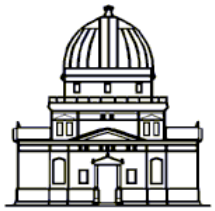


Observatoire astronomique
de Strasbourg

Science @ CDS

CDS Scientific Council

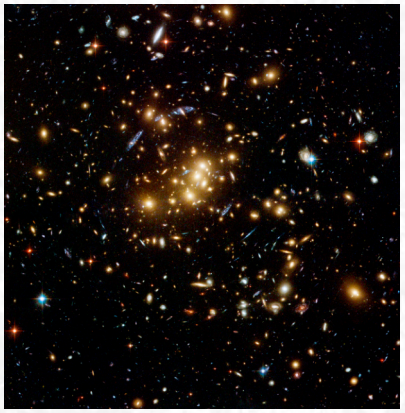
September 19 2012

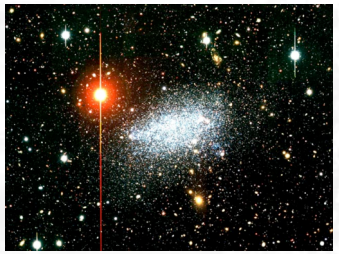
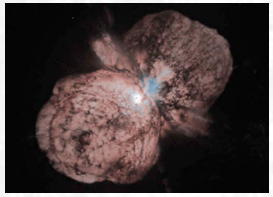
CDS content

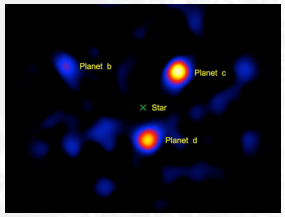
Observatoire astronomique de Strasbourg

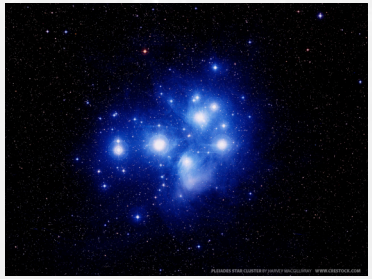
Science highlights, CDS counsil 2012

A wide variety of objects reflecting different scales in the universe



CDS content

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

- over 200 object types in Simbad:
  - hierarchichal
  - multi-wavelength
  - specialised
- Need for expert knowledge for data curation

Standard name	Cond.	Extended explanation
Unknown	?	Object of unknown nature
Radio	Rad	Radio-source
- Radio(m)	mR	metric Radio-source
- Radio(cm)	cm	centimetric Radio-source
- Radio(mm)	mm	millimetric Radio-source
- Radio(sub-mm)	smm	sub-millimetric source
- HI	HI	HI (21cm) source
- radioBurst	rB	radio Burst
- Maser	Mas	Maser
IR	IR	Infra-Red source
- IR>30um	FIR	Far-IR source (λ >= 30 µm)
- IR<10um	NIR	Near-IR source (λ < 10 µm)
Red	red	Very red source
- RedExtreme	ERO	Extremely Red Object
Blue	blu	Blue object
UV	UV	UV-emission source
X	X	X-ray source
- ULX?	UX?	Ultra-luminous X-ray candidate
- ULX	ULX	Ultra-luminous X-ray source
gamma	gam	gamma-ray source
- gammaBurst	gB	gamma-ray Burst
Inexistent	err	Not an object (error, artefact, ...)
Gravitation	grv	Gravitational Source
- LensingEv	Lev	(Micro)Lensing Event
- Candidate_LensSystem	LS?	Possible gravitational lens System
- Candidate_Lens	Le?	Possible gravitational lens
- Possible_lensImage	LI?	Possible gravitationally lensed image

CDS content

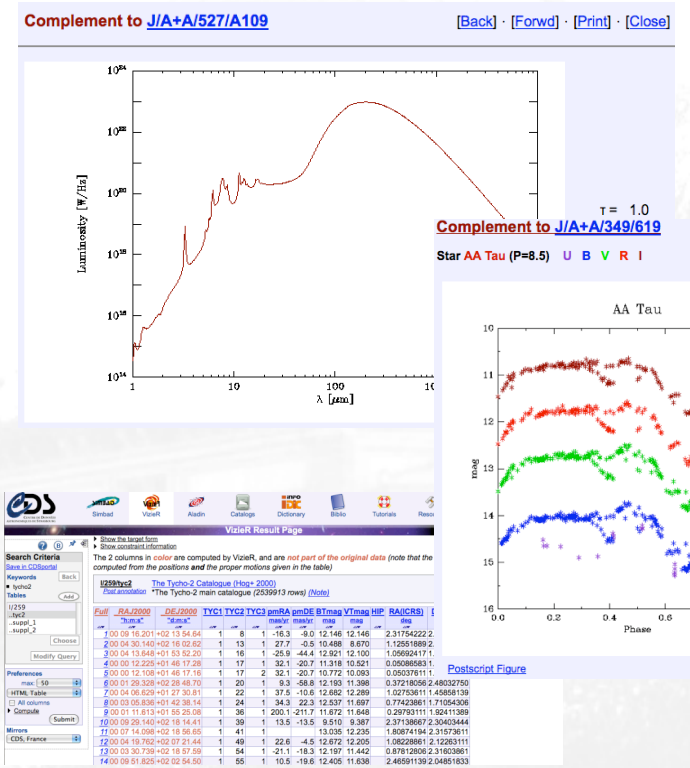
Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

- variety in data types:
  - astrometry
  - photometry & fluxes
  - spectroscopy
  - time domain (ephemerides & light curves)

  ⇒ associated physics and techniques are different

  - individual objects
  - catalogues



A Science Team @ CDS

Observatoire astronomique de Strasbourg

- Variety of data ⇒ different techniques and different physics associated
- Amount of data produced by observations too large ⇒ a selection of important data must be made

⇒ data ingestion and curration must be “supervised” by specialists

- Need for a scientific team @ CDS to oversee these points

⇒ expertise within the team must cover as many aspects as possible

⇒ need for active scientists to follow the evolution of astronomy

⇒ intrinsically different from a standard science team

Expertise @ CDS

Observatoire astronomique de Strasbourg

Science Team:

- M. Allen
- C. Bot
- L. Cambresy
- S. Derriere
- F. Genova
- C. Loup
- F. Ochsenbein
- P. Ocvirk
- A. Siebert
- B. Vollmer

Expertise:

- stars & peculiar stars
- star formation
- ISM & Extinction
- Galactic dynamics
- physics of galaxies
- clusters of galaxies
- cosmology & reionisation
- numerical simulations
- catalogues
- data description and access

Participation in large projects

Observatoire astronomique de Strasbourg

- Planck
- Gaia
- IVOA
- Euro-VO

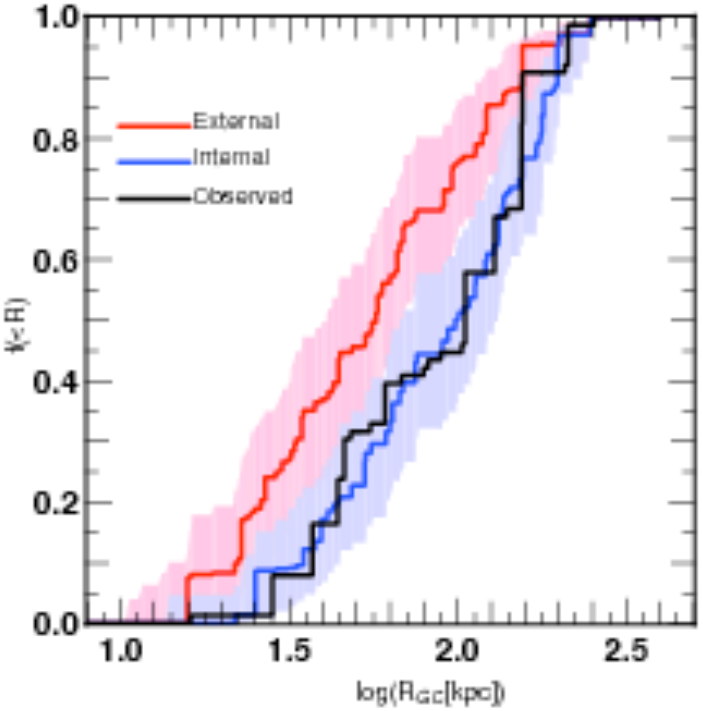
- Herschel
- APEX/LABOCA, JCMT/SCUBA-2
- Mopra, VLA
- RAVE, Gaia-ESO, GREAT, (WEAVE)

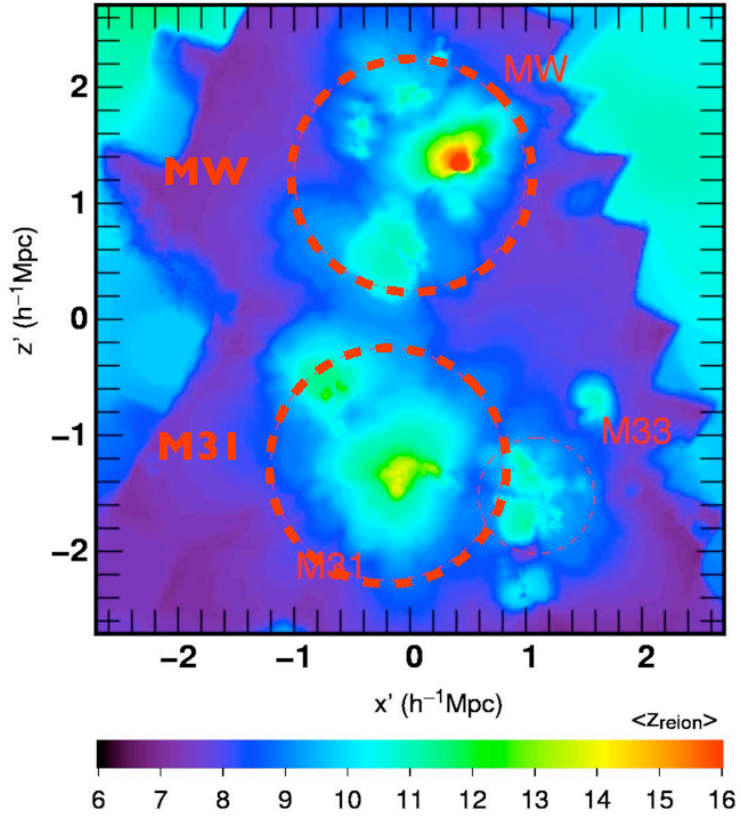
Reionisation of the local group

Observatoire astronomique de Strasbourg

Impact of reionisation scenarios on the MW satellite galaxies properties (Ocvirk et al.)

Use of CLUES simulations + ATON (radiative transfer) + semi-analytic codes





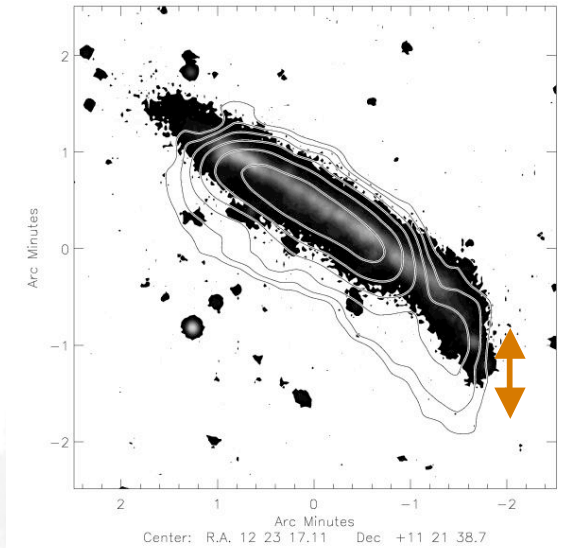
Ram pressure stripping and star formation in the stripped Virgo spiral galaxy NGC 4330

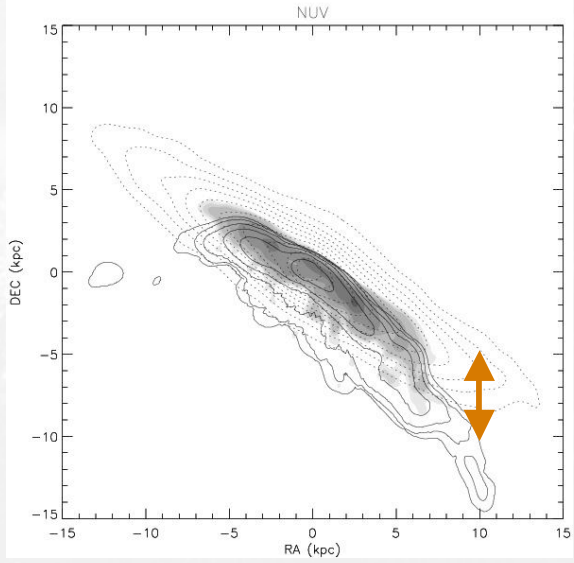
Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(Vollmer et al. 2012a)

- Truncation of the gas disk
- One-sided UV and HI tail
- Offset between HI and UV tail
- Model: reproduction of these features; explanation: ram pressure stripping; Star formation Efficiency (SFE) decreases in the stripped gas; collapsing, starforming gas clouds decouple from the ram pressure wind





Observations
Greyscale: GALEX UV
Contours: VLA HI

Model
Greyscale: UV
Contours: HI

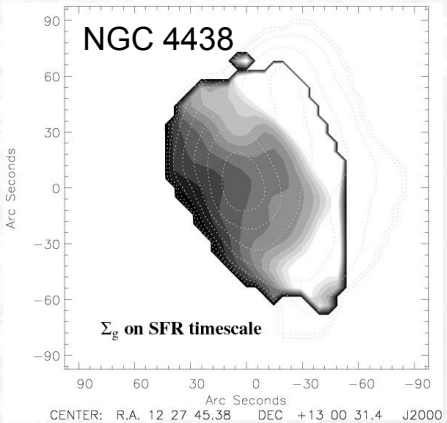
The star formation efficiency (SFE) of Virgo cluster spiral galaxies

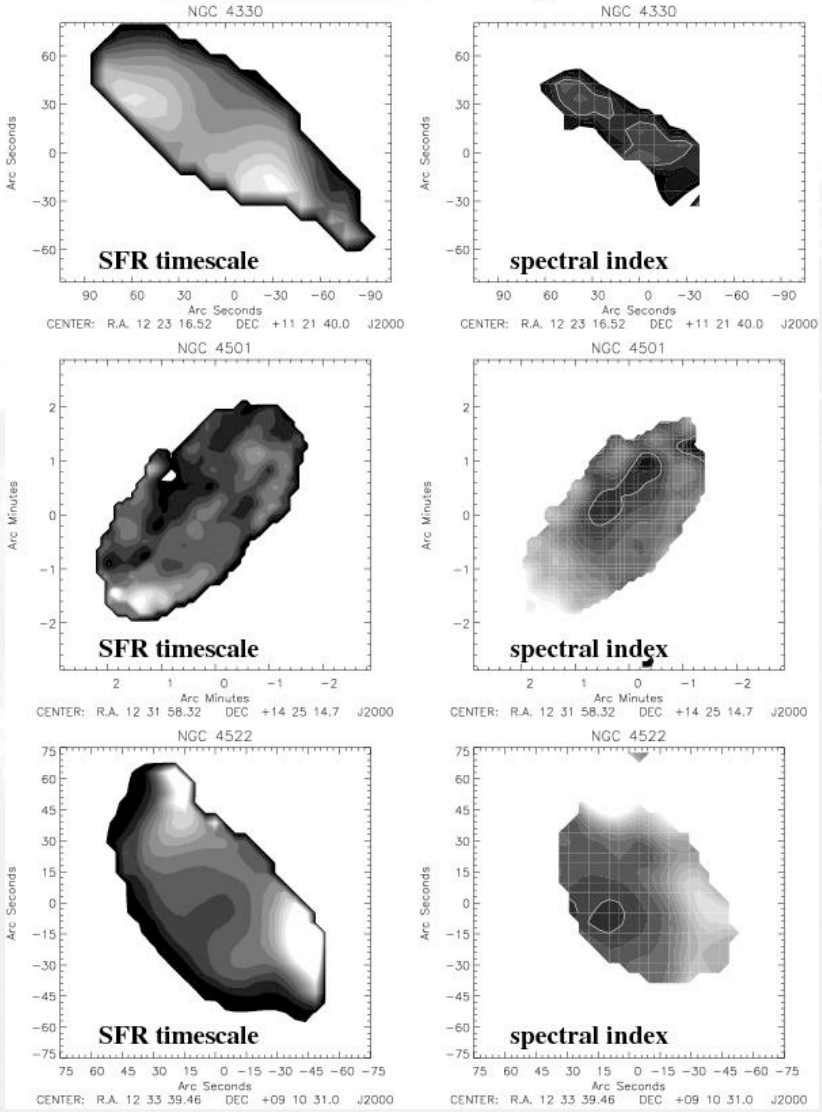
Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(Vollmer et al. 2012b)

- VLA HI + radio continuum, Nobeyama CO, GALEX UV, Spitzer IR
- SFE w.r.t. molecular gas is about constant as for field spirals except in NGC 4438
- SFE w.r.t. total gas decreases in the stripped gas + steepening of the spectral index (aging)





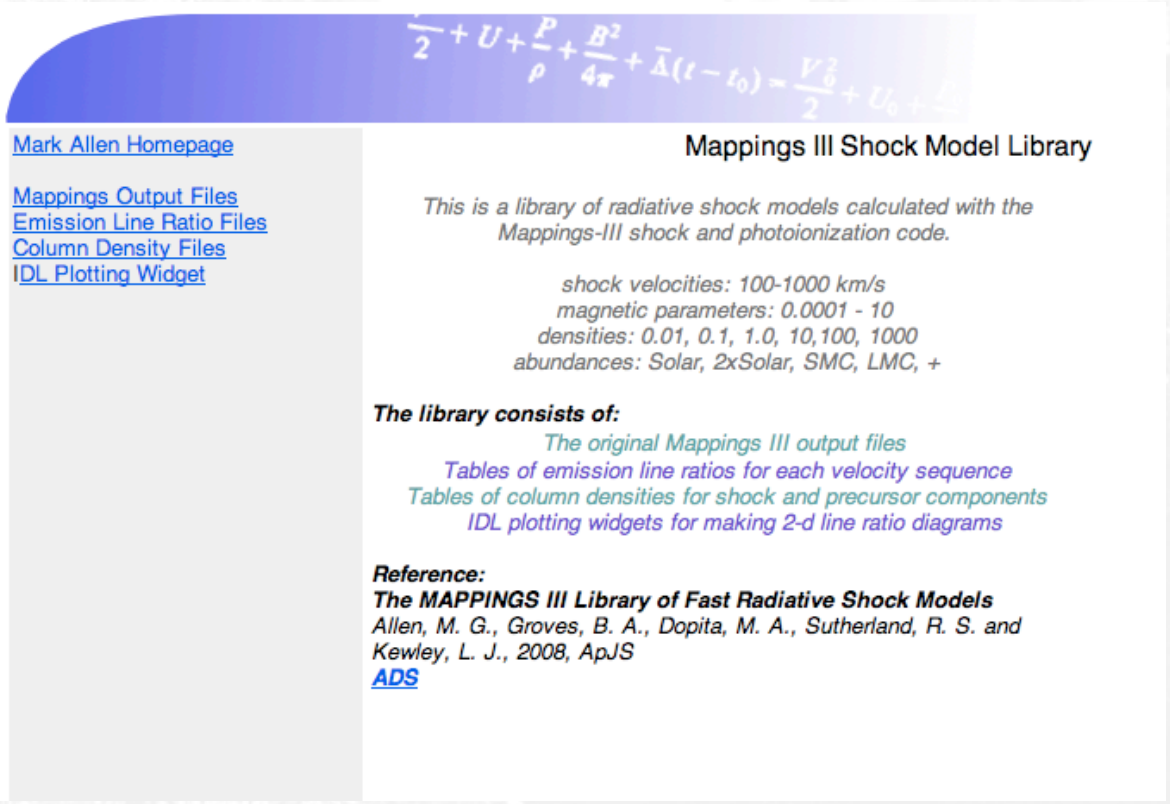
Modeling of fast radiative shocks

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(Allen et al. 2008)

A library of fast shocks was published in 2008 and support has been provided to application of these models in many different contexts. (100+ citations)



Mark Allen Homepage

Mappings Output Files
Emission Line Ratio Files
Column Density Files
IDL Plotting Widget

Mappings III Shock Model Library

This is a library of radiative shock models calculated with the Mappings-III shock and photoionization code.

shock velocities: 100-1000 km/s
magnetic parameters: 0.0001 - 10
densities: 0.01, 0.1, 1.0, 10,100, 1000
abundances: Solar, 2xSolar, SMC, LMC, +

The library consists of:

The original Mappings III output files
Tables of emission line ratios for each velocity sequence
Tables of column densities for shock and precursor components
IDL plotting widgets for making 2-d line ratio diagrams

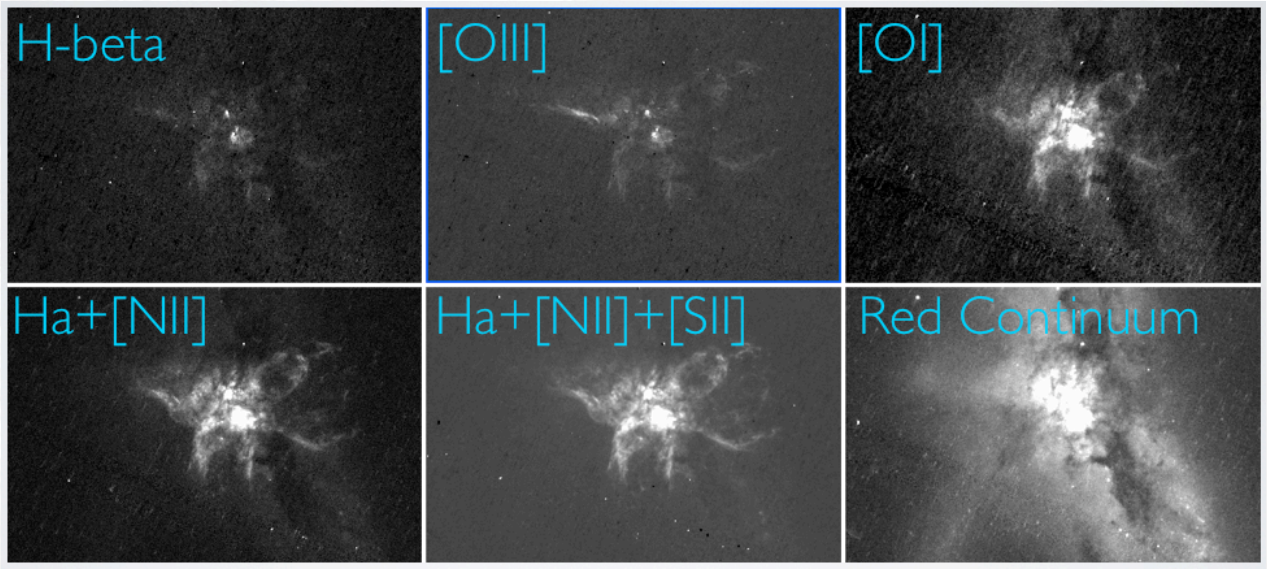
Reference:
The MAPPINGS III Library of Fast Radiative Shock Models
Allen, M. G., Groves, B. A., Dopita, M. A., Sutherland, R. S. and Kewley, L. J., 2008, ApJS
ADS

Shocks in merging systems

Observatoire astronomique de Strasbourg

(Allen et al.)

- project obtained Hubble Space Telescope time in cycle 19
- observations of deep emission line imaging of two interacting galaxies
- detailed spatially resolved analysis of emission line ratio maps is in progress
- Comparison will be made with a full range of shock, AGN and starburst models of ionized gas.



Dust in the Magellanic clouds

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(Bot et al.)

Magellanic clouds SEDs very difficult to model with current dust models

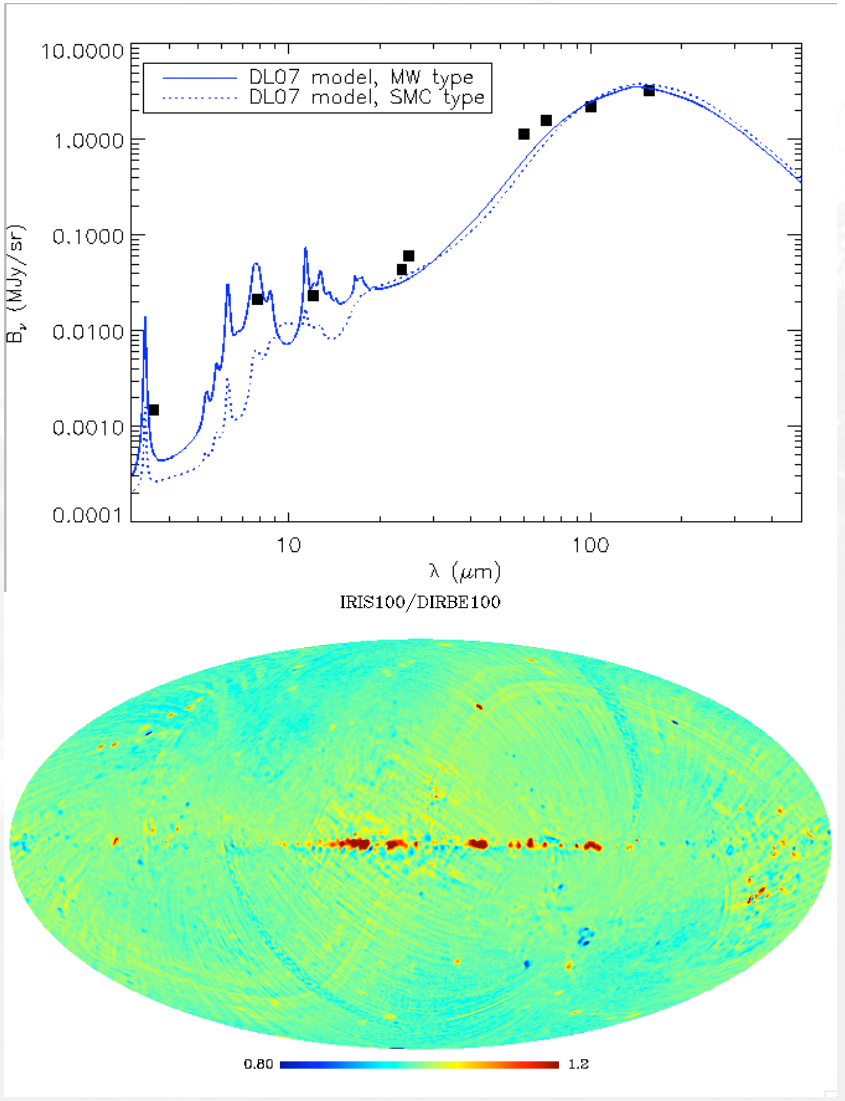
- flat from 60 to 160µm

•<u>Benchmarking effort</u> of the different existing dust models on a set of test SEDs

- ongoing work with 72 “dust experts”

•Re-assessment of the data:

- <u>comparison of IRIS and DIRBE at 100µm</u> show discrepancies
- not explained by color corrections nor emission lines
- unknown origin yet



Are there M-star AGB stars with fossil dust shells?

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(C. Loup et al.)

Asymptotic Giant Branch stars : He burning

- Many are variables (Miras, Srs, L irregular), but not all
- Mass-loss from 1D-7 to 1D-4 Mo/yr
- Believed to undergo several phases of mass-loss with interruptions

Is it possible to observe the fossil dust shells ?

Carbon stars : yes

- IRAS results : many have a FIR excess at 60μ compared to 12-25μ, indicating a fossil dust shell
- IRAS + ISO + Hershell maps : rings resolved for 13 C stars and 1 S star

Are there M-star AGB stars with fossil dust shells?

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

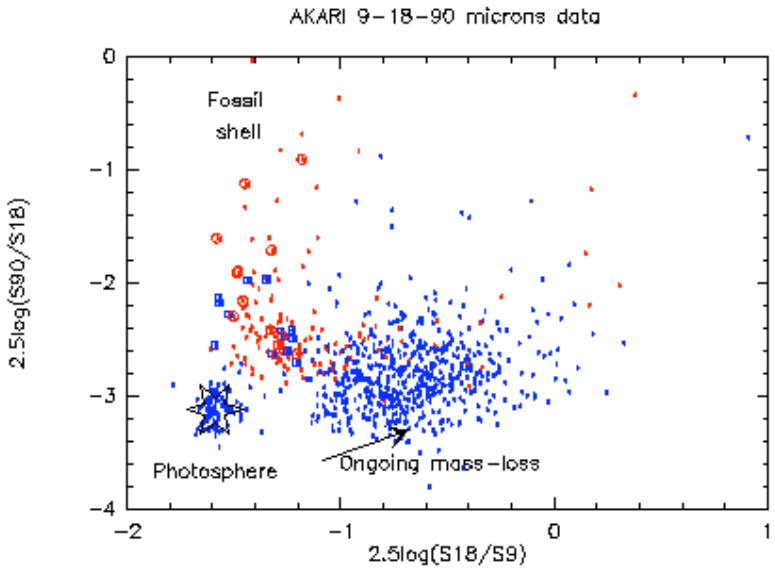
What about the M (O-rich) AGB stars ? A few cases with FIR excess in IRAS, but still controversial

•AKARI-IRC (9+18μ) and AKARI-FIS (90μ) surveys, and still the IRAS survey + Compilation of spectral types (B.Skiff, in Vizier) : 118000 M stars

• The data support the idea that both C and M stars undergo episodic mass-loss; M stars with FIR excess at 60 or 90μ are however 20 times rarer than C stars

•Evolutionary sequence observed with both IRAS and AKARI data :
ongoing mass-loss → interruption → fossil shell → fossil shell + ongoing mass-loss

---> Project :
Observe a ring around an M AGB star → proposal for discretionary time on Hershell



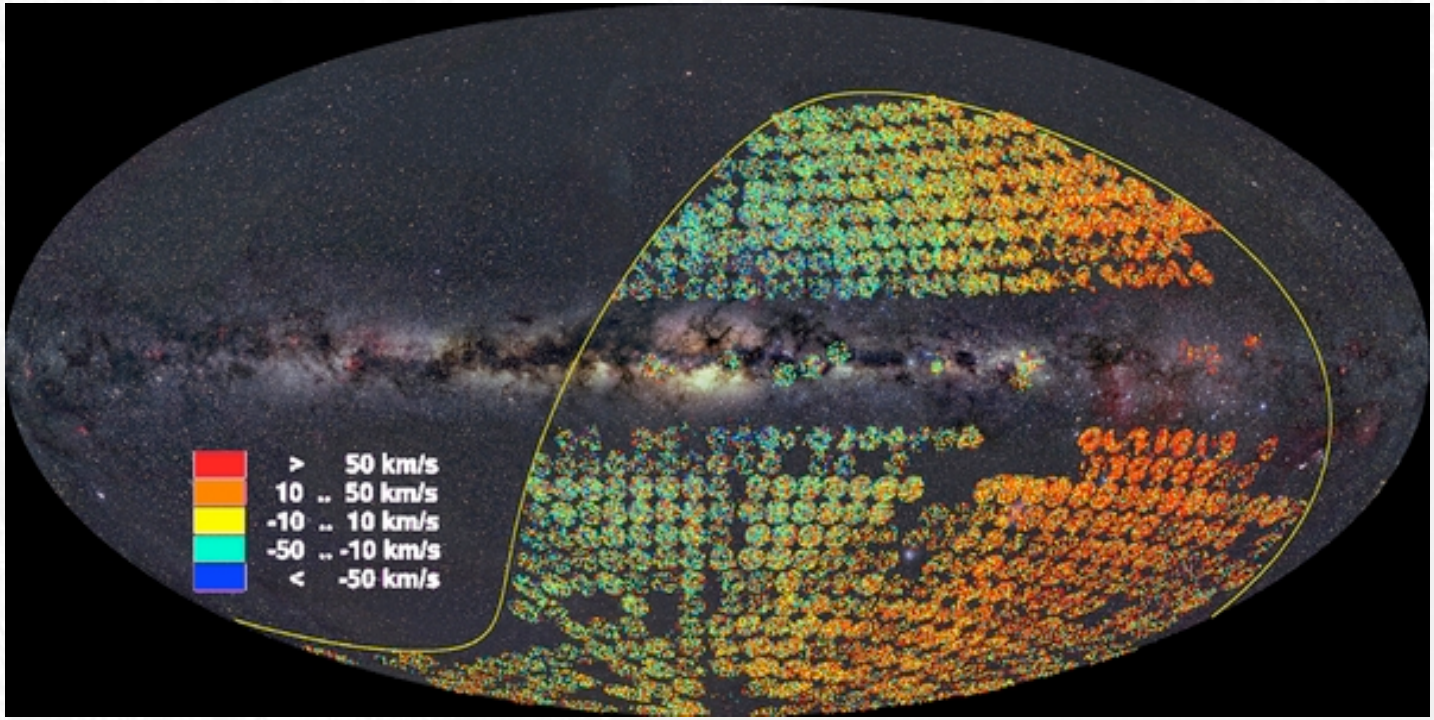
RAVE Data Release 3

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

(Siebert et al. 2011)

RAVE 3rd data release: full pilot survey
- 83,072 radial velocities
- atmospheric parameters for 39,843 stars
- available through VizieR & Simbad



The properties of the local spiral arms

Observatoire astronomique de Strasbourg

Science highlights, CDS counsil 2012

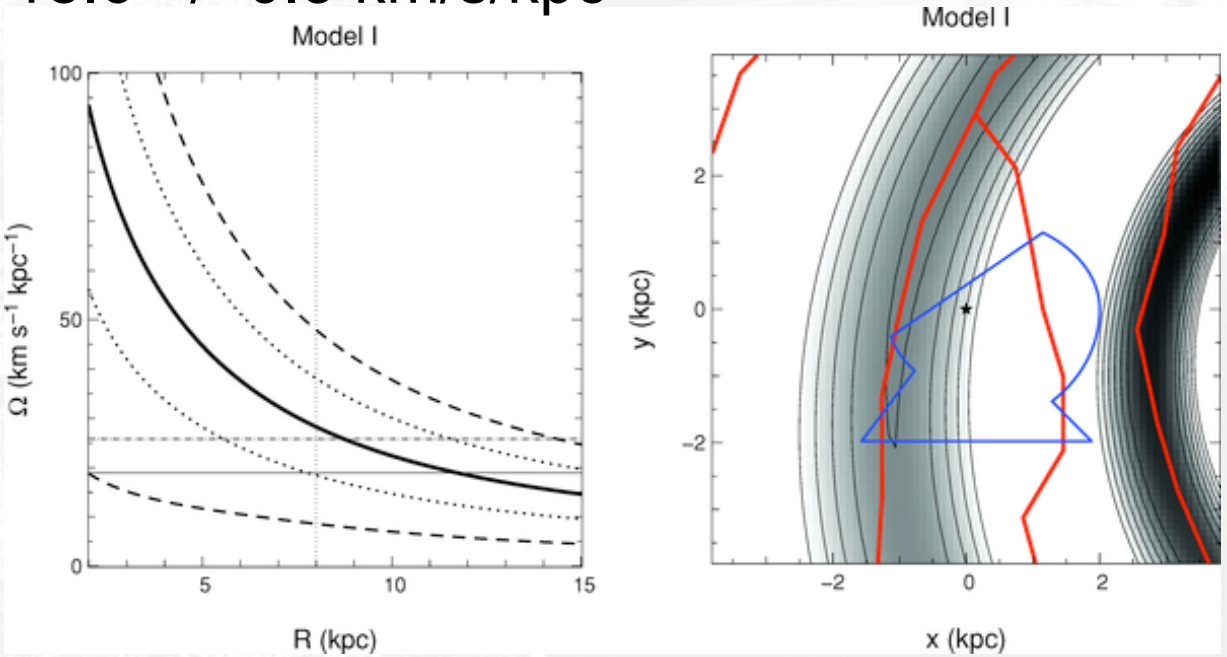
(Siebert et al. 2012)

density wave model + radial velocity gradient in the disc (Siebert et al. 2011) ⇒ constrains on spiral arms perturbation:

m=2 dominant mode

A~0.55 +/- 0.02 % of the background potential

Ω~18.6 +/- 0.3 km/s/kpc



Summary

Observatoire astronomique de Strasbourg

- The scientific team @ CDS covers a wide range of expertise
  - different from a standard scientific group
  - linked to the needs of the different services
  - important to foresee the needs of the astronomical community
- Implication in many large projects, ongoing or planned
- Scientifically active researchers