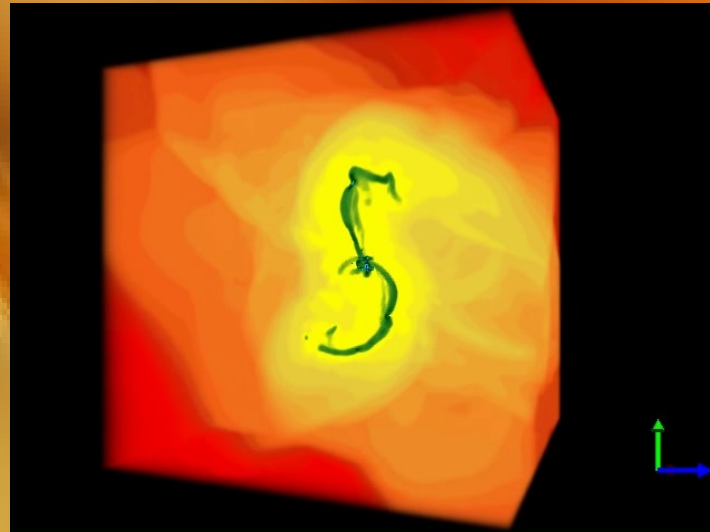


Glnemo2

Un programme de visualisation 3D interactif



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CéSAM

Plan

- Introduction
- Architecture logicielle
- Développement / packaging
- Utilisation dans le monde
- Films scientifiques

Introduction

Histoire et prononciation

G-L NEMO 2

Open**GL** library

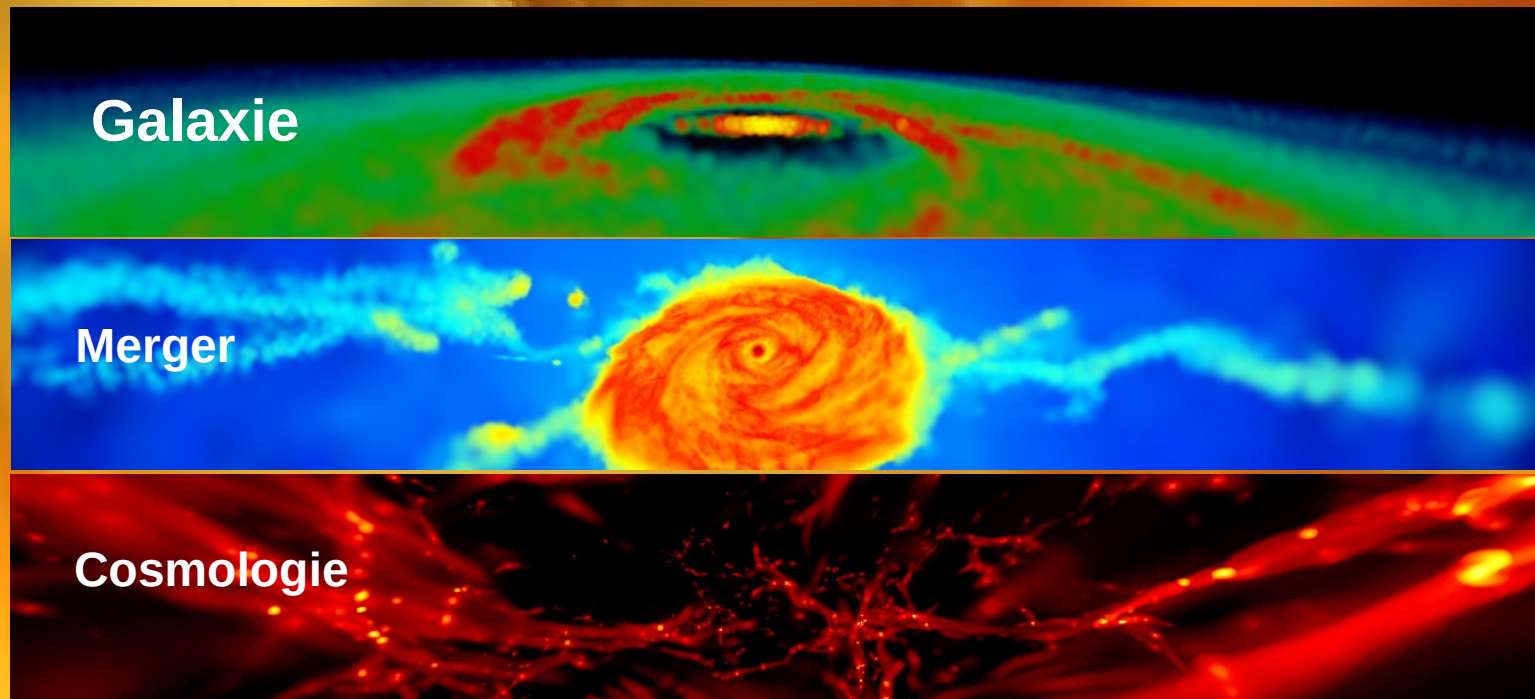


Projet **Nemo** (Peter Teuben)

Deuxième version
depuis 2007

Glnemo2 : un outils universel

- visualisation interactive 3D pour les simulations astrophysique
- mise en évidence de la structure des données (forme, zone de densité, structures spirale, barre, noyau etc...)
- observer l'évolution dans le temps (4D)
- création d'images pour illustrer les articles scientifiques
- création de films scientifiques
- utiliser pour l'enseignement des simulations n-corps (Strasbourg, Barcelone, Tokyo)



Les Simulations en astrophysique

Conditions initiales : Galaxies / Univers

Particules : Matière noire/Gaz/Étoiles

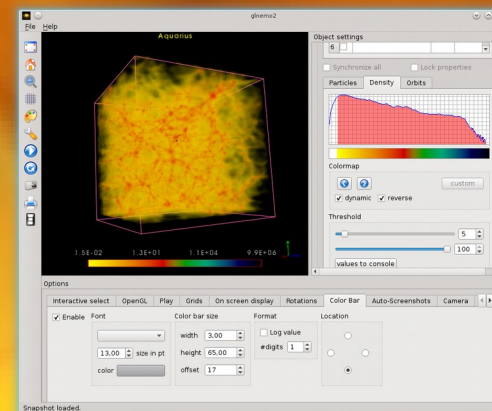
Position x,y,z

Vitesse v_x,v_y,v_z

Valeur physique:densité/température/ages

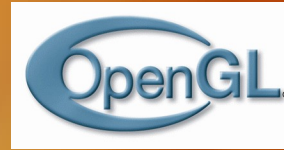
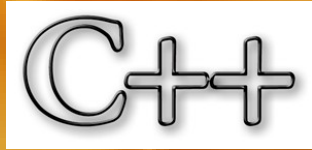
Simulateur : Gadget/Ramses etc...

snapshot

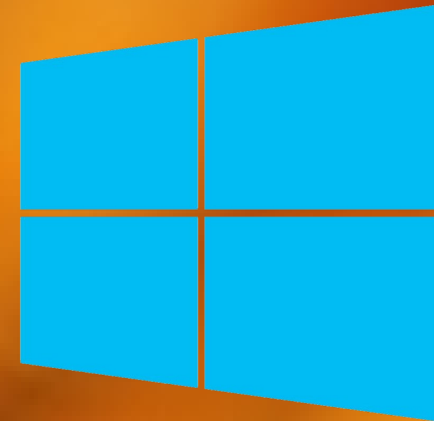


Architecture de Glnemo2

multi-plateforme et opensource



Fonctionne parfaitement sur les 3 principaux OS



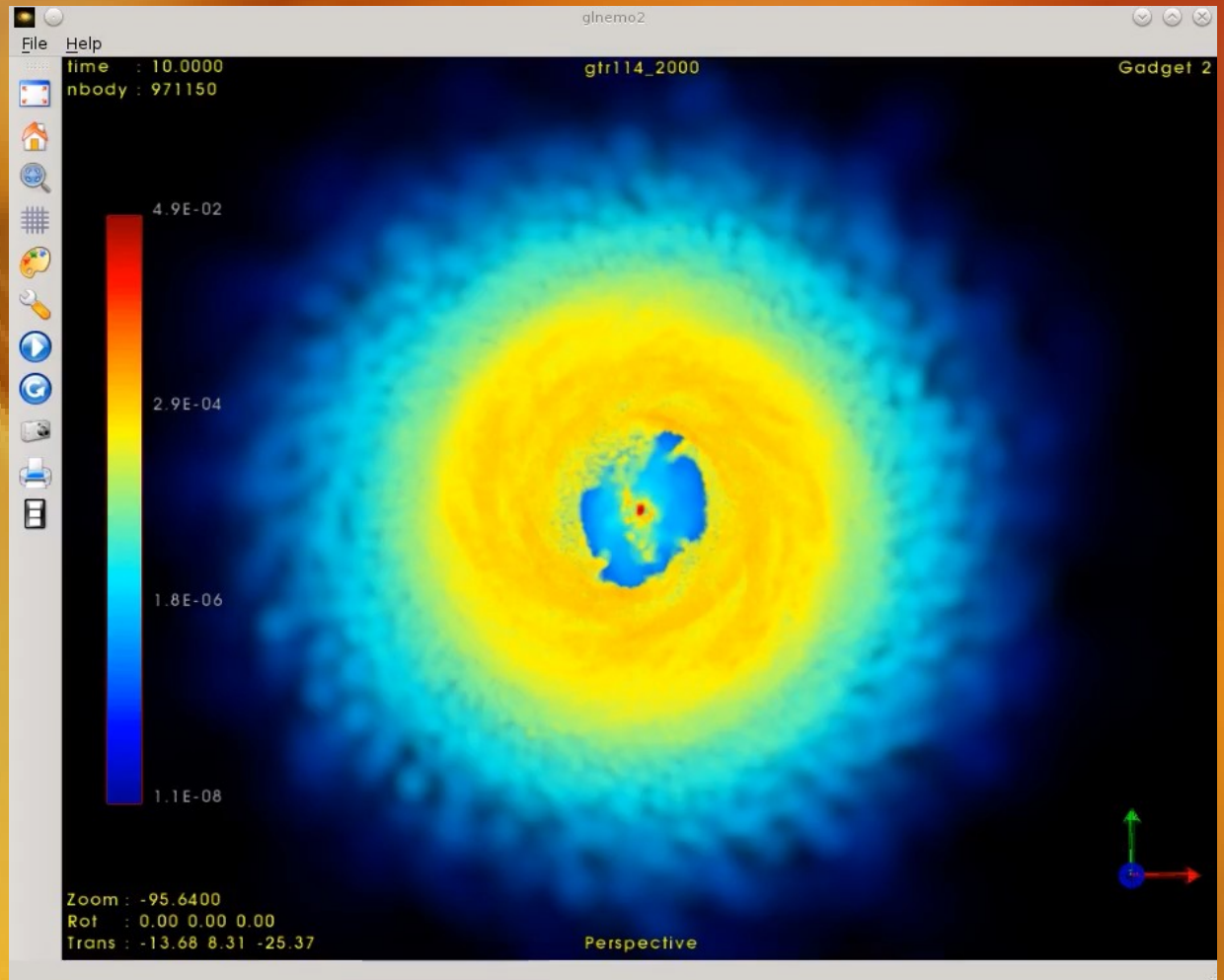
OpenSource avec Licence CeCILL 2

GUI interactive

Interface graphique basée sur l'api QT5 de Digia

GUI opérations

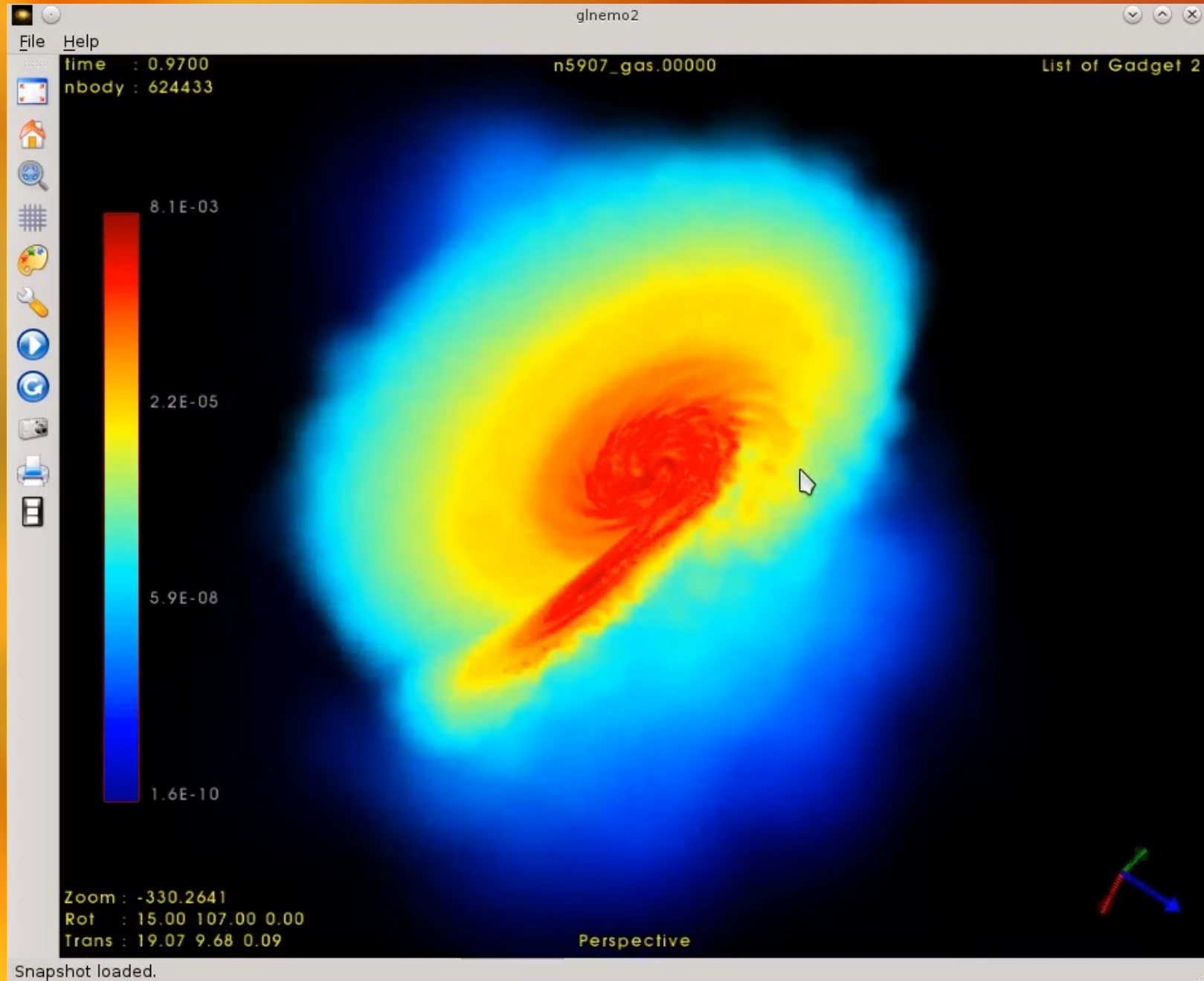
- zoom In/out
- rotations / translations
- sélection de particules/objets
- couleur densité / physiques
- tracé d'orbites
- évolution dans le temps
- création d'images et films



GUI interactive

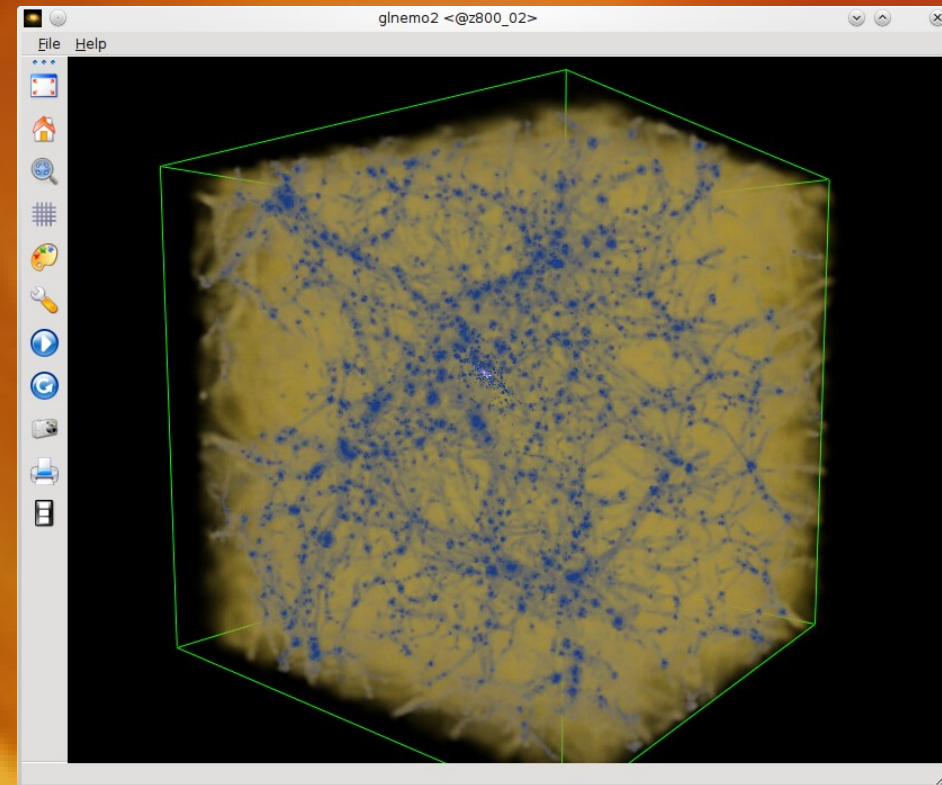
- interface multi-threaded
- interface réactive
- utilisation des Qthreads
- contrôle de l'interface par sémaphores
- chargement des données en parallèle

Interactivité sur une séquence de snapshots

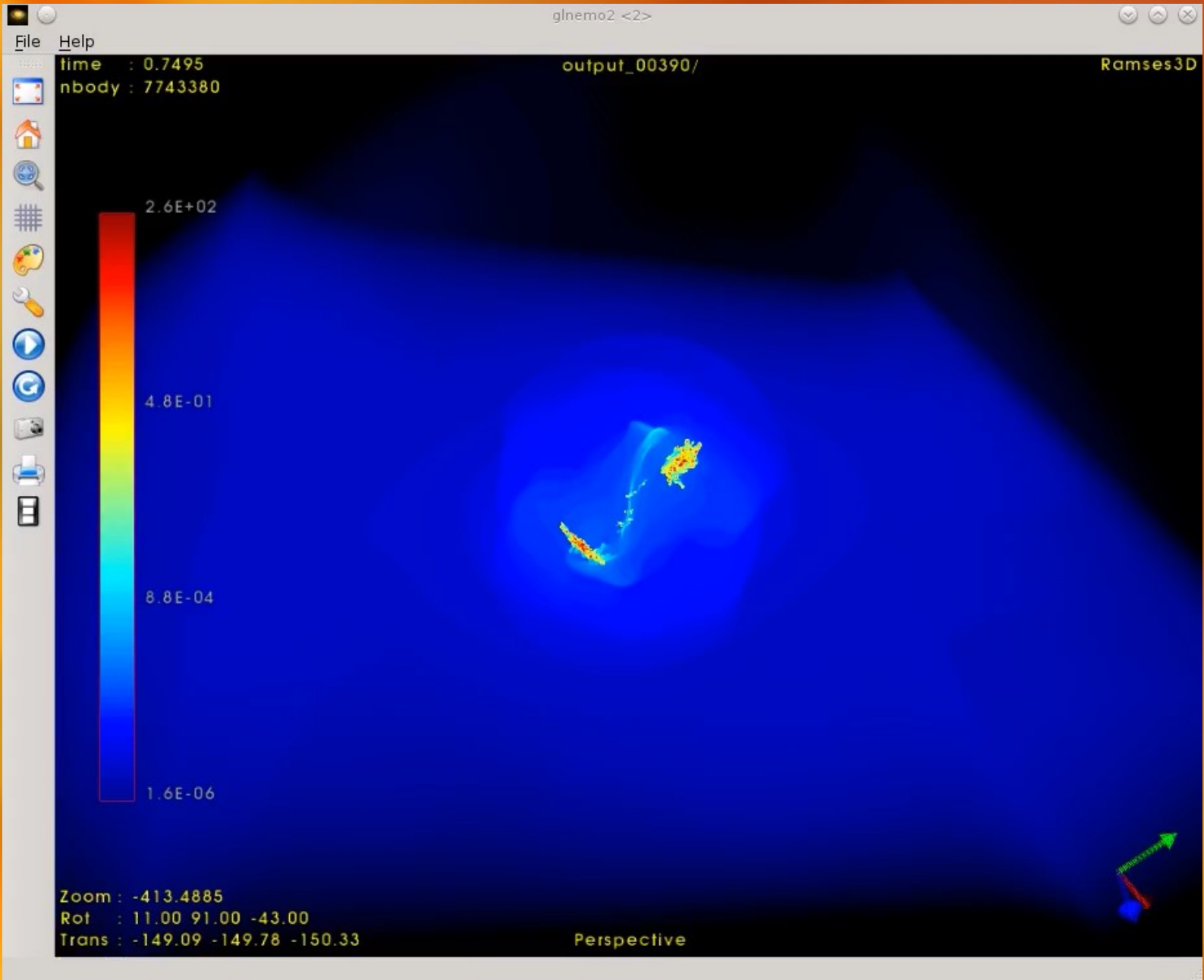


Moteur 3D rapide

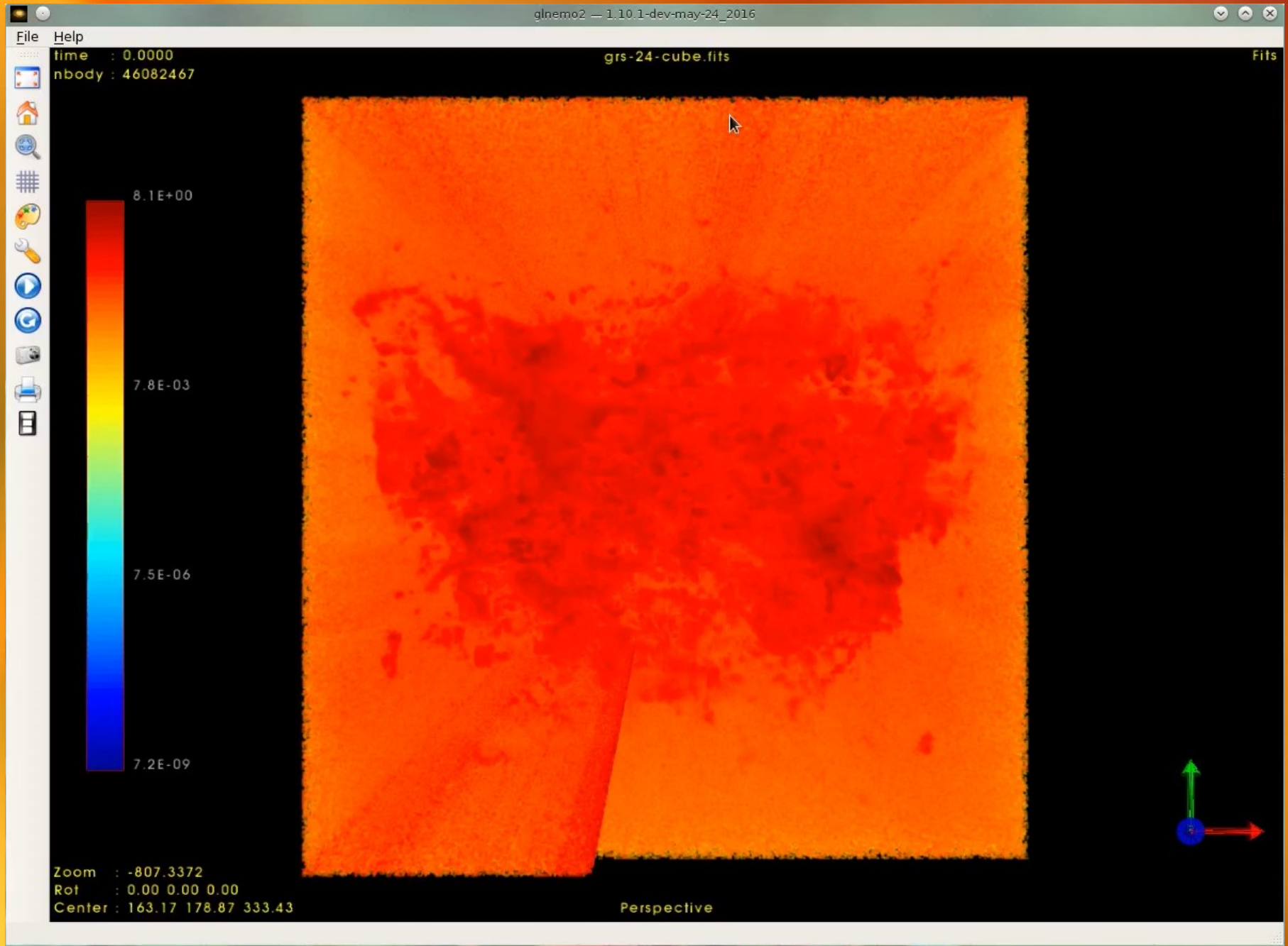
- rendu de plusieurs millions de particules en temps réel
- rendu effectué par le GPU
- librairie OpenGL
- GLSL shaders (exécutés sur GPU)
- vertex buffer object (accès mémoire cpu/gpu)
- frame buffer object (fbo – offscreen rendering)
- multi-threading (GUI responsive)



Rendu temps réel de 8 millions de particules



Rendu temps réel de 46 millions de particules



Supporte plusieurs types de données

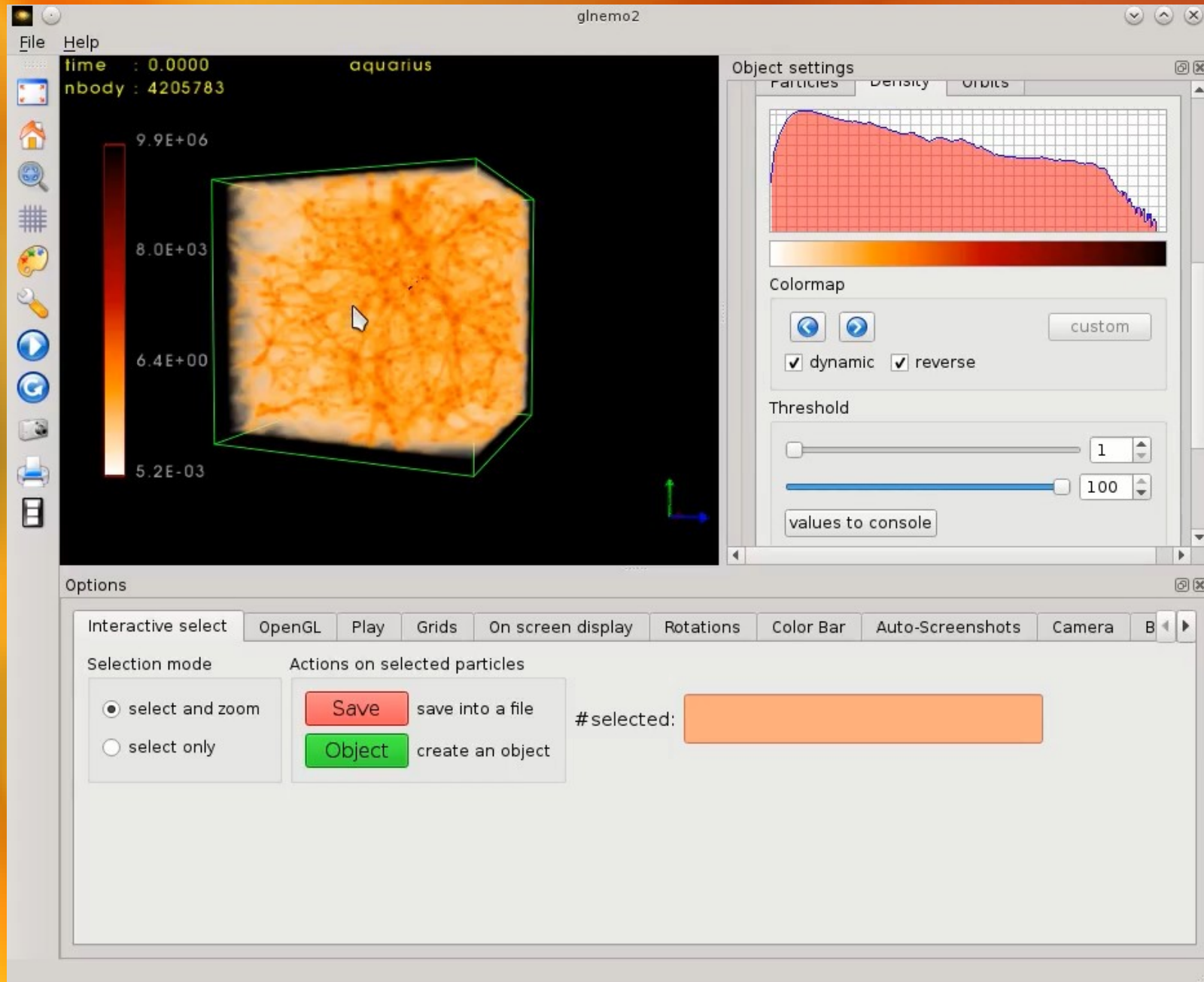
Utilisation de plugin pour le chargement des données

Détection automatique des formats de données

- NEMO files (<http://carma.astro.umd.edu/nemo>) Peter Teuben
- Gadget 1,2,3, (<http://www.mpa-garching.mpg.de/gadget/>) Volker Springel
- RAMSES files (http://irfu.cea.fr/Projets/Site_ramses/RAMSES.html) Romain Teyssier
- Fits 2D and 3D (datacubes)
- Topsy files
- phiGRAPE file (<http://www-astro.physik.tu-berlin.de/~harfst/index.php?pid=8>)
- list of files stored in a file (to watch evolution)
- realtime gyrfalcON (Walter Dehnen) simulation via a network plugin (see

`$NEMO/usr/jcl/glnemo2/gyrfalcon/README)`

Module de création de films



Développement / packaging

Développement : Qtcreator / cmake / GIT

The screenshot shows the Qt Creator IDE interface. The left sidebar displays a project tree for 'glnemo2' with folders like 'ftm', 'gadget', 'nemolight', 'network', 'pfmtlib', 'plugins', 'ramses', 'src', and 'tipsy'. The main editor window shows the source file 'glnemo.cc' with the following code:

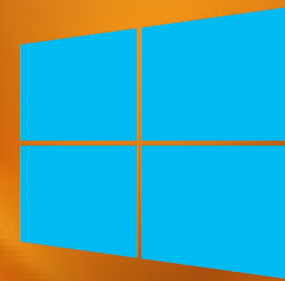
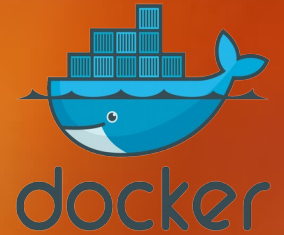
```
1 // =====
2 // Copyright Jean-Charles LAMBERT - 2007-2014
3 // e-mail: Jean-Charles.Lambert@lam.fr
4 // address: Centre de donneeS Astrophysique de Marseille (CeSAM)
5 // Laboratoire d'Astrophysique de Marseille
6 // Pôle de l'Etoile, site de Château-Gombert
7 // 38, rue Frédéric Joliot-Curie
8 // 13388 Marseille cedex 13 France
9 // CNRS U.M.R 7326
10 // =====
11 // See the complete license in LICENSE and/or "http://www.cecill.info".
12 // =====
13 #ifdef HAVE_CONFIG_H
14 #include <config.h>
15 #endif
16
17 #include <QtGlobal>
18 #if QT_VERSION >= QT_VERSION_CHECK(5, 0, 0)
19 #include <GL/glew.h>
20 #include <QApplication>
21 #else // QT4
22 #include <QtGui>
23 #include <QApplication>
24 #include <GL/glew.h>
25 #endif
26 #include <QtPlugin>
27 // #include <QtOpenGL>
28 // #include <QGLFormat>
29 #include <QDesktopWidget>
30 #include <iostream>
31 #include <QSplashScreen>
32 // Nemo stuffs
33 #define _vectmath_h // put this statement to avoid conflict with C++ vector class
34 #include <nemo.h>
35
36 #include "mainwindow.h"
37 using namespace std;
38 #define RELEASE_VERSION "1.8.1-dev-December-2014-1st"
39
40 #if QT_VERSION >= QT_VERSION_CHECK(5, 0, 0)
41 // Import snapshot plugins
42 Q_IMPORT_PLUGIN(SnapshotNemo)
43 Q_IMPORT_PLUGIN(SnapshotFtm)
44 Q_IMPORT_PLUGIN(SnapshotGadget)
45 Q_IMPORT_PLUGIN(SnapshotPhiGrape)
46 Q_IMPORT_PLUGIN(SnapshotRamses)
47 #ifndef _WIN32
48 Q_IMPORT_PLUGIN(SnapshotTipsy) // WIN32 has no native XDR support requested by TIPSY
49 #endif
50 Q_IMPORT_PLUGIN(SnapshotList)
51 Q_IMPORT_PLUGIN(SnapshotNetwork)
52 #else // QT4
53 Q_IMPORT_PLUGIN(nemoplugin);
54 Q_IMPORT_PLUGIN(ftmplugin);
55
```

The bottom status bar shows a search bar and a list of tabs: 1 Issues, 2 Search Results, 3 Application Output, 4 Compile Output, 5 QML/JS Console, 6 General Messages.

Développement : Packaging

3 cibles :

- **Linux** (cible de développement principale)
 - Dev distribution linux mageia
 - Linux binaires via docker
- **Windows**
 - Cross compilation via MXE
- **MacOSX**
 - Macbook air sous Maverick



http://projets.lam.fr/projects/glnemo2

The screenshot shows a web browser window displaying the 'Overview' page for the 'GLnemo2' project. The browser's address bar shows the URL 'https://projets.lam.fr/projects/glnemo2'. The page has a dark blue header with navigation links: HOME, PROJECTS, SCRUM STATISTICS, MY PAGE, HELP. The user is logged in as 'jclamber'. On the left, there is a sidebar with a search bar containing 'GLnemo2' and a menu with options: Overview, Activity, Issues, New issue, News, Wiki, Files, Repository, and Settings. The main content area is titled 'Overview' and features a 'New subproject' button and a 'Close' button. It includes a project image of a galaxy, a description of GLNEMO2 as an interactive 3D visualization program, and links to Wiki, Download, and Movies. Below this is a 'Git url' section with links to the Git repository. The 'Issue tracking' section contains a table with columns for OPEN, CLOSED, and TOTAL issues, categorized by Action, Bug, Feature, Support, and Evolution. To the right, there are sections for 'Members' (Manager: Jean-charles LAMBERT) and 'Latest news' with several recent updates.

Overview - GLnemo2 - Projects at LAM - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Overview - GLnemo2 ... x Download - GLnemo2... x Movies - GLnemo2 - ... x News - GLnemo2 - Pr... x LAMBERT Jean-charle... x

https://projets.lam.fr/projects/glnemo2

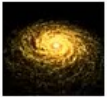
HOME PROJECTS SCRUM STATISTICS MY PAGE HELP Logged in as jclamber My account Sign out

Search: GLnemo2

GLnemo2

- Overview
- Activity
- Issues
- New issue
- News
- Wiki
- Files
- Repository
- Settings

Overview

 **GLNEMO2**, an interactive visualization 3D program for nbody snapshots.
see [Wiki](#)
see [Download](#)
see [Movies](#)

Git url : <https://gitlab.lam.fr/jclamber/glnemo2>
git clone <https://gitlab.lam.fr/jclamber/glnemo2.git>

Issue tracking

	OPEN	CLOSED	TOTAL
Action	3	2	5
Bug	1	7	8
Feature	9	4	13
Support	1	2	3
Evolution	0	0	0

[View all issues](#)

Members

Manager: Jean-charles LAMBERT

Latest news

- 3D rendering of GAIA Universe Model Snapshot**
Added by Jean-charles LAMBERT about 1 month ago
- Glnemo2 1.10.0 for Ubuntu 16.04**
Added by Jean-charles LAMBERT about 2 months ago
- glnemo2 1.10.0 released**
Added by Jean-charles LAMBERT 2 months ago
- Article with glnemo2 rendering**
Added by Jean-charles LAMBERT 3 months ago
- New article with glnemo2 rendering**
Added by Jean-charles LAMBERT 4 months ago

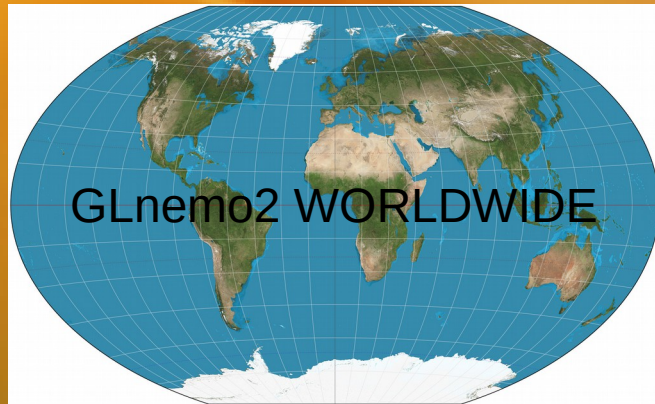
[View all news](#)

<https://projets.lam.fr/news/211>

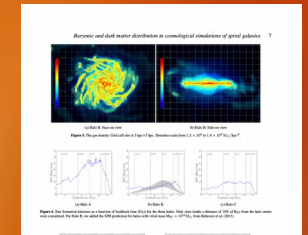
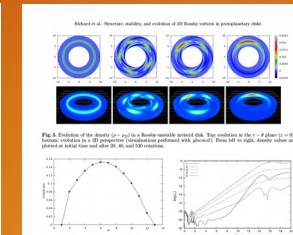
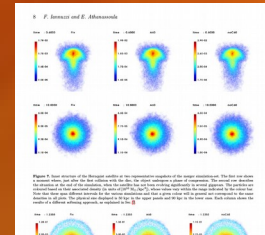
Marseille, France: 30 °C Mer. : 29 °C Jeu. : 28 °C

Utilisation à travers le monde

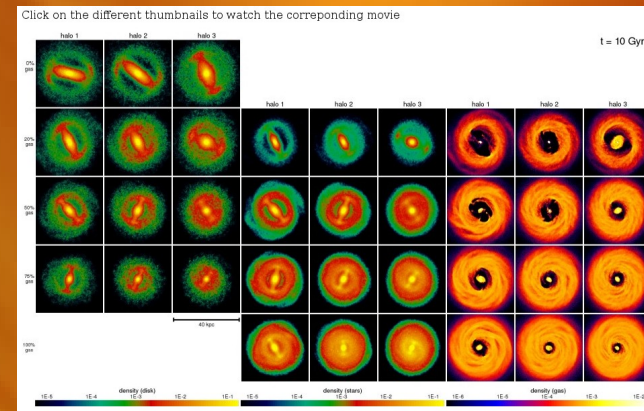
Utilisation à travers le monde



Articles scientifiques



Films scientifiques



Recherche laboratoire

- Thèses
- Écoles thématiques
- Enseignement
 - Strasbourg
 - Tokyo
 - Barcelone

Films scientifiques

Simulation cosmologique de matière noire du Big Bang à aujourd'hui

Simulation cosmologique

Ramses Dark Matter simulation
of a 20 megaparsecs cube
from redshift 39 to 0

(13.6 billions years ago to now)

GAIA Universe Model Snapshot

GAIA

**Gaia Universe Model Snapshot
a simulation of the expected
contents of the Gaia catalogue**

Merci