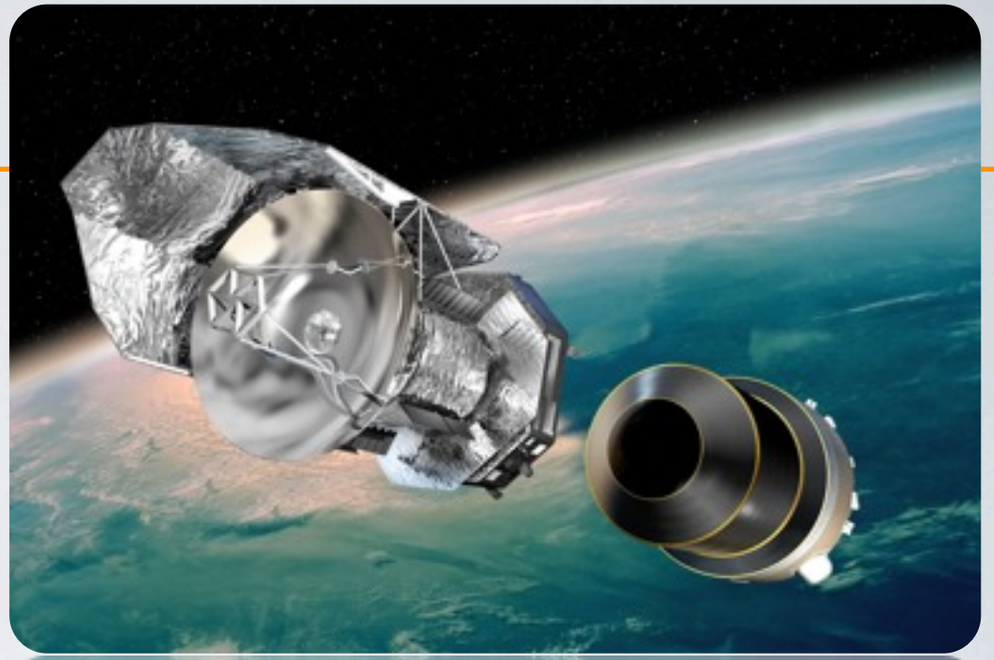
Grid Applications at Paris Observatory

Franck Le Petit

The Meudon PDR code on EGEE
Dynamics of the Solar System
High Energy Astrophysics

l'Observatoire de Paris

Herschel Space Observatory



Herschel launched on 14th may

Observation of Interstellar Medium
- search for molecules as H_2O, O_2, ...
- study of star formation regions
- galaxies

Interpretation of ISM observations require simulation codes

The Meudon PDR code will be one of them used by several teams for various Key Programs :

- **Diffuse regions** (PRISMA key prog.)
- **Star forming regions & complex chemistry** (WADI key prog.)
- **Search for O_2 molecule** (O_2 key prog.)
- **Extra-galactic regions** (Galaxies and AGN program)

The Meudon PDR code

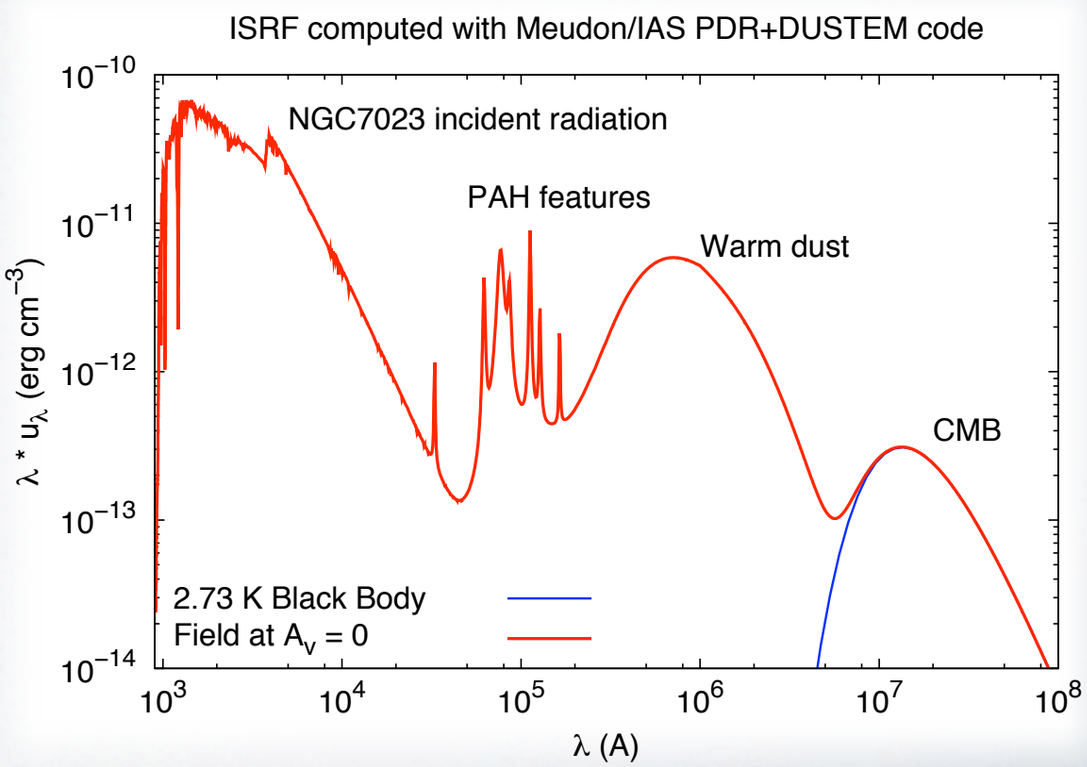
J. Le Bourlot, E. Roueff & F. Le Petit / LUTH - Paris Obervatory

Computes the chemical and thermal structure of interstellar gas

- Radiative transfer (FUV - sub-mm)
- Chemistry
- Thermal processes
- Statistical equilibrium in levels

- Molecules abundance profiles
- Gas and grains temperature
- Levels excitation
- ...
- Line intensities
- Column densities
- Absorption & emission spectra

Public code : http://pdr.obspm.fr



The Meudon PDR code on EGEE

One interpretation may need hundred runs.

One run of the code :
- 6 hours to 1-3 days depending on precision on radiative transfer
- few memory required

Well suited for Grid Computing

Gridification by G. Taffoni (INAF) :
- Development of procedures to run massively simulations
- Documentation to help the ISM community to run it on EGEE
- Online access through Astrogrid on Grid via VO-Neural

Application :
- 120 PDR models in 3 days
- Publication of results in the VO PDR Database
  - Several sets of simulations planned :
    - diffuse clouds
    - star forming regions
    - high redshift regions
    - proto-planetary systems ...

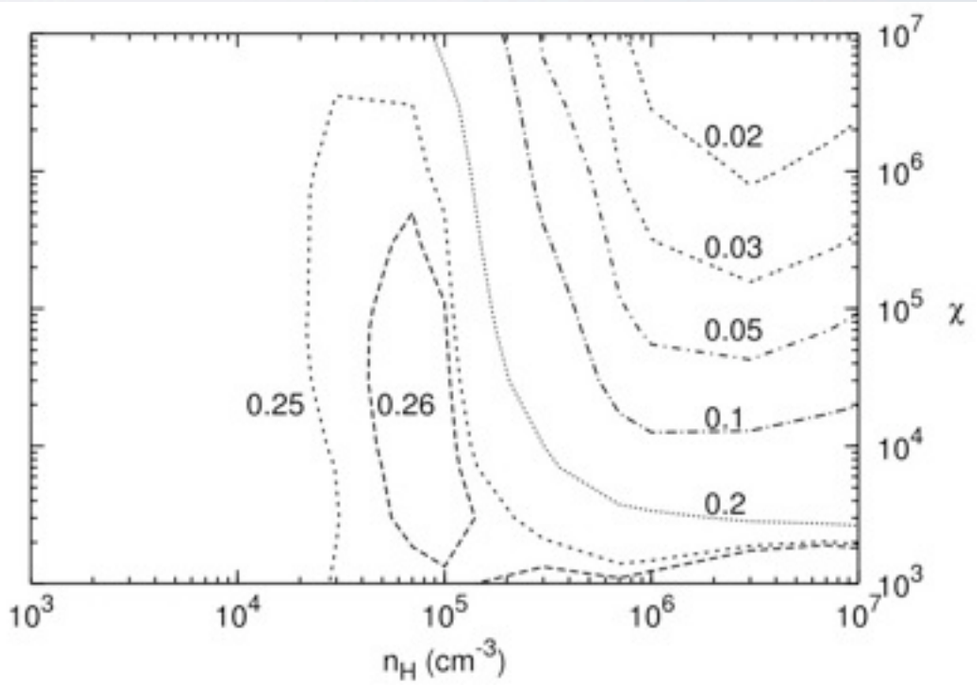


FIG. 31.—Ratio of the intensities of the H_2 lines 2–1 $S(2)$/1–0 $S(1)$ given

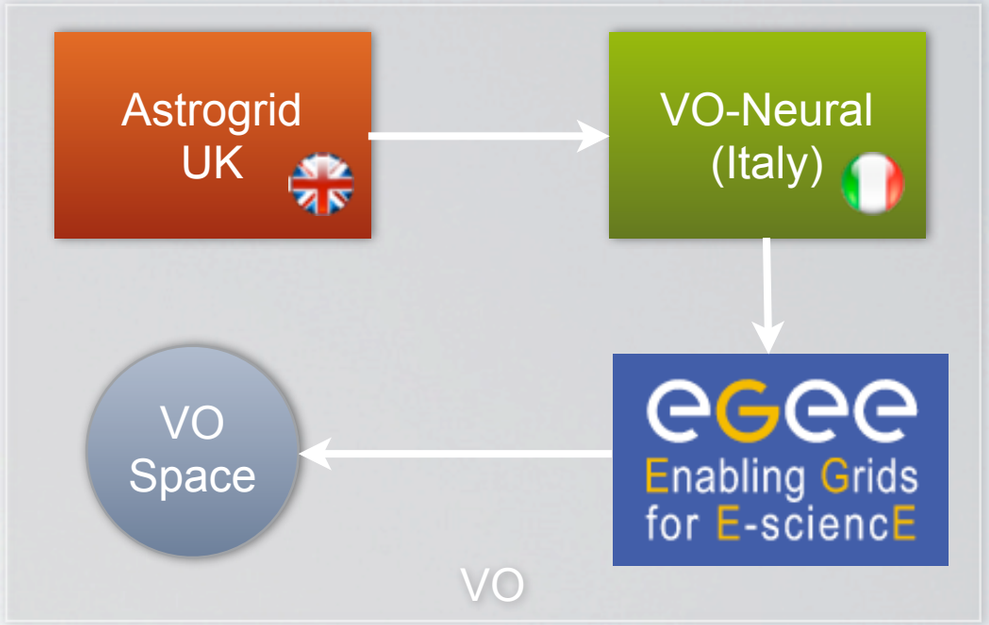
The Meudon PDR code on EGEE

Plans

Integration of Grid services in PDR Virtual Observatory services :

- Online access
- Grid / Cloud Computing ressources

First test with VO-Neural



Use the Grid to fill the VO PDR database

- Developpment of VO-Theory services (SimDAP) to extract them

Study of the dynamics of the solar system

Jacques Laskar & Mickaël Gastineau - IMCCE / Paris Observatory

Computes dynamics of solar system on 5 Gyr

Probability of collision of Mercure with Sun / Venus ?
Ejection of Mercure

Run : 120 days per run for 5 Gyr
Statistical study : Chaotic system

CPU time (2008):

- CINES : 5 Mh
- EGEE Grid : 0.7 Mh - 125000 jobs
- SIO : 0.4 Mh
- Local computers : 1 Mh
- IPGP : 0.4 Mh

Difficulties with EGEE : Identification and re-submission of job failures was time consuming

Very High Energy Astrophysics

Jean-Philippe Lenain et al.
LUTH / Paris Observatory

H.E.S.S. team at LUTH

H.E.S.S. antenna - Namibia

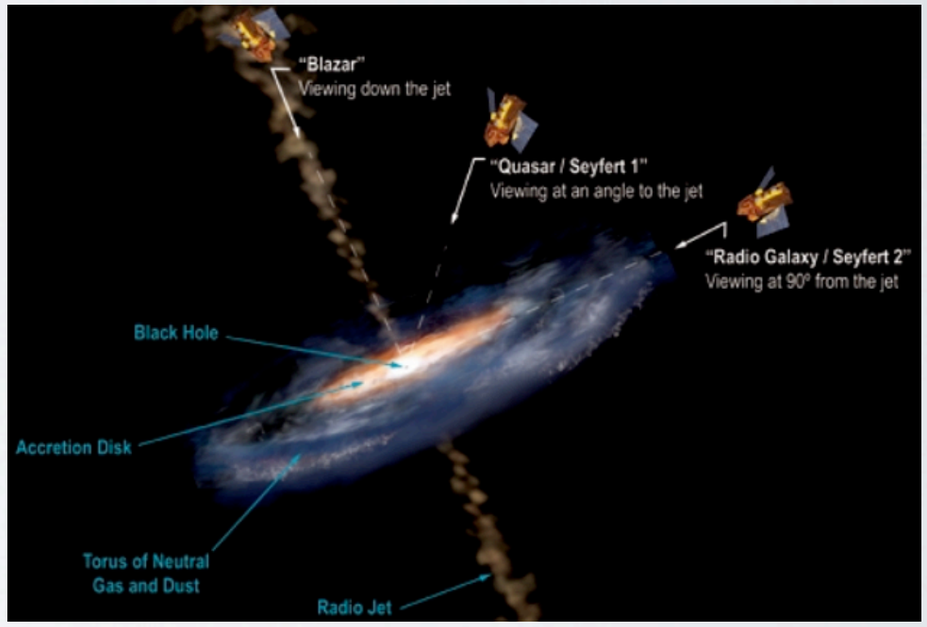
Gridification of a code that computes multi-wavelength emission of Blazar

- Temporal evolution of plasma blob
- Propagation along a jet
- Computes its radiation

25 free parameters - 2 hours per run

Aim :

- Exploration of physical input parameters
- Define a set of parameters to interpret observations
- Unify different spectral behaviour in blazars



Gridification on EGEE :

- 30 000 jobs in 3 months
- 60 000 CPU hours

EGEE Node at Paris Observatory

Albert Shih - Pierre Le Sidaner - DIO / Paris Observatory

Paris Observatory
INSU / CNRS
Region Ile de France :

Funding of an EGEE node at Paris Observatory

- several hundreds CPUs
- 2 Go RAM per CPU

Available : end 2009 (?)

Conclusions

3 applications gridified :
- PDR code
- Very High Energy Astrophysics
- Celestial mecanics

Plans :
- Gridification of other codes

Conclusions :

- No real difficulties to gridify these applications

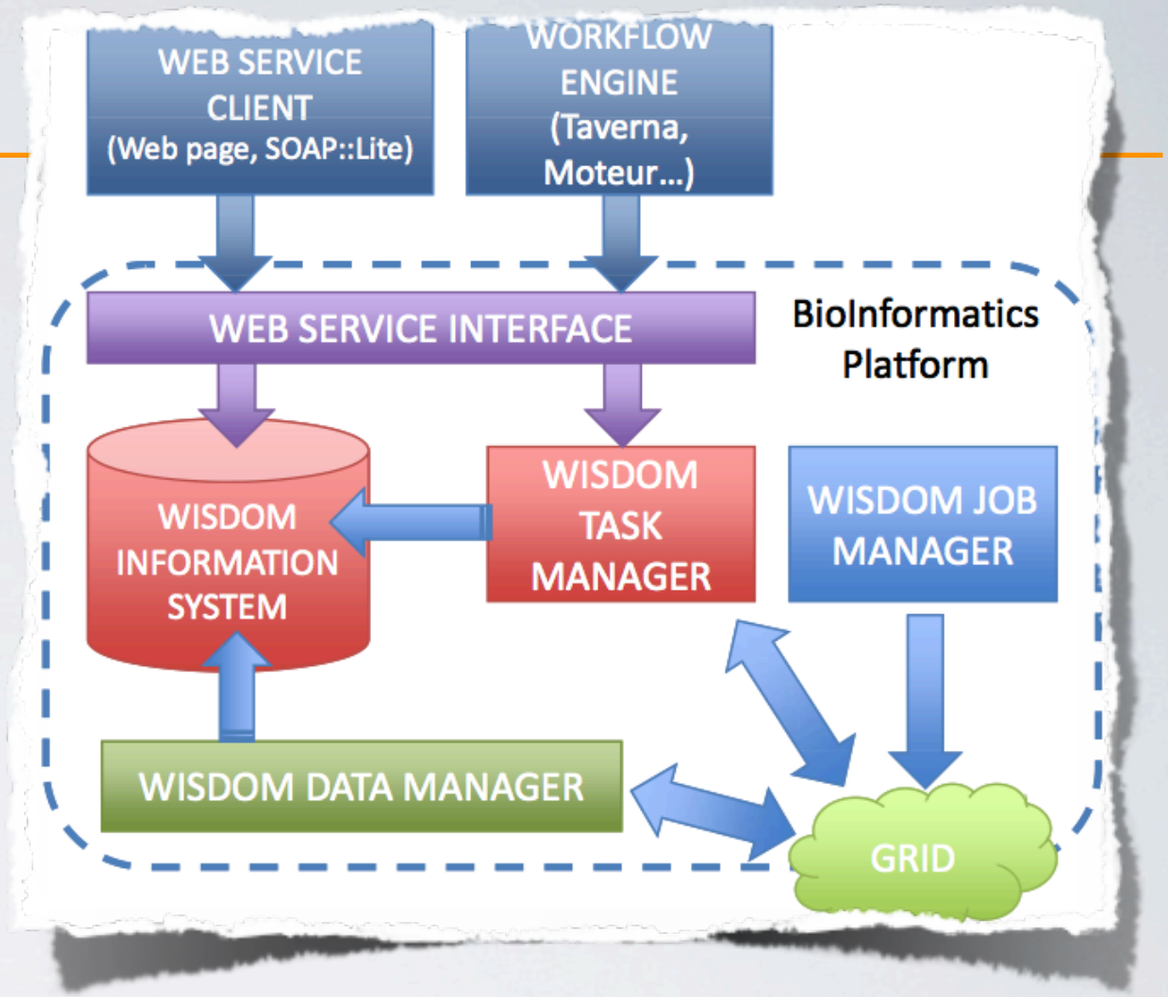
But :
- Detection and correction of failures on the Grid is time consuming
- too painful for some potential users

Requirements :
- Need to develop intermediate software layer to facilitate the use of the Grid

Conclusions

Many tools have been developped by other communities

Example :
- Bio-Informatics
- Earth Science
- High Energy
- ...



A&A community : interoperability layer (Virt. Obs.)
Other communities : Have developped tools for Grid computing

Should take benefit of other developments to Improve fault tolerance & monitoring :

- Automatic creation of JDL files to run massive amounts of models
- Control job submission
- Identification of failures
  - check status
  - resubmit if needed
  - re-initialize proxy if required
  - ...