece evidências sobre esses objetos e sobre os mecanismos de aceleração natural de partículas.

1.2 Conexão com a Física de Partículas

Anaconda Navigator

File Help

ANACONDA.NAVIGATOR

Update Now | Connect

Home
Environments
Learning
Community

All applications on base (root) Channels

PyCharm
The only Python IDE you need – built for data and AI/ML professionals. Supercharged with an AI-enhanced IDE experience. Free forever, plus one month of Pro included.
Install

Anaconda AI Navigator
Access various large language models (LLMs) curated by Anaconda, and start leveraging secure local AI today.
Install

Anaconda Toolbox
4.20.0
Anaconda Assistant
JupyterLab supercharged with a suite of Anaconda extensions, starting with the Anaconda Assistant AI chatbot.
Launch

Anaconda Cloud Notebooks
Cloud-hosted notebook service from Anaconda. Launch a preconfigured environment with hundreds of packages and store project files with persistent cloud storage.
Launch

anaconda_prompt
1.1.0
Opens a terminal instance with conda activated (requires menuinst 2.1.1 or greater).
Launch

JupyterLab
4.2.5
An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
Launch

Notebook
7.2.2
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
Launch

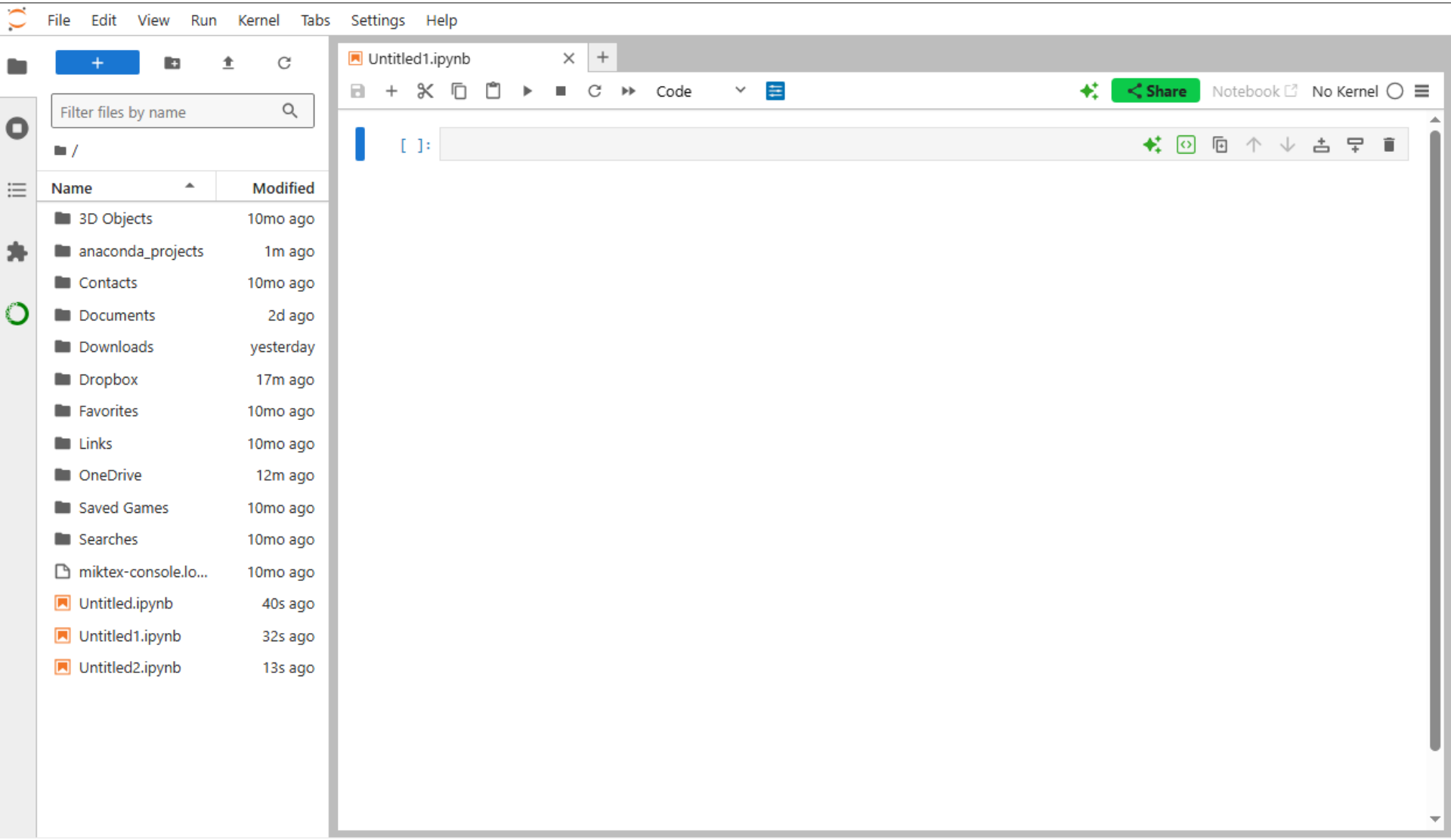
Qt Console
5.5.1
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
Launch

Spyder
5.5.1
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
Launch

EduBlocks
Web-based coding platform from Anaconda designed for students. Learn Python coding through an interactive, block-based visual environment.
Launch

Documentation
Anaconda Blog

Verifying **anaconda-toolbox** on **C:\ProgramData\anaconda3**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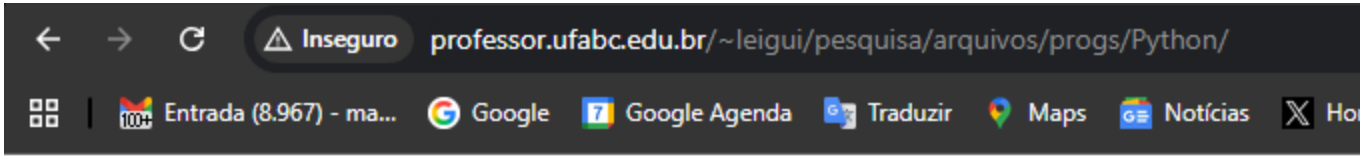
anaconda_projects 1m ago
Contacts 10mo ago
Documents 2d ago
Downloads yesterday
Dropbox 17m ago
Favorites 10mo ago
Links 10mo ago
OneDrive 12m ago
Saved Games 10mo ago
Searches 10mo ago
miktex-console.lo... 10mo ago
Untitled.ipynb 40s ago
Untitled1.ipynb 32s ago
Untitled2.ipynb 13s ago
Untitled1.ipynb
Code
Share
Notebook
No Kernel
[ ]:



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Name	Last modified	Size	Description
Parent Directory		-	
astroparticles.ipynb	2025-08-21 11:11	182K	

localhost:8889/lab/tree/Dropbox/work/workGRC/progs/Python/astroparticles.ipynb?

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Name	Modified
astroparticles.ipynb	14d ago

Untitled1.ipynb | astroparticles.ipynb

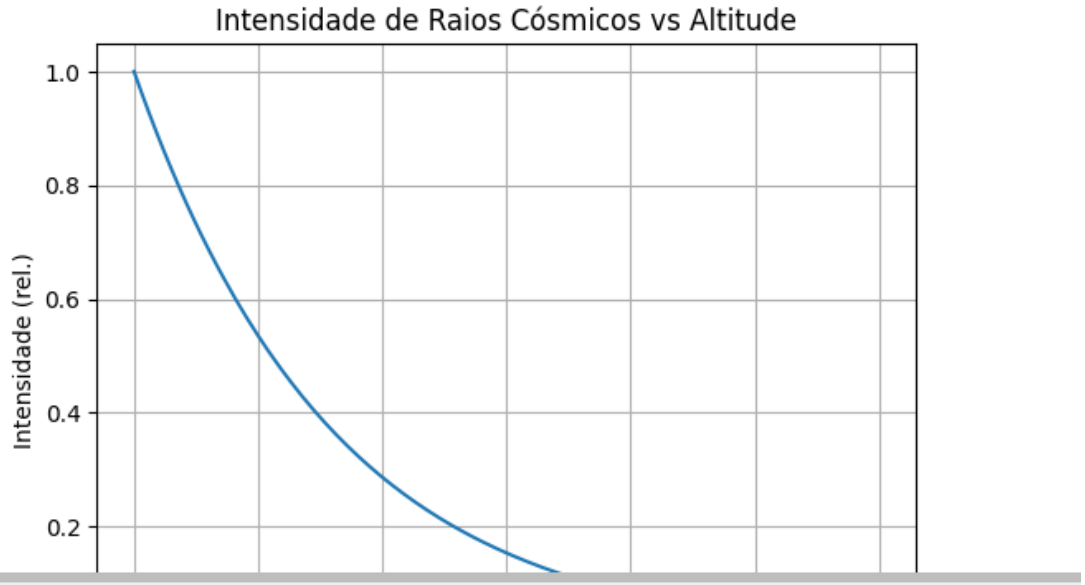
Code

[1]:

```
%matplotlib inline

import numpy as np
import matplotlib.pyplot as plt

h = np.linspace(0, 30, 200)  # altitude em km
I = np.exp(-h / 8)           # atenuação exponencial
plt.plot(h, I)
plt.xlabel('Altitude (km)')
plt.ylabel('Intensidade (rel.)')
plt.title('Intensidade de Raios Cósmicos vs Altitude')
plt.grid(True)
plt.show()
```



Simple 0 1 Python [conda env:base] * | Idle