Leibniz-Institut für Astrophysik Potsdam

AIP

ISC proudly presents:

First AIP-Jamboree, June 13, 2014

The rules of the game:

- 2 minutes (2 slides)

- Present yourself and your work

- Get to know the colleagues

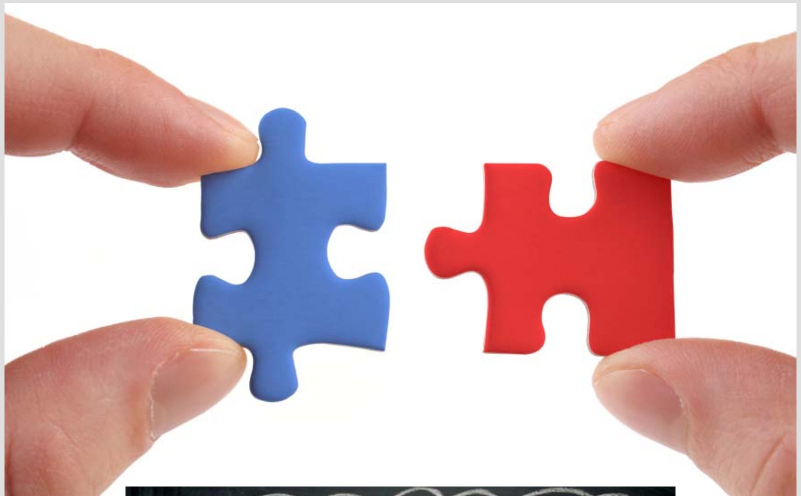
Silvia Adelhelm
innoFSPEC

Knowledge and technology transfer at the AIP

…enabling multidisciplinary transfer to foster innovations

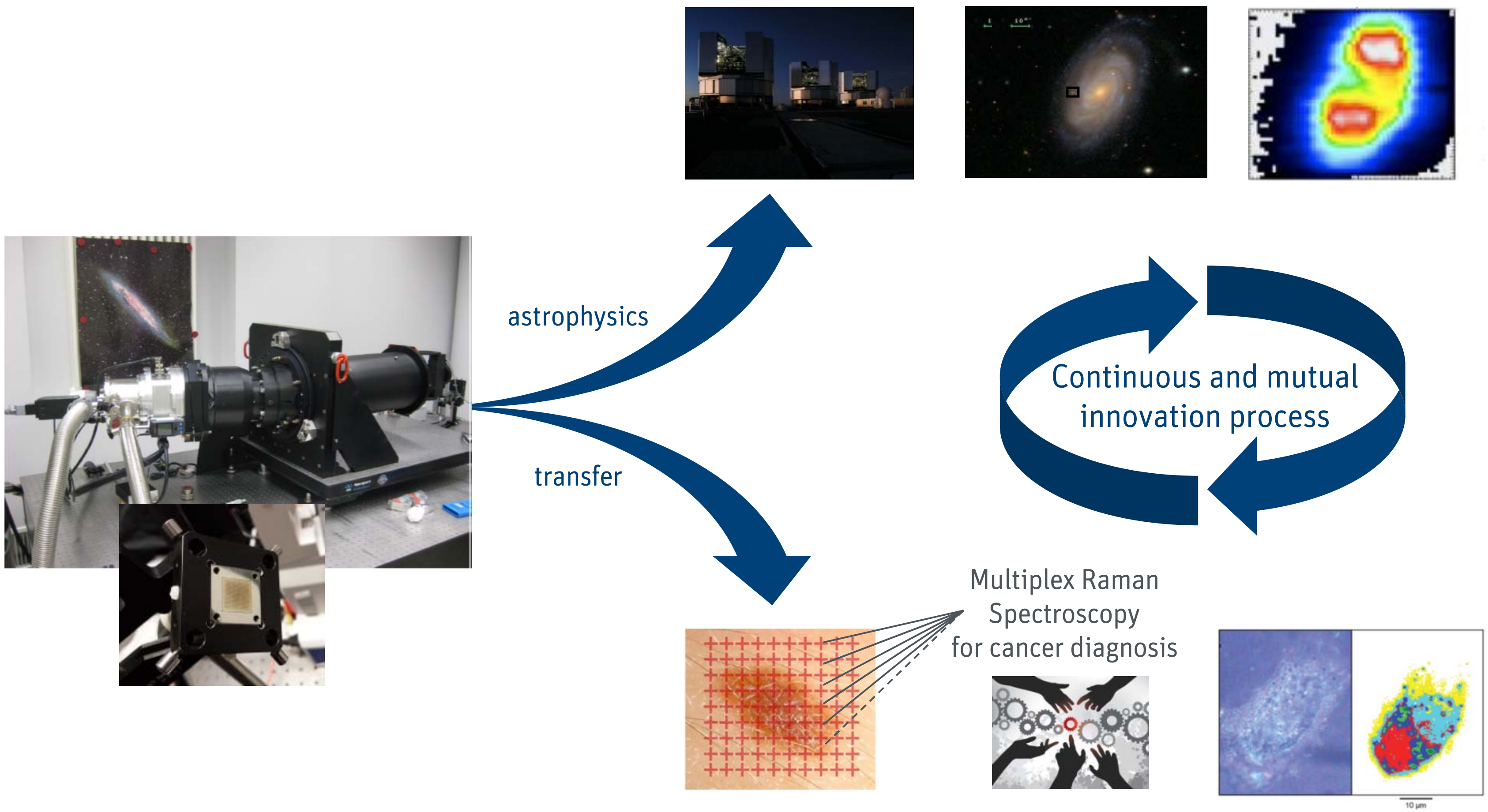
AIP - KTT

AIP
basic research



transfer partners
from science,
society and
industry

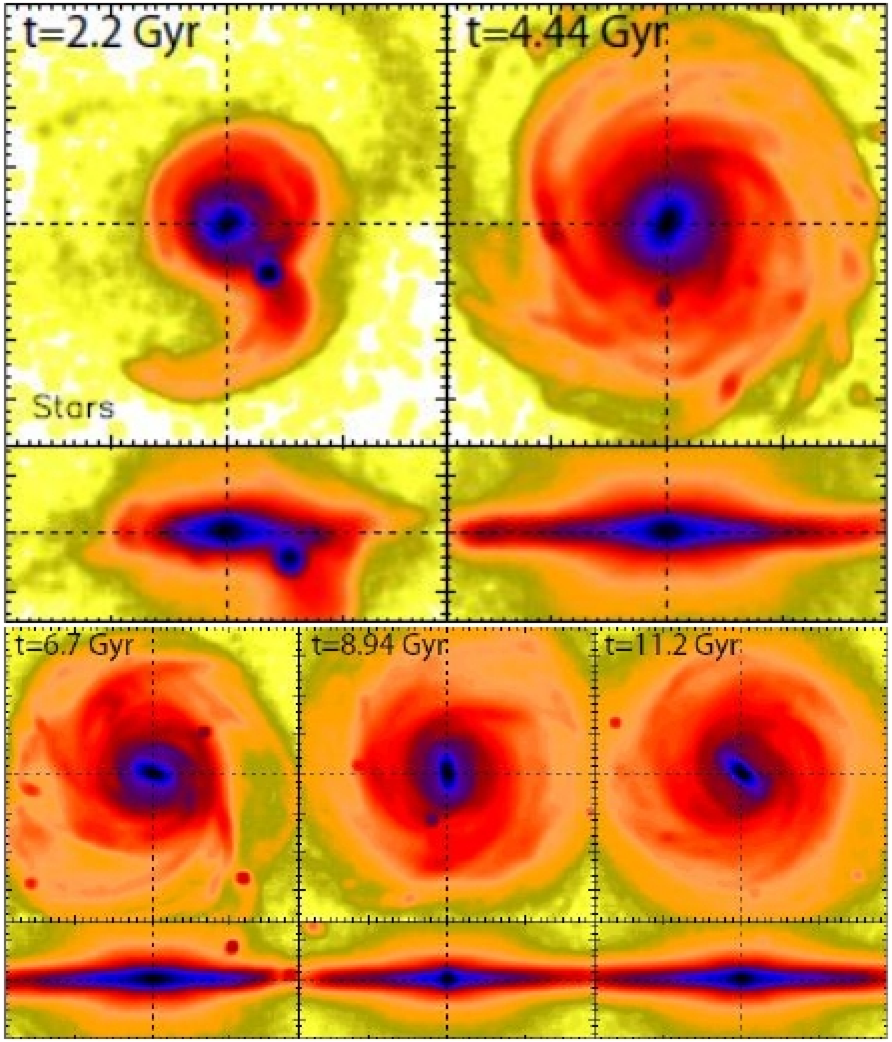
Transfer example – from astrophysics to medicine



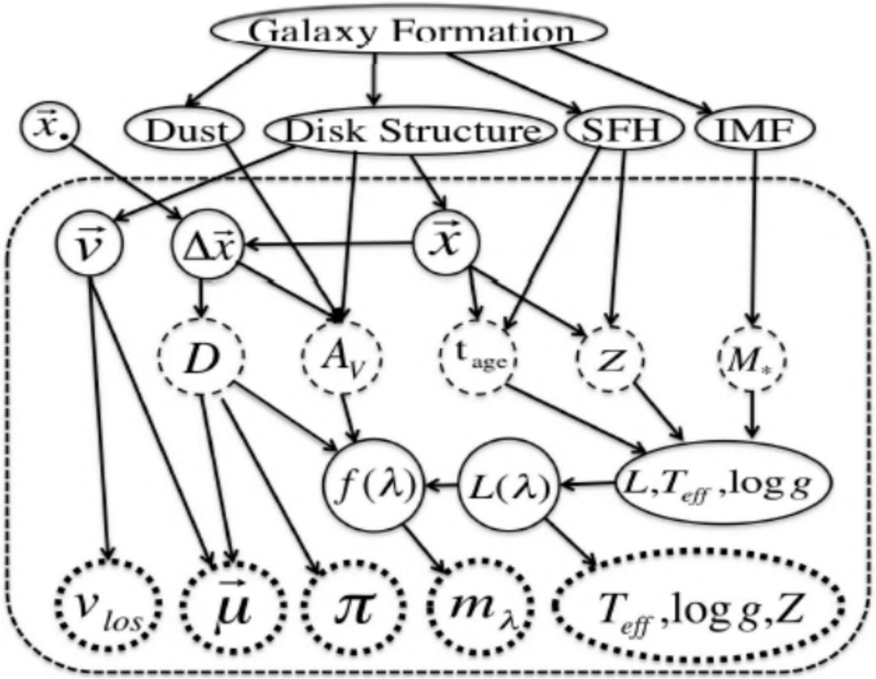
Friedrich Anders

Milky Way and the Local Volume

Galactic Archaeology

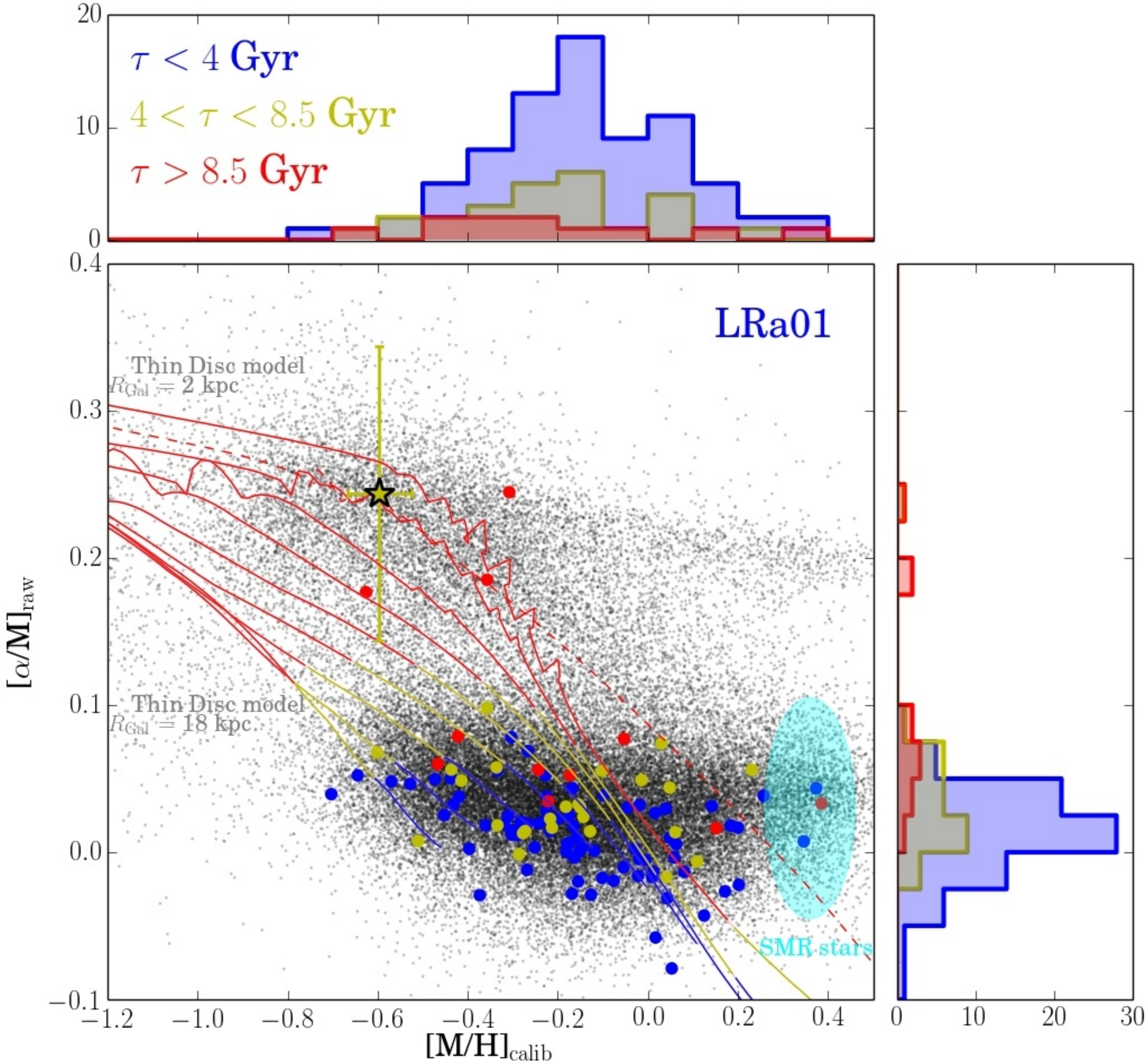


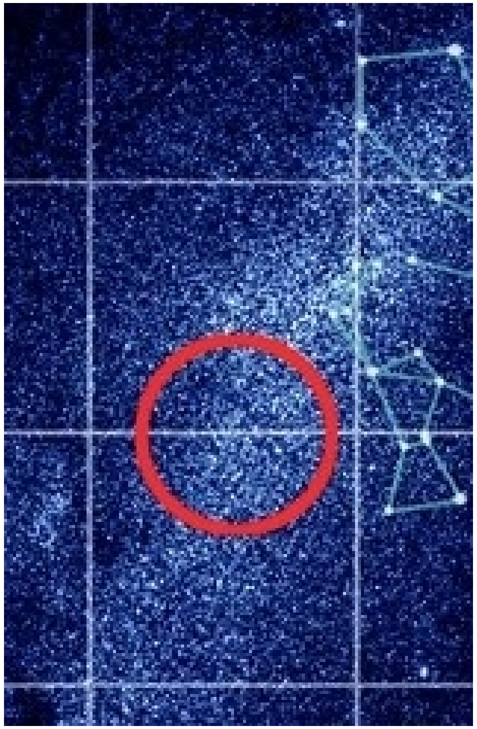
Minchev, Chiappini, Martig (2013), A&A, arXiv:1208.1506



Rix & Bovy 2013, arXiv:1301.3168

Galactic Archaeology



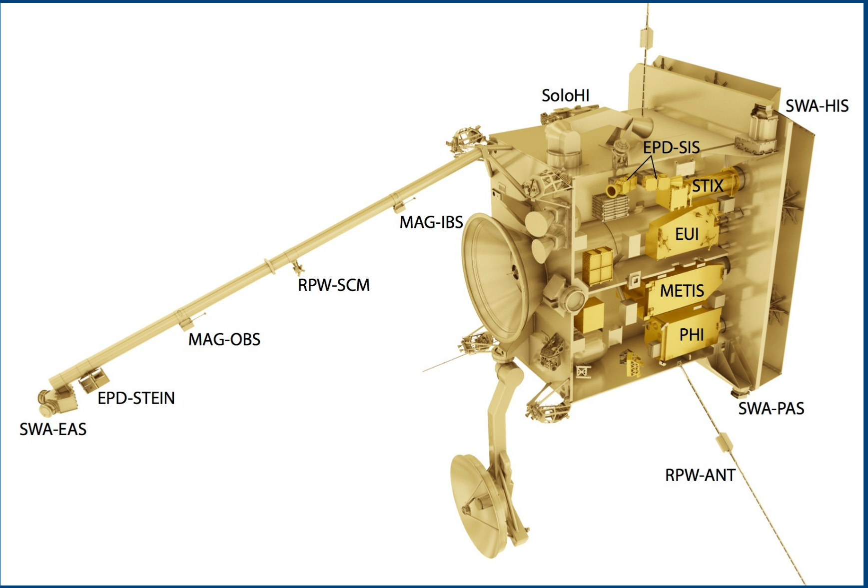


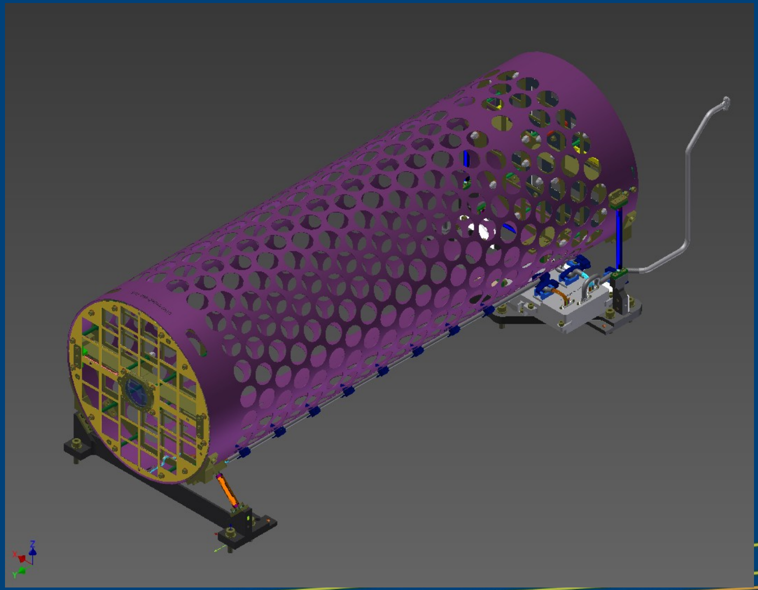
James Anderson
Solar Radio

Leibniz-Institut für Astrophysik Potsdam

James M Anderson

AIP STIX Imager Project Manager
(Imaging part of the X-ray imaging spectrograph instrument for the ESA Solar Orbiter Mission)

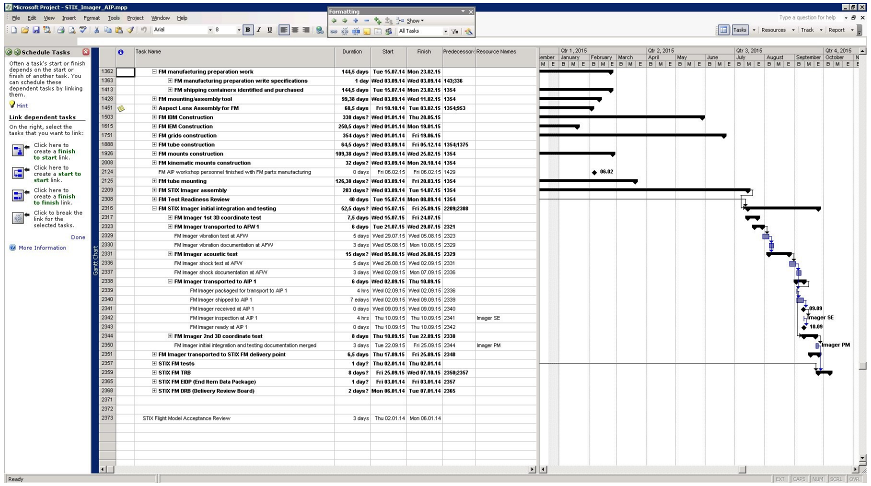




STIX

Activites

- Project planning
  - Time, personnel, resources planning and scheduling
  - Budget planning
- Investigation of implications of spacecraft requirements
  - Effects of space and radiation exposure on transmissivity of molecular contamination
  - Methods for charge dissipation on space-exposed optics surfaces
- Interactions with PI, collaborating groups, subcontractors, …
  - Instrument design development
  - Negotiations on who does what for how much
- Documentation...



- In my ``free'' time

http://lsdc.aip.de/

  - Occasional discussions on radio interferometry imaging techniques with F Breitling
  - Continued work on preparing to study magnetic field structures in AGN jets at resolutions down to ~ 10 μas (RadioAstron)

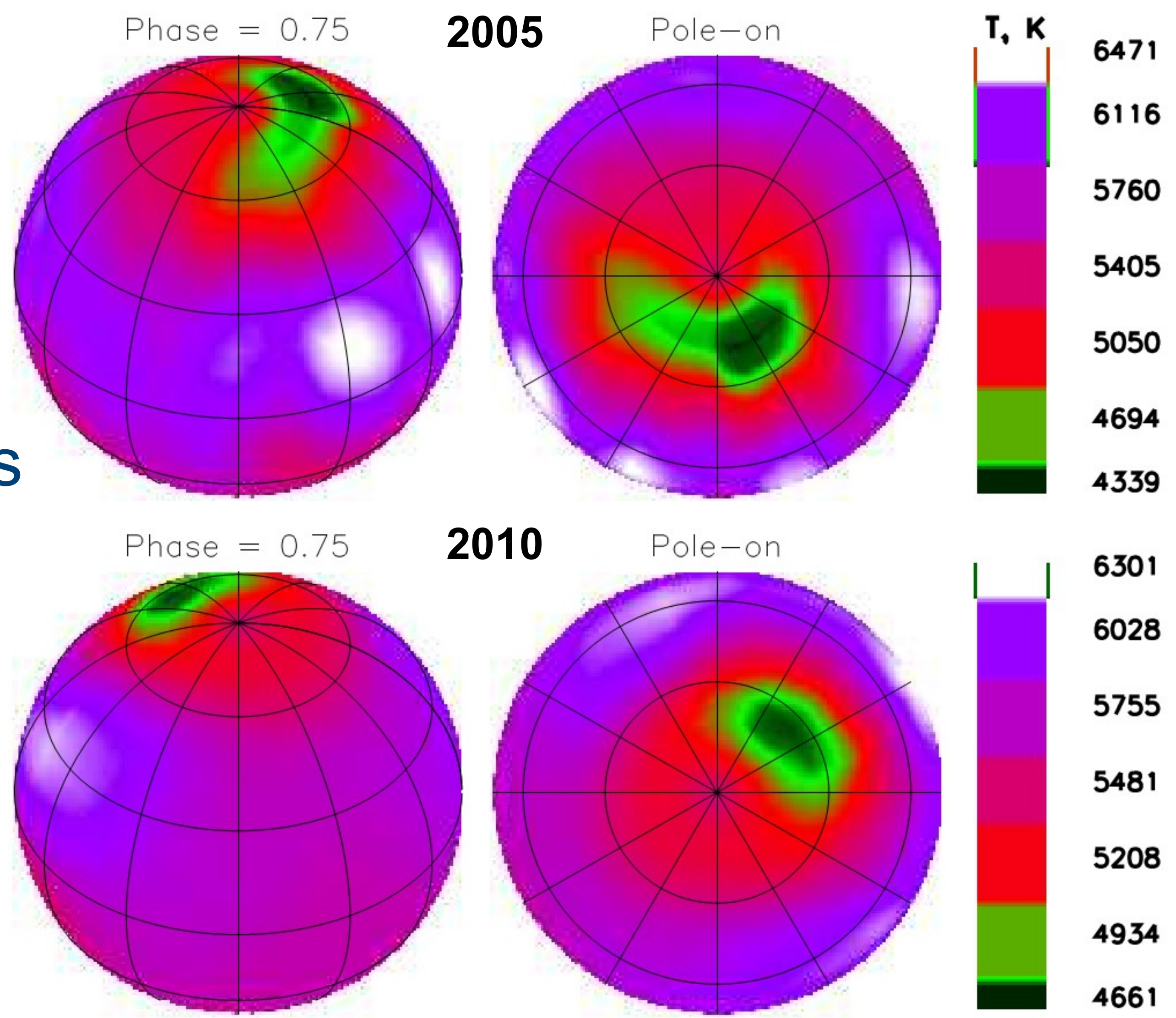
http://www.asc.rssi.ru/radioastron/

Rainer Arlt
MHD

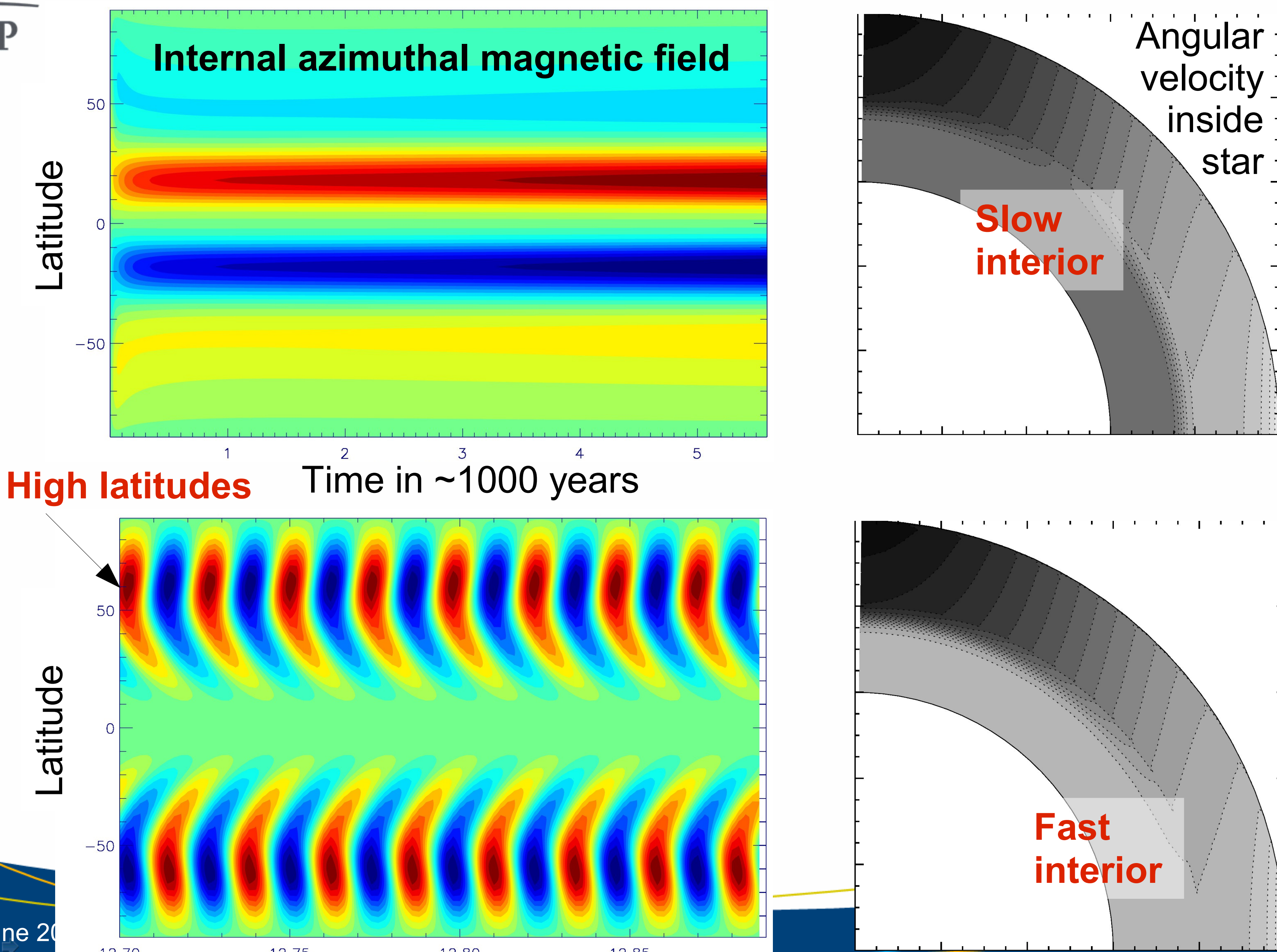
Dynamos for observed star spots

Järvinen et al (2014)

- Observations: AF Leporis
- Spots at 61–68° latitude
- Dynamo models based on mean induction effect of stellar convection (α-effect)



Dynamo solutions for AF Lep



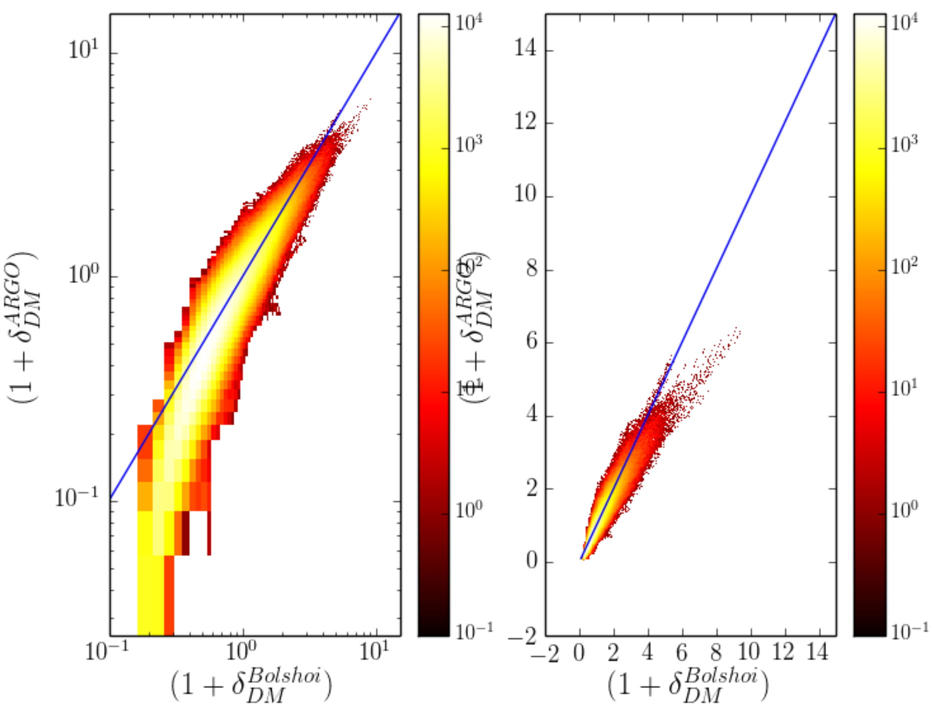
Metin Ata
Cosmology

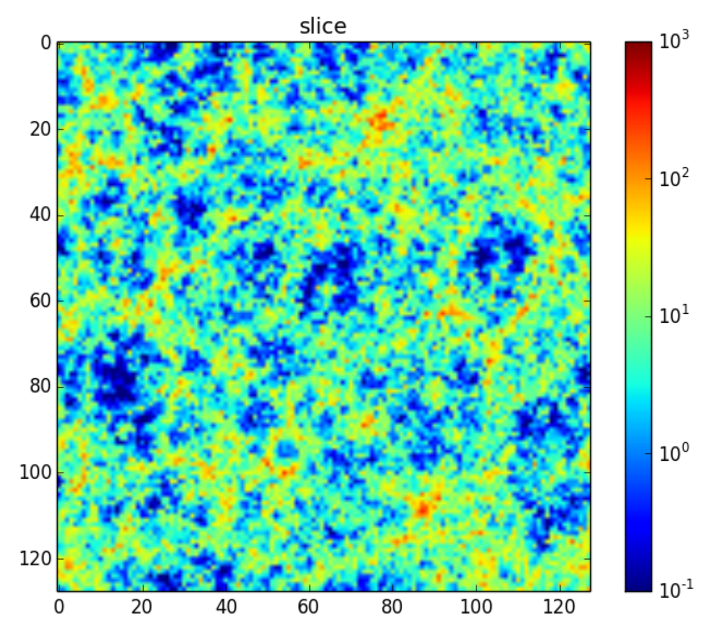
Metin Ata at the Jambo

- PhD Student in Cosmology
- Master Degree in particle physics
- Left due to error propagation

Metin Ata at the Jambo

- Research interest in cosmic density fields
- Statistics of Clustering
- Inference of cosmological parameters

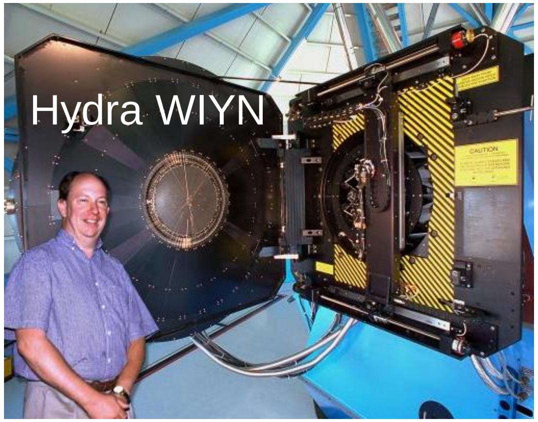


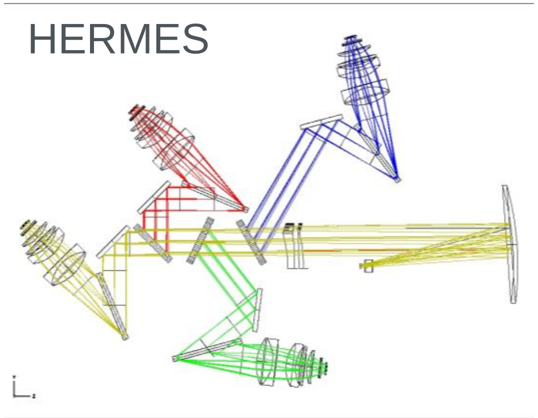


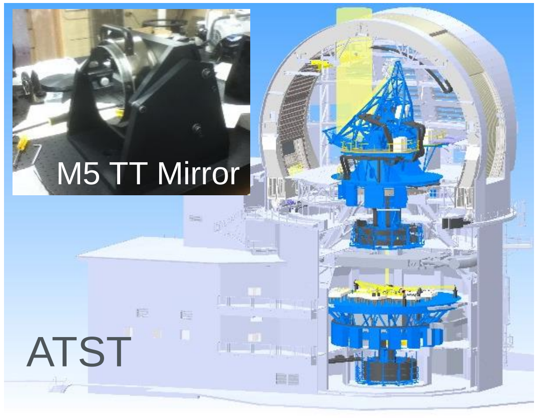
Samuel Barden

Milky Way and the Local Volume

Samuel Barden – 4MOST Project Engineer
Started January 2014 at AIP







Tucson, AZ

- Early Fiber Optics and VPH Grating Expertise
- NOAO Instrument Scientist
- Nessie, Hydra (Mayall, WIYN, Blanco) MOS
- DensePak IFU
- GSMT ELT Early Instrument Concepts

Australia

- AAO Head of Instrumentation
- WFMOS Studies
- HERMES Design Specification and Development
- Enhancement of Project Management

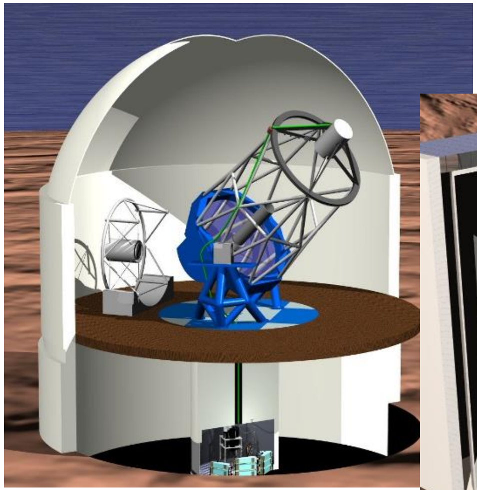
Sunspot, NM

- NSO ATST Wavefront Correction Manager

Scientific Interests

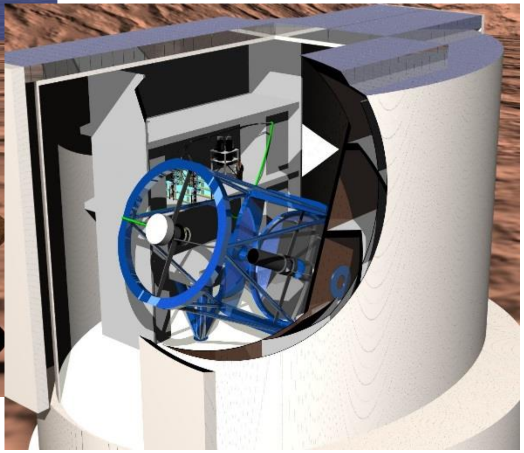
- Active Chromosphere Stars
- High Precision Spectroscopy

Samuel Barden – 4MOST Project Engineer



WFMOS Gemini

WFMOS Subaru



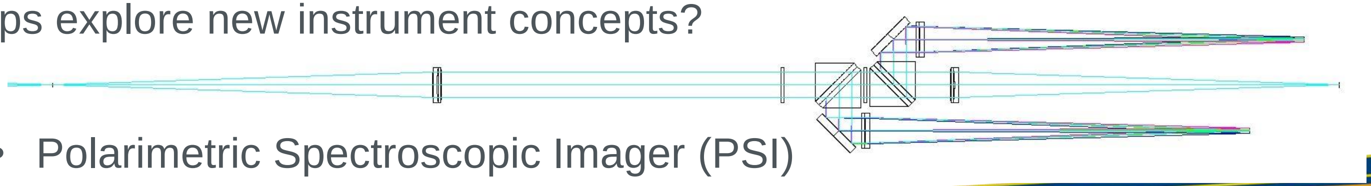
4MOST

AIP Objectives:

Career long dream of large aperture wide field multi-object spectroscopy to be fullfilled

- f/6 Gemini option (late 1980s) (not implemented)
- SWIFT → KAOS → WFMOS Gemini → WFMOS Subaru (1998 to 2007) (cancelled after conceptual design study)
- 4MOST (present day) (on path to implementation at end of current decade!!)

Perhaps explore new instrument concepts?

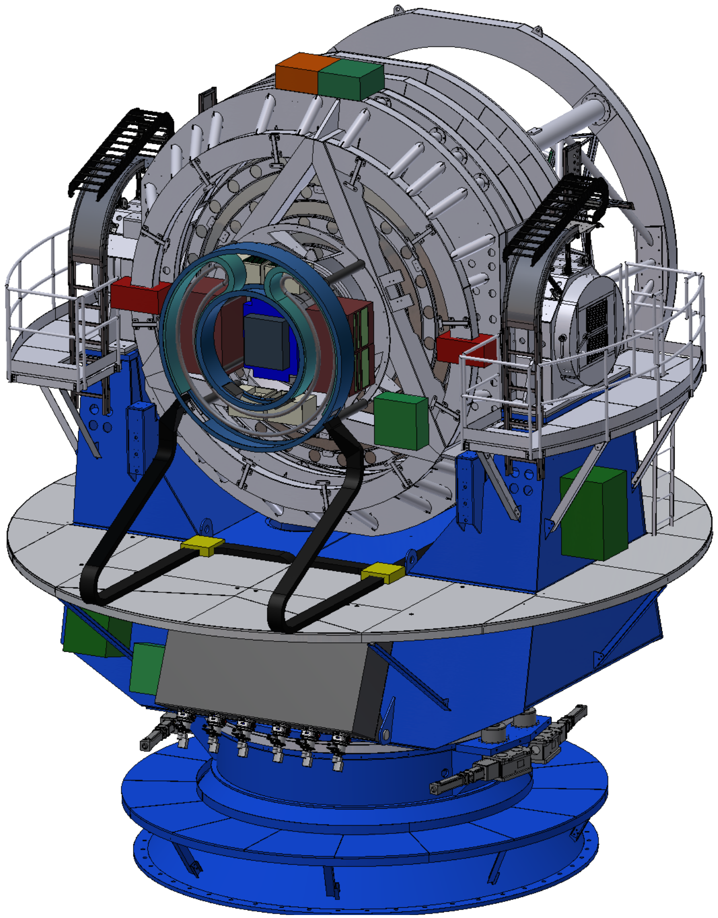


- Polarimetric Spectroscopic Imager (PSI)

Olga Bellido Tirado

innoFSPEC

4MOST– 4m Multi-Object Spectroscopic Telescope



- **4MOST Facility** is a very high-multiplex, wide-field fibre-fed spectrograph system for the ESO **VISTA** telescope.

- Complex system made up of **16 subsystems** including:
  - Wide Field Corrector
  - Fibre Positioner
  - Low Resolution Spectrographs
  - High Resolution Spectrograph

Systems Engineering in 4MOST

- Systems Engineering is an interdisciplinary approach that provides the means to enable the realisation of successful complex systems.

- A Systems Engineer:
  - focuses on the relationship between the different subsystems,
  - deals with requirements specifications, the flow down from science requirement to the technical specifications,
  - manages interfaces between the different subsystems, making sure that when two components are physically or logically connected, they both know how they interact.

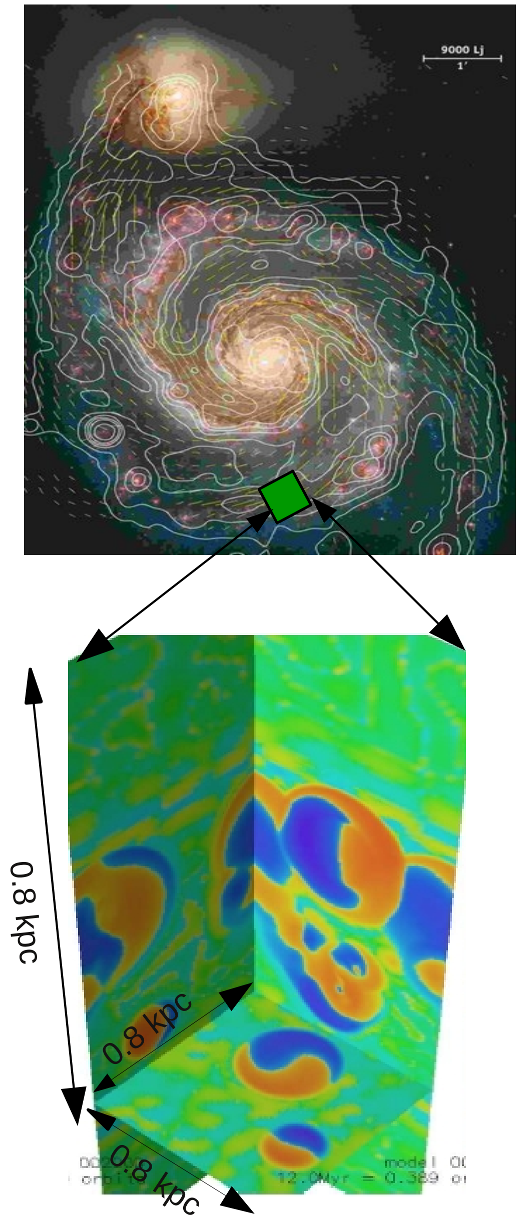
Abhijit Bendre

MHD

Supernova Driven Dynamo

Bendre A., Elstner D.

M51, Fletcher et al (2011)



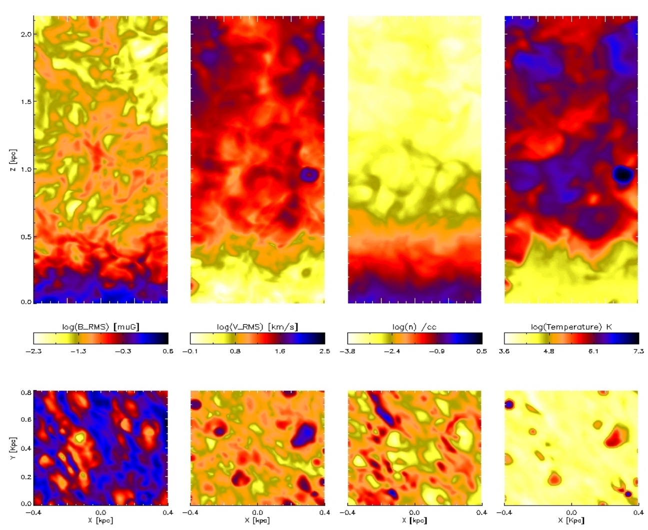
Motivation and introduction

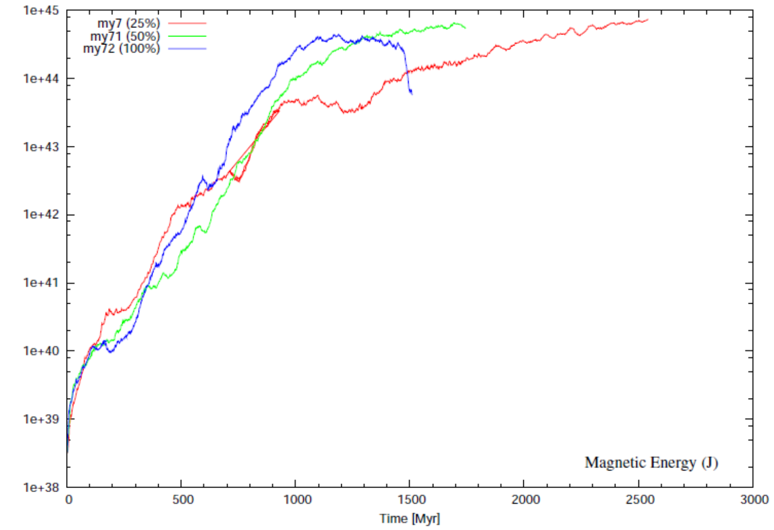
- Large magnetic field structures over kpc scale
- Magnetic field strengths of few μG
- Many gaseous phases
- SN explosions
- Cosmic rays

Spitzer 1978

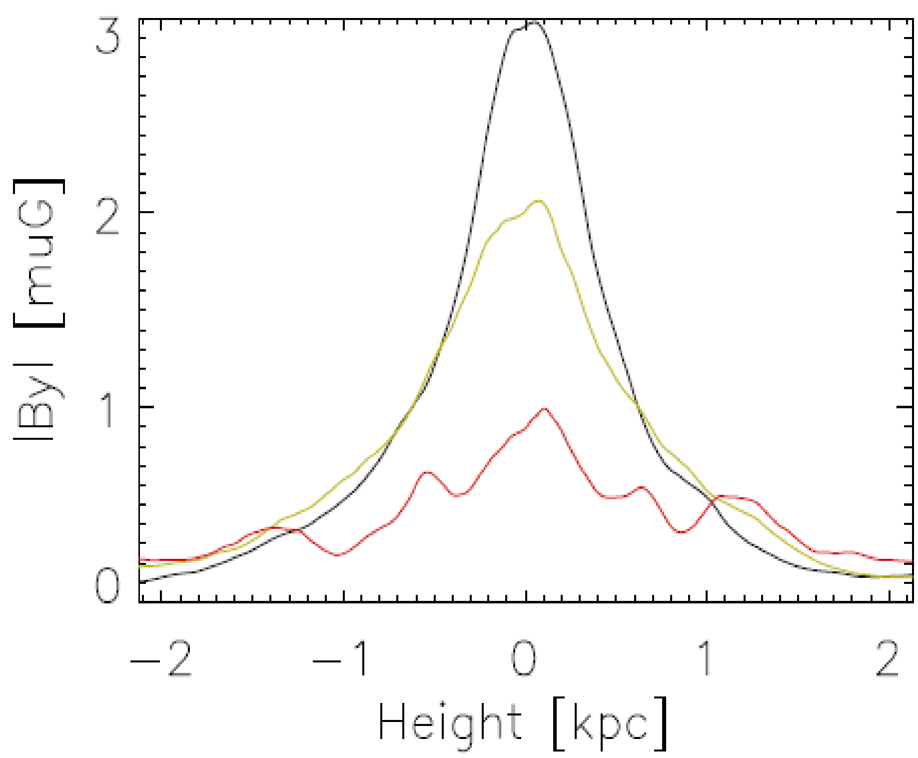
Model Includes

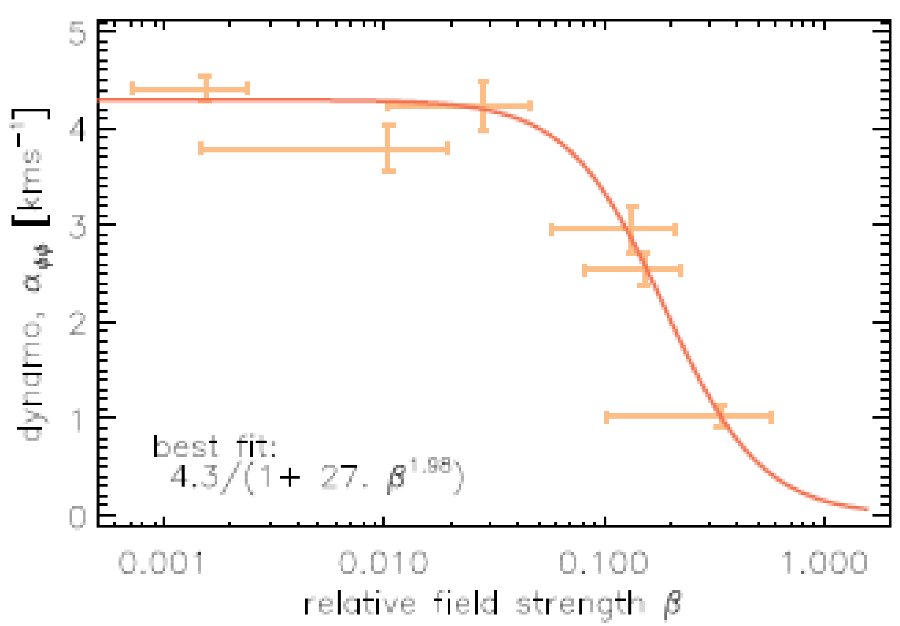
- Radiative cooling
- SN I, SN II with clustering (different SN rates)





- Pitch angle increases with SNR, (30^0) (Rhode et al 1999)
- Mean field to turbulent field ratio ~ $\sigma^{-0.3}$ (Chyzy et al 2008)
- Growth time ~ 100 Myr
- Scalings : $\alpha \sim \sigma^{0.4}; \eta \sim \sigma^{0.4}$
- Saturation = quenching of dynamo coefficients
- $\alpha \sim \frac{1}{(1+27\beta^2)}; \eta \sim \frac{1}{(1+6\beta)}$
- Case of wind quenching

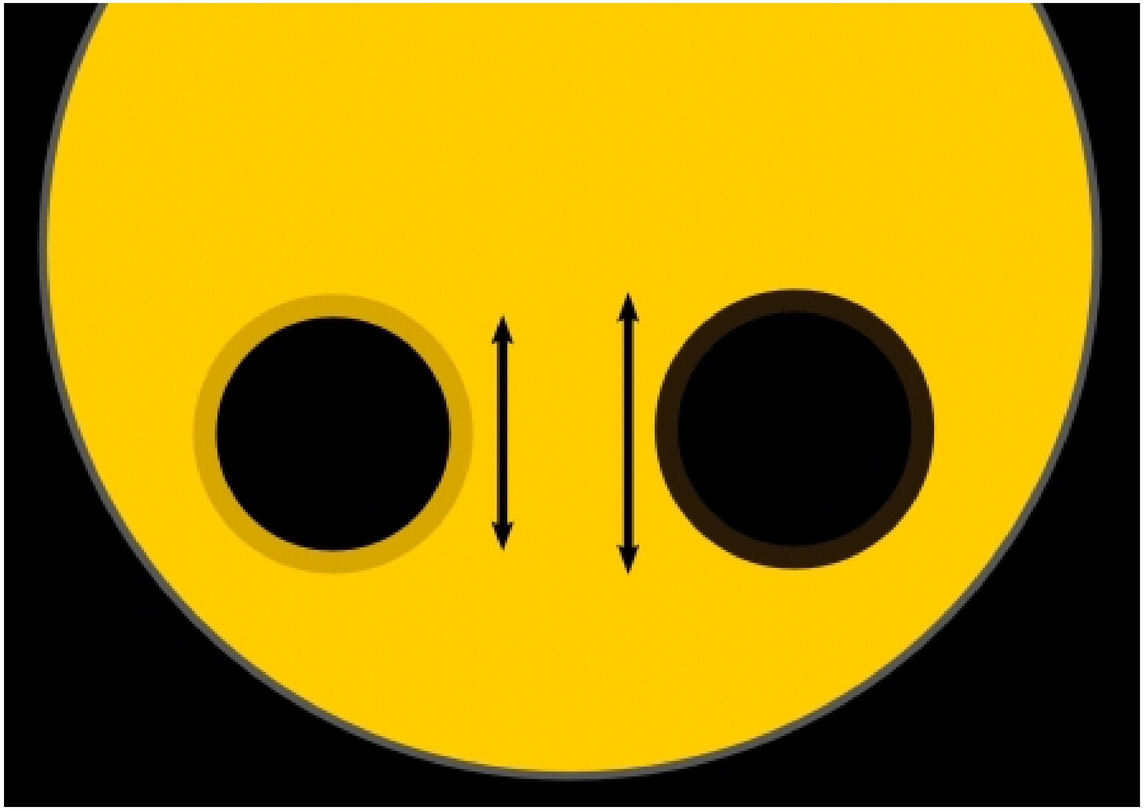




- ISM properties
- Magnetic energy mostly in the warm component
- Max VFF 'tran.' and Max MFF 'warm'
- *B* scaling with $\rho^{0.3}$, *V* scaling with $\rho^{-0.3}$
- Constant Alfven velocity
- Few words about CR

Irene Bernt
Stellar Physics

Initial characterisation of exoplanet atmospheres with small aperture telescopes



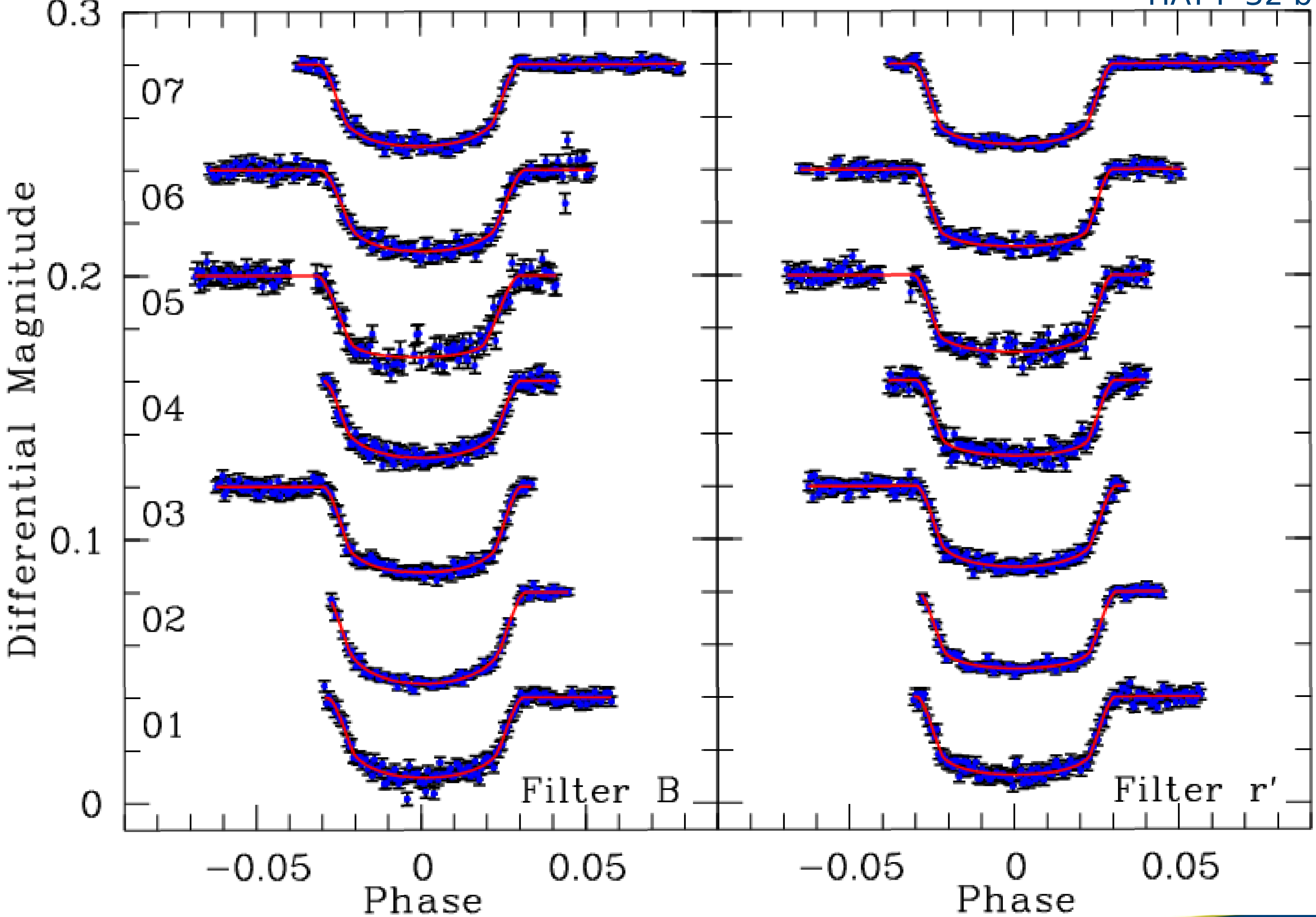
Phil Bull / Oxford Astrophysics

Irene Bernt
Diploma Student

Irene Bernt

Transitobservations with STELLA

HAT-P-32 b



Gabriel Bihain
Stellar Physics

Stellar Physics group, Prof. Dr. K. G. Strassmeier

Dr. Gabriel Bihain

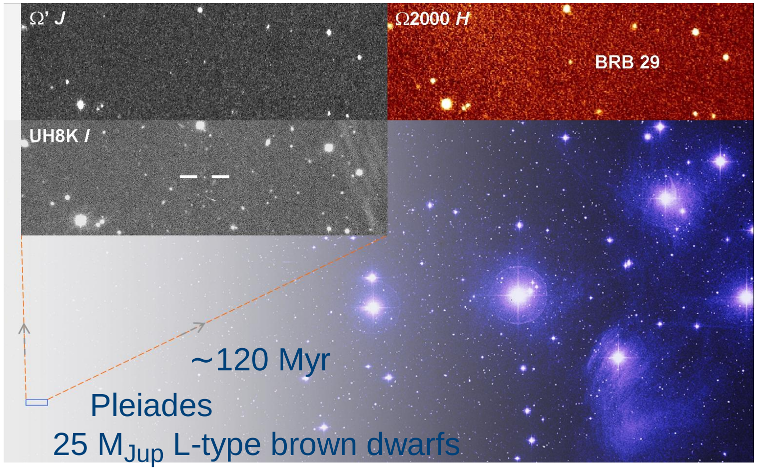
Low-mass stars and substellar objects

→ search, identification, and characterization of these objects, to better understand their formation, evolution, and distribution within the Galaxy.

→ observational methods: near-infrared and optical imaging, astrometry, and spectroscopy

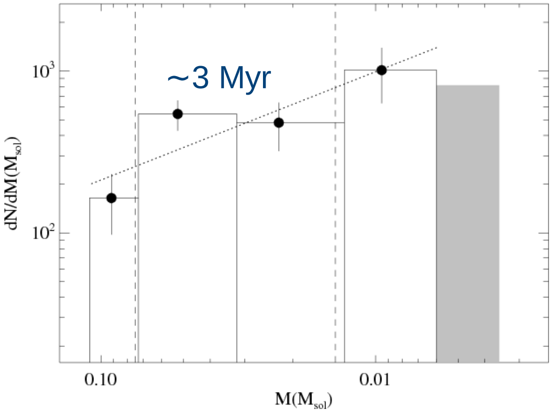
Substellar objects are self-gravitating objects that do not have enough mass to maintain a sufficiently high core temperature for stable hydrogen fusion ($M<0.075M_{Sol}$, [Fe/H]=0)

→ They do not reach the main sequence; instead they cool down and dim progressively



Bihain et al. (2006, A&A, 458, 805; 2010, A&A, 519, 93)

σ Orionis mass function → 4 M_{Jup}



Bihain et al. (2009, A&A, 506, 1169)

Ongoing projects:

obtention of deep (multi-)epoch STELLA/WIFSIP photometric stacks of open clusters of different ages, for evolutionary studies of cool star rotation (Strassmeier et al. 2014, submitted soon)

spectroscopic characterization of field ultra-cool dwarfs („WISEA J064750.85-154616.4: a new nearby L/T transition dwarf“, R. D. Scholz et al., 2014, accepted)

search of T-type free-floating planetary-mass objects in the ~120 Myr old Pleiades open cluster („Search for free-floating planetary-mass objects in the Pleiades“, M. R. Zapatero Osorio et al., 2014, refereed)

search and characterization of low-mass companions to M dwarfs of the ~700 Myr old Hyades open cluster (Bihain et al. 2014, in preparation)

search of substellar companions to the nearest stars with GTC/CanariCam (Gauza et al. 2014, in preparation)

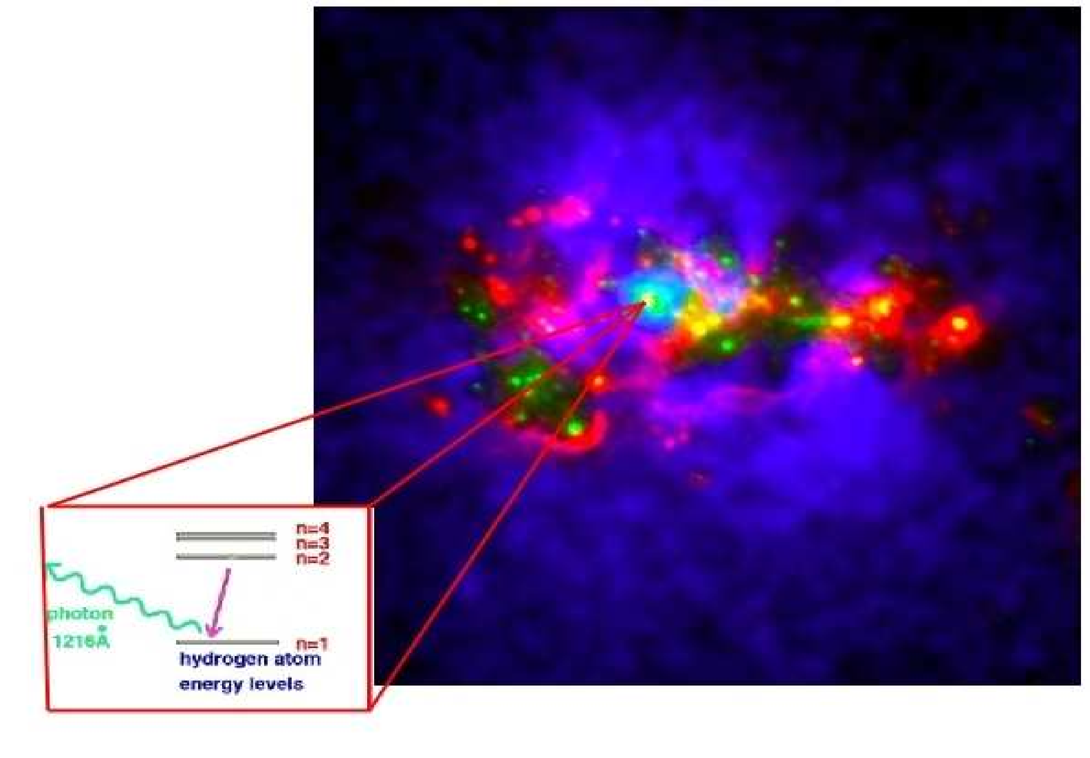
Maria del Pilar Bonilla-Tobar

Cosmology

Clustering of Lyman-α emitters (LAEs) at medium redshifts

Maria del Pilar Bonilla-Tobar Leibniz Institute for Astrophysics (AIP)

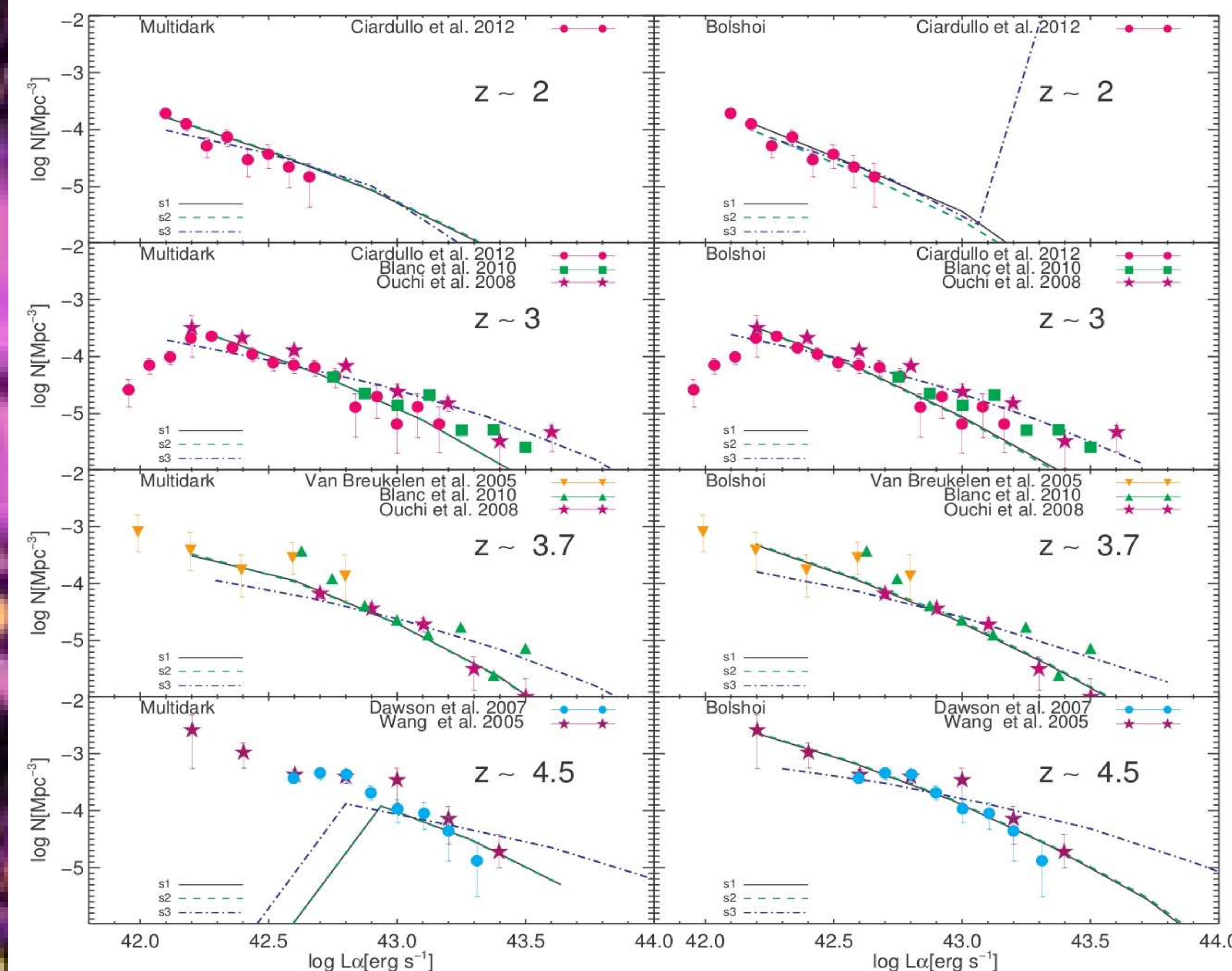
LAEs!!!!



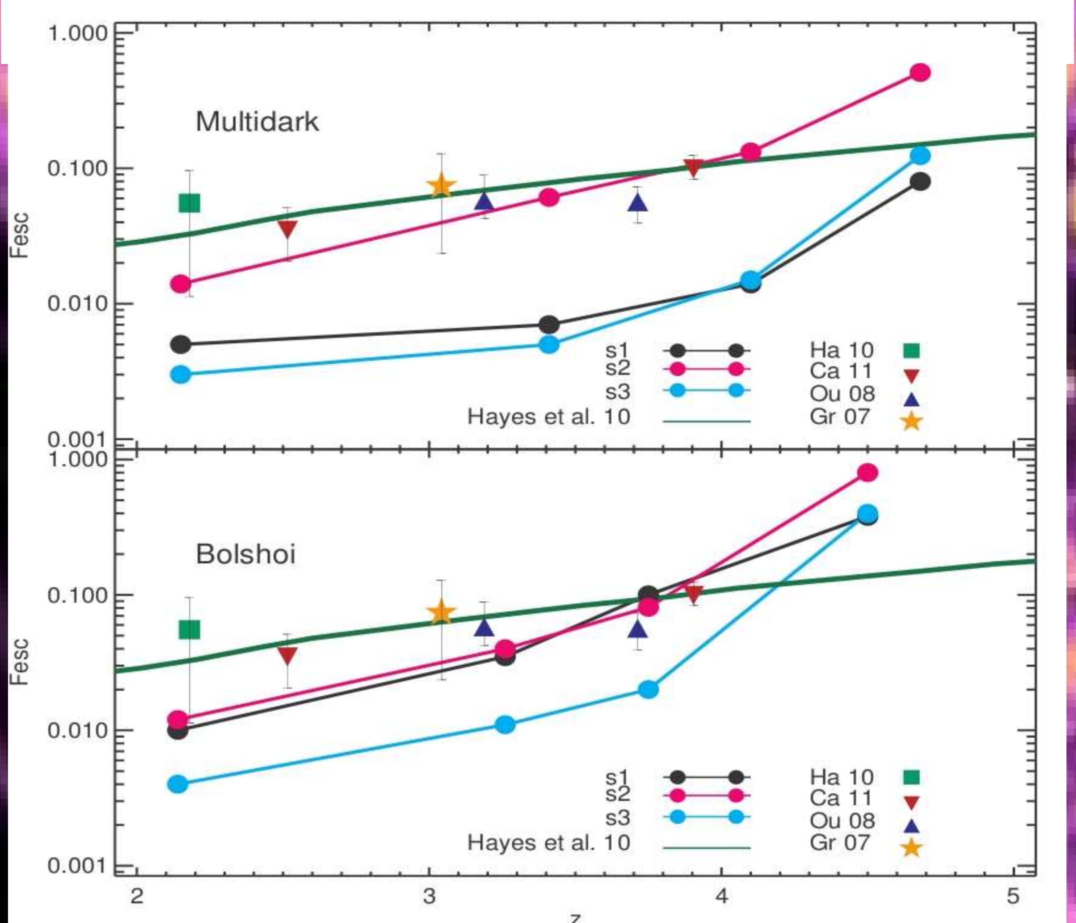
Probes Large Scale Structure

- Simulations - Big Volumes Resolution
- Semi-analytical model
- SFR- S1,S2,S3.
- LAEs model

LAEs luminosity function



Escape fraction



Mock catalogues of LAEs

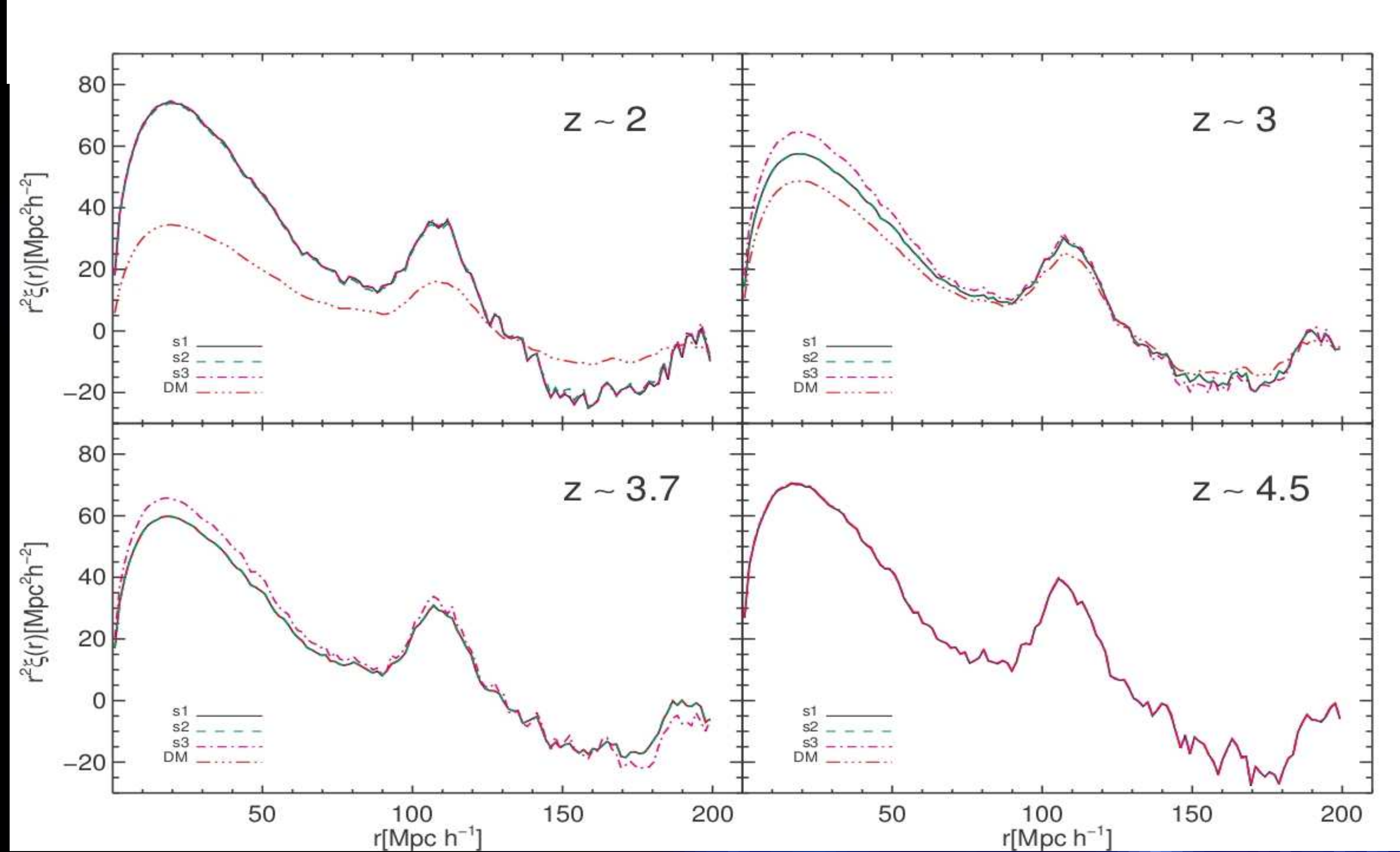
- Clustering LAEs
- Power Spectrum
- Bias LAEs and DM

mardelpi@aip.de

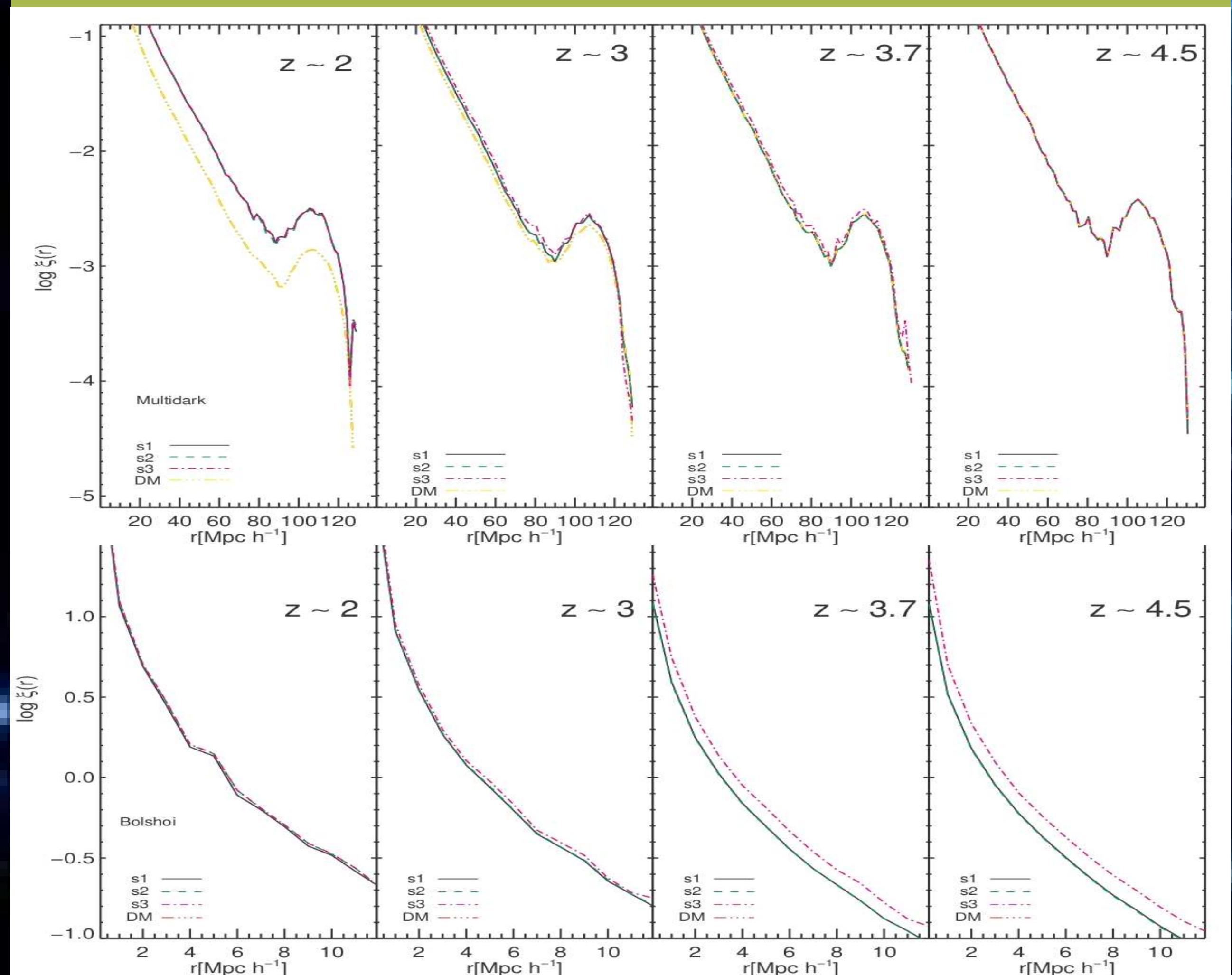
Clustering of Lyman-α emitters (LAEs) at medium redshifts

Maria del Pilar Bonilla-Tobar Leibniz Institute for Astrophysics (AIP)

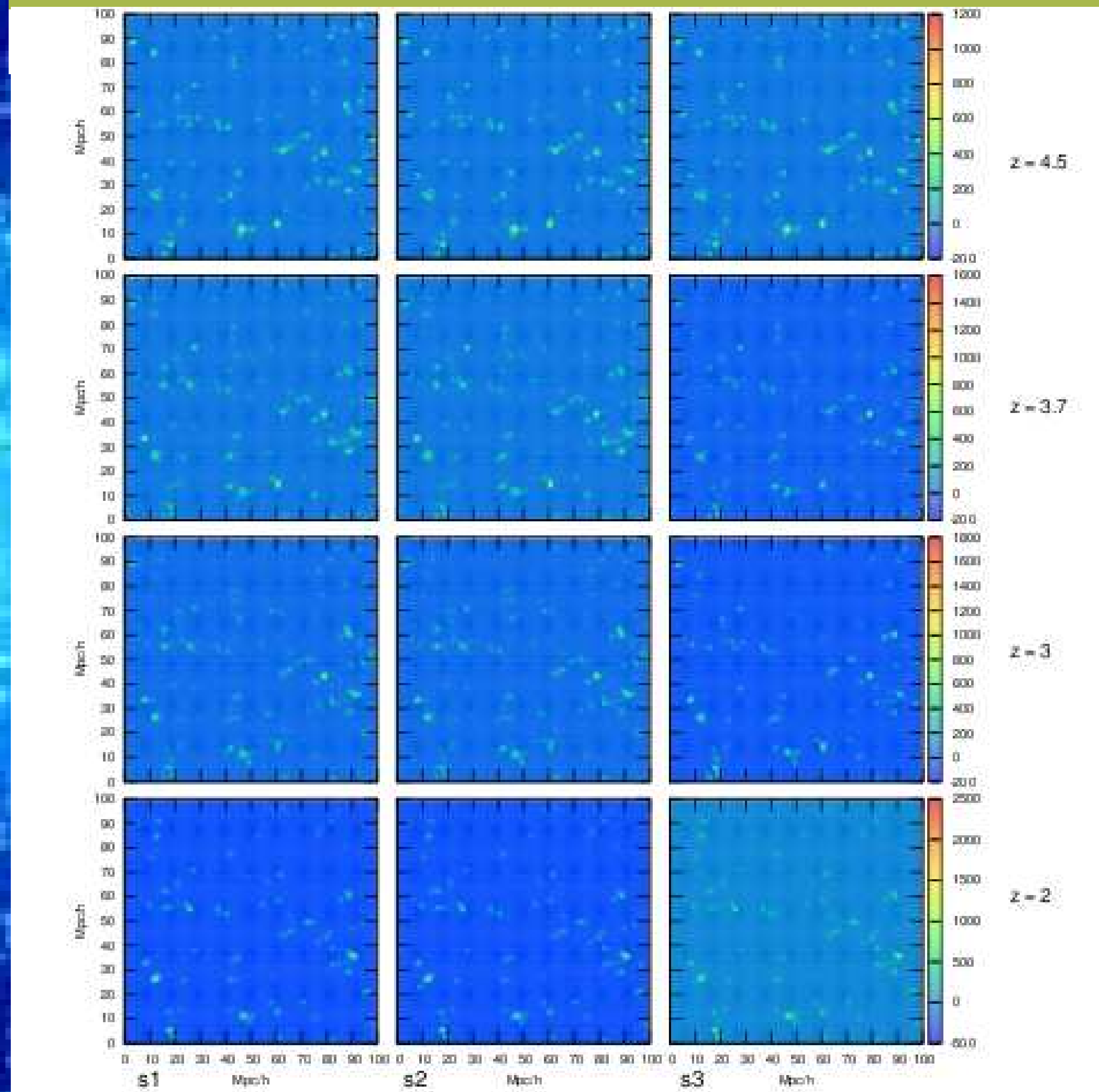
Clustering



CFs Bolshoi & MultiDark



LAEs Distribution



...

Reconstruction methods for cosmological density fields.

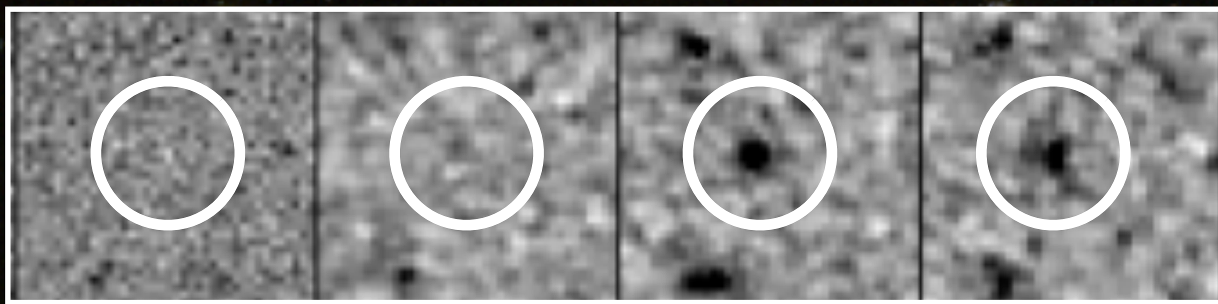
mardelpi@aip.de

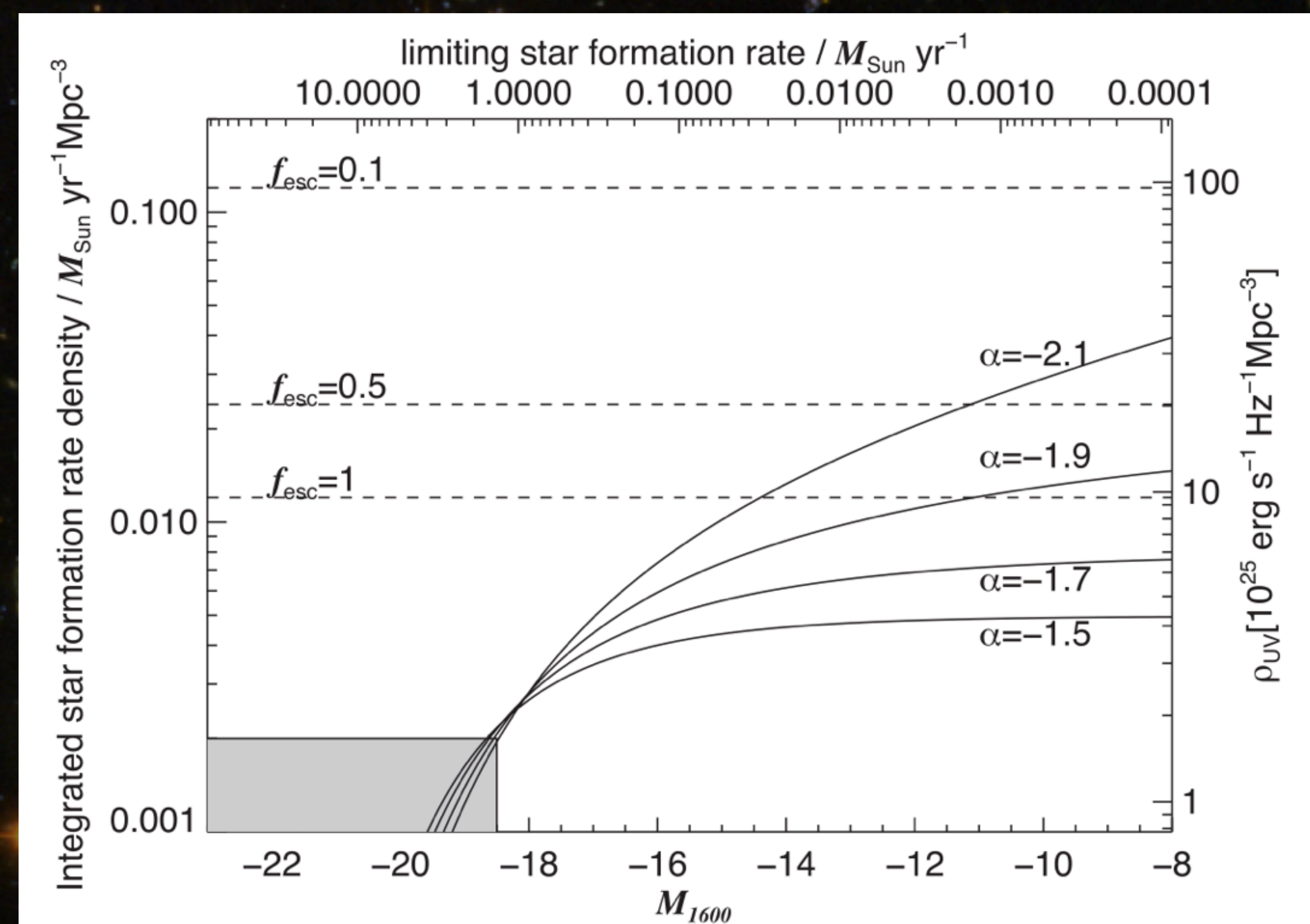
Joseph Caruana

Galaxies

Constraints on Reionisation

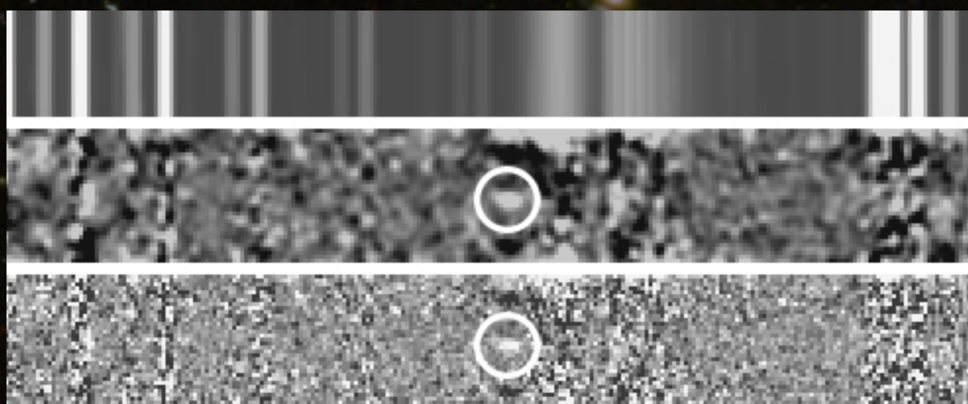
Lyman-break technique





Lorenzoni et al. (2013)

Ly-α and the Neutral Fraction of Hydrogen



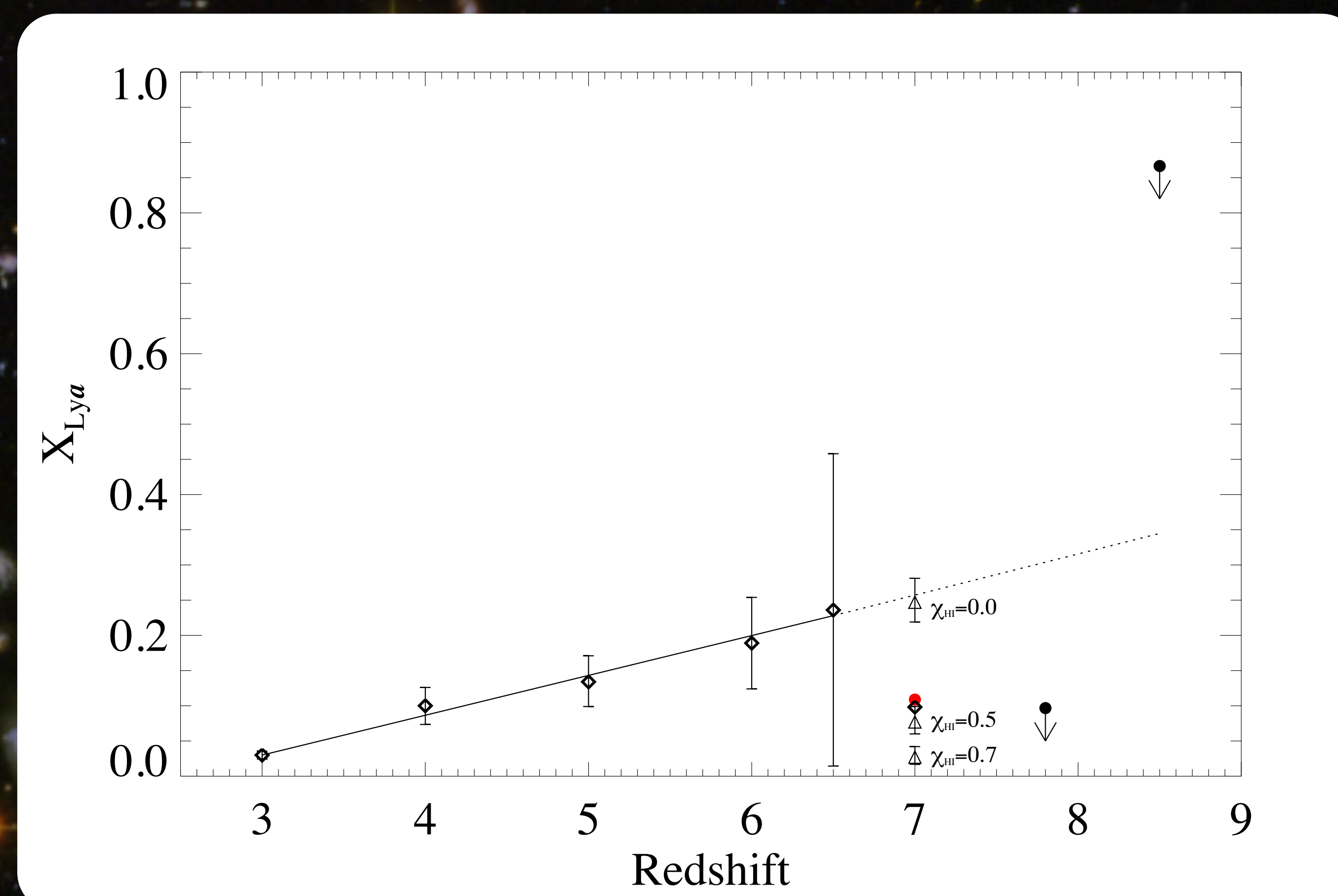
Sky

Gaussian-smoothed data

Data

z=6.08 galaxy

Drop in Ly-α emitters at z > 7



Caruana et al. (2014)

$\chi_{HI} \sim 0.5$ at $z \sim 7$

Gabriele Cescutti

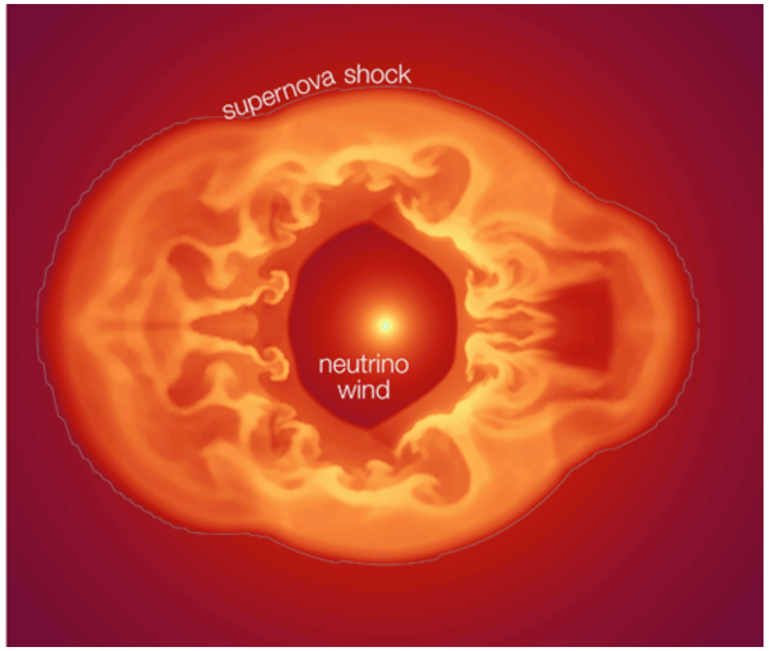
Milky Way and the Local Volume

Cescutti Gabriele

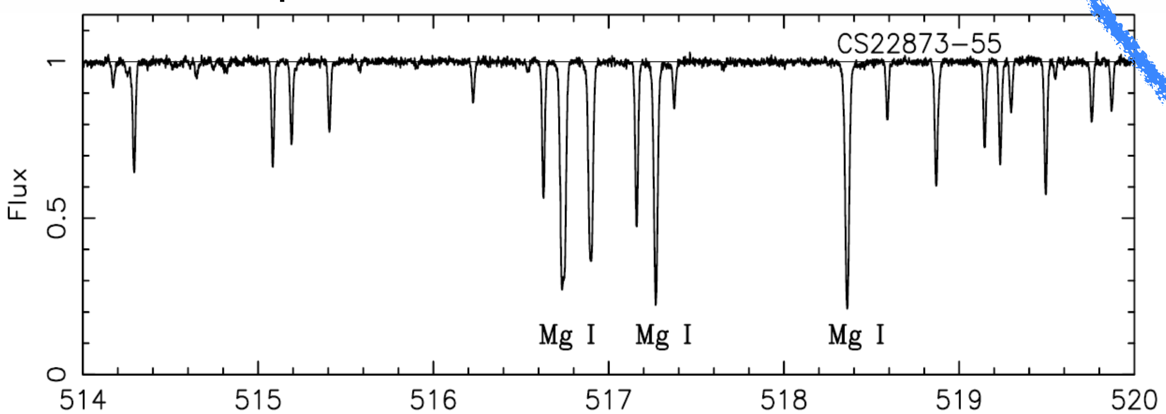
Milky Way and Local Volume

SH room 211

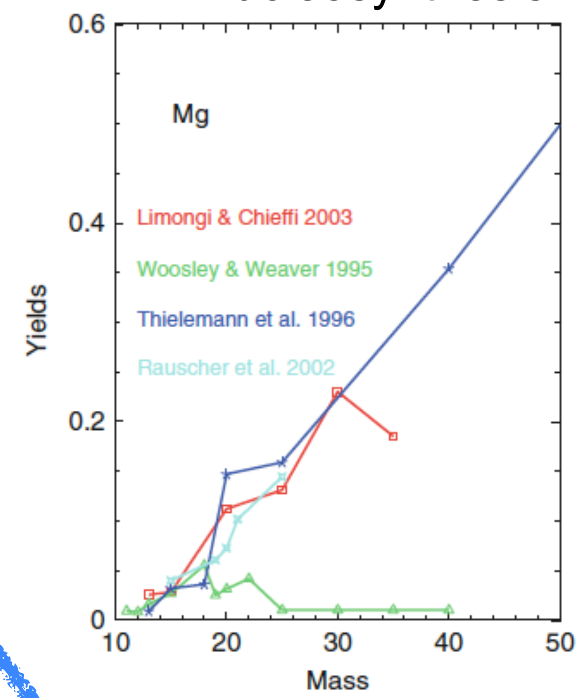
Stellar evolution



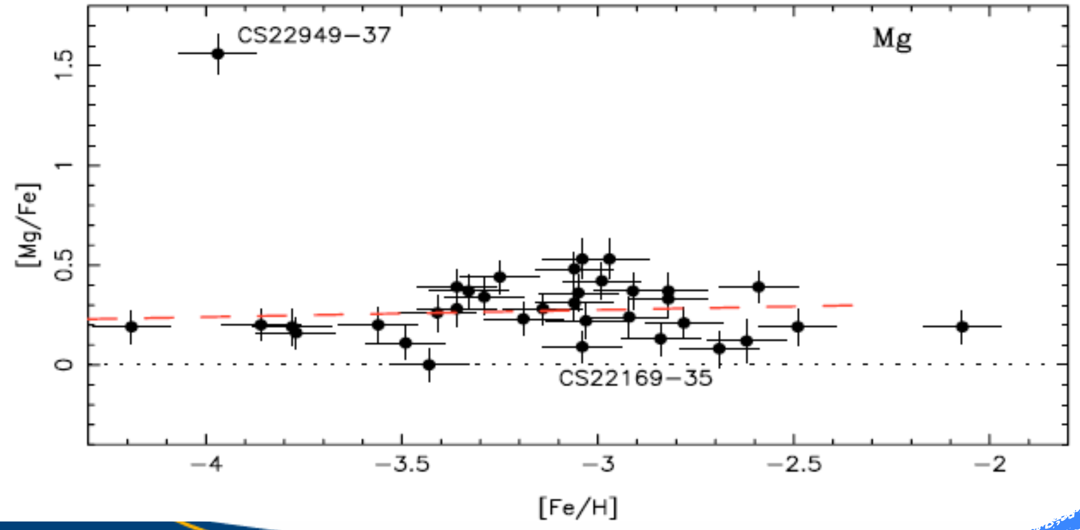
Stellar spectra



Nucleosynthesis



Stellar chemical abundances

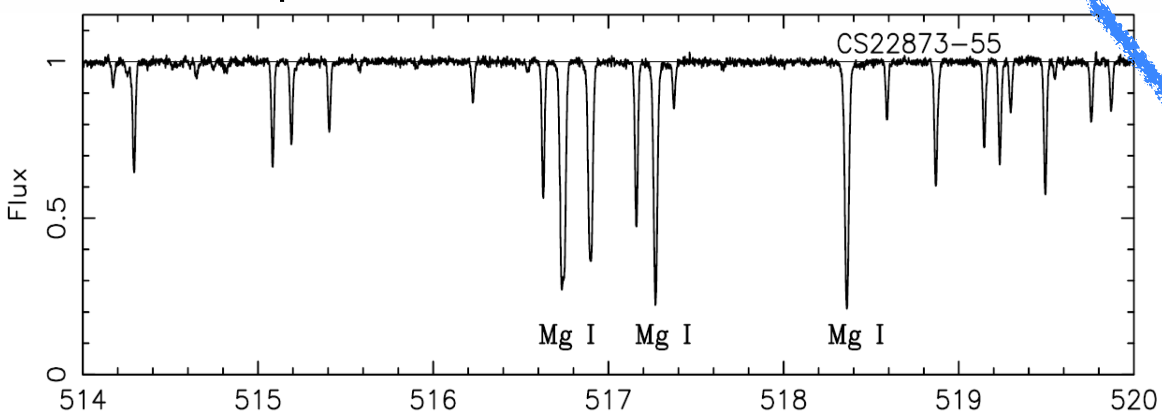


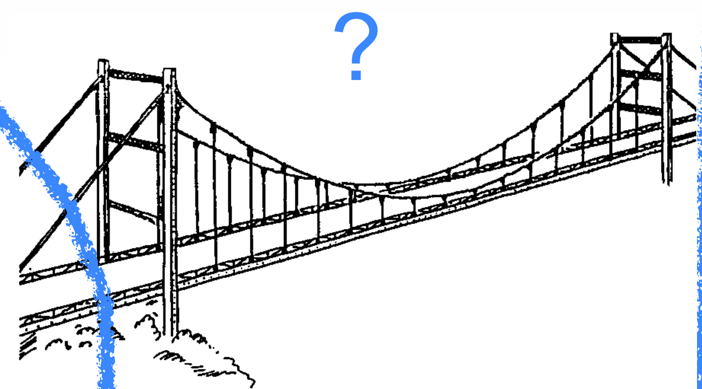
Cescutti Gabriele

Milky Way and Local Volume

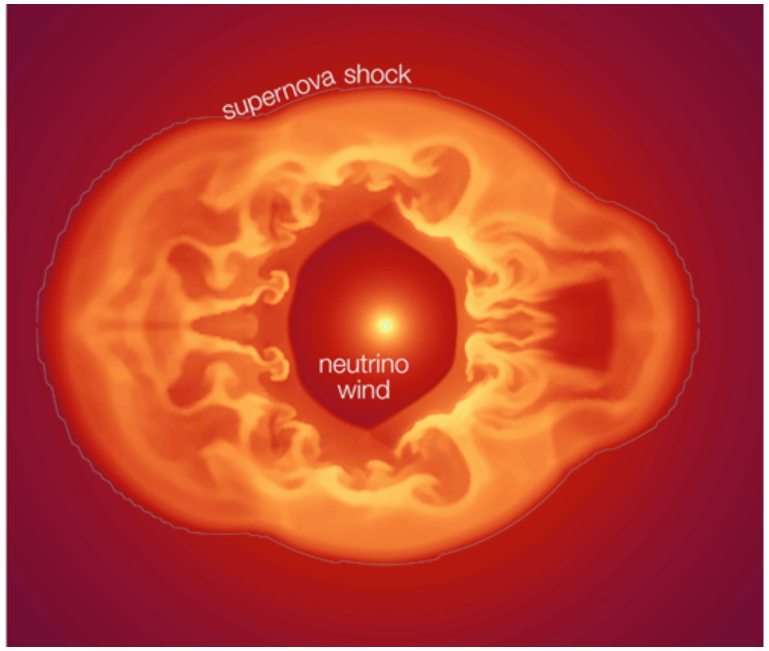
SH room 211

Stellar spectra

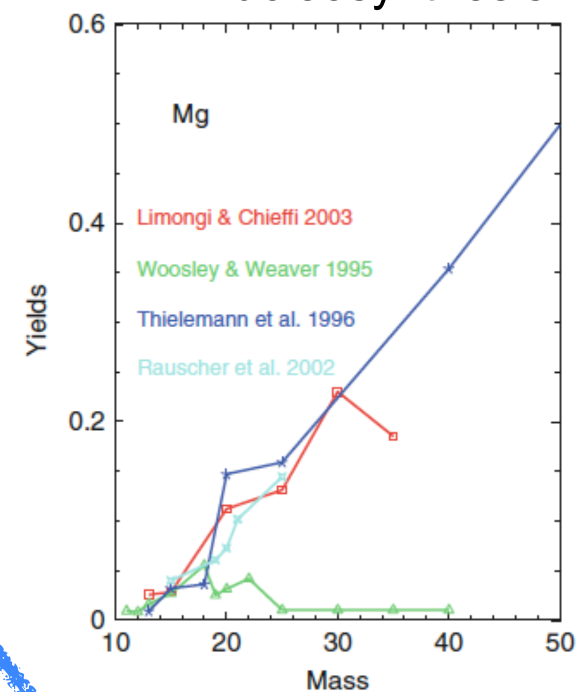




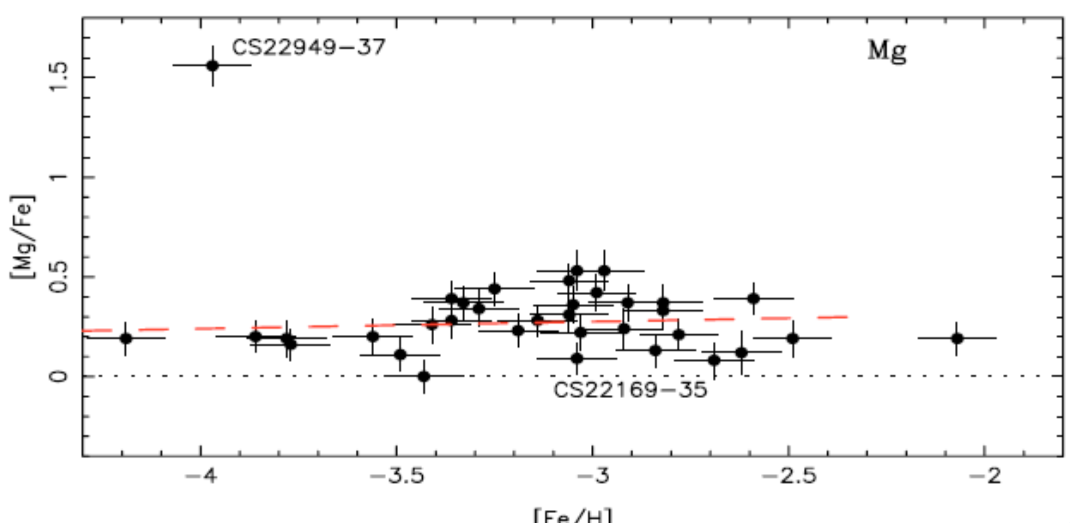
Stellar evolution



Nucleosynthesis



Stellar chemical abundances

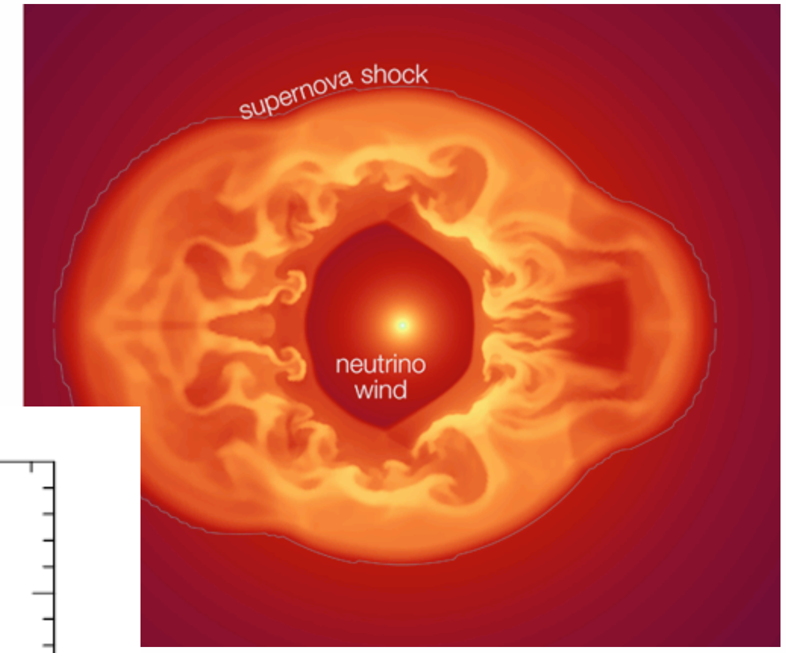


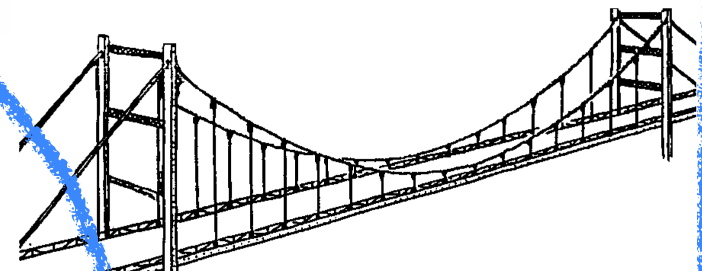
Cescutti Gabriele

Milky Way and Local Volume
SH room 211

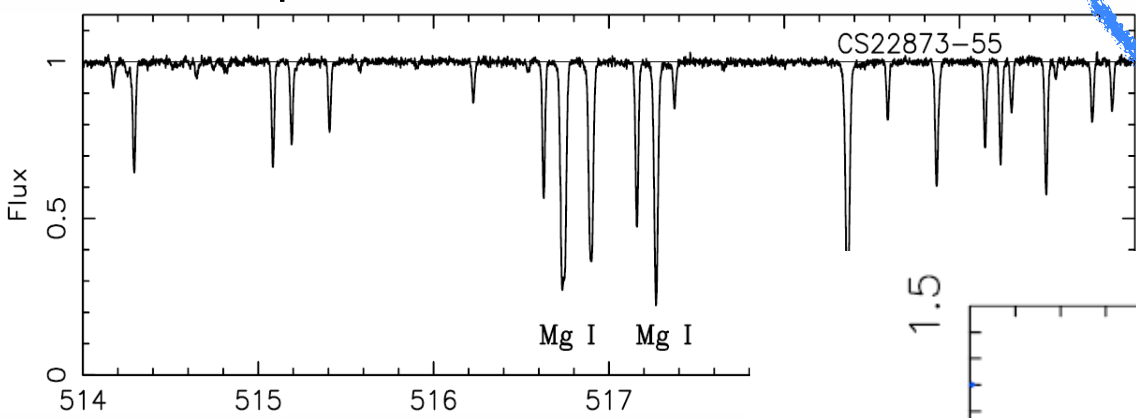
Chemical evolution models

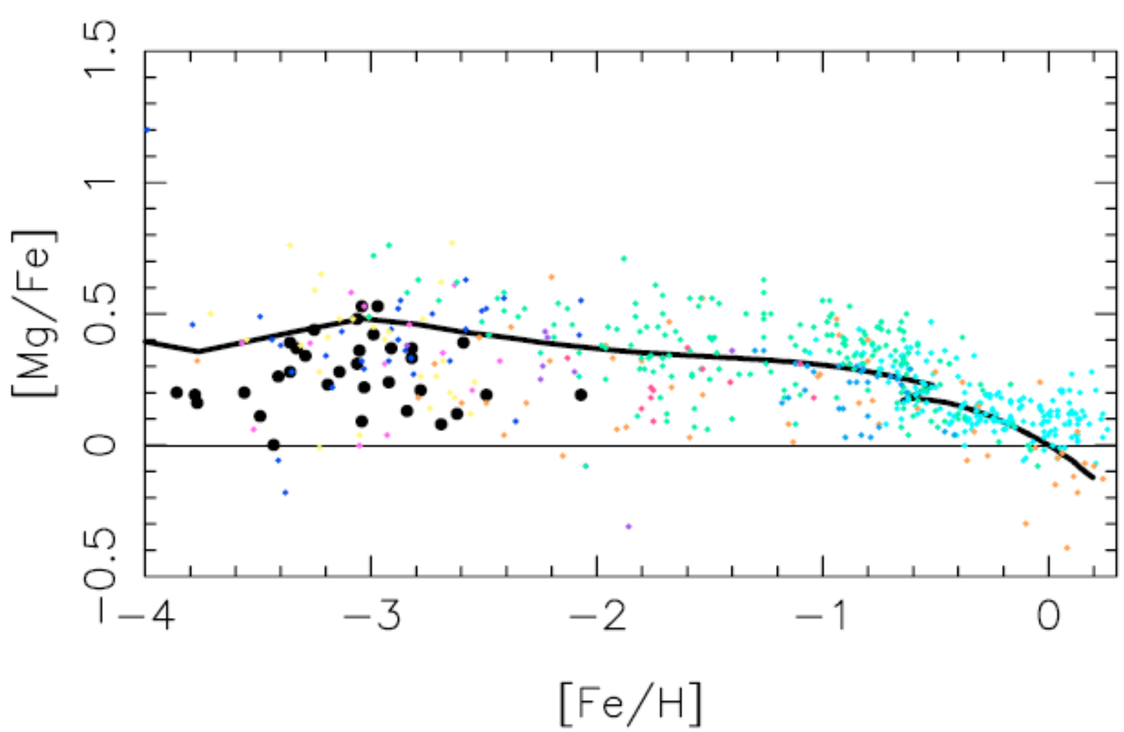
Stellar evolution



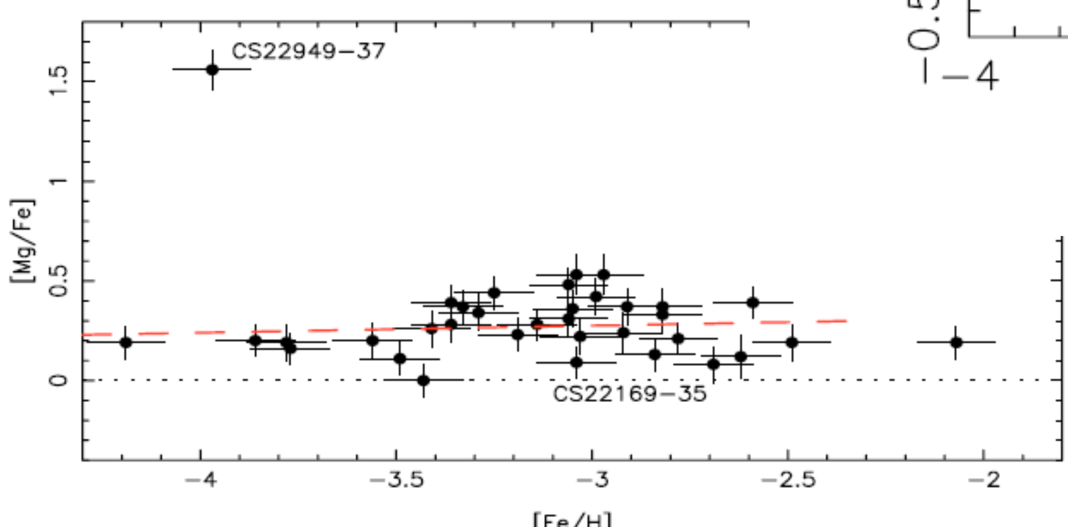


Stellar spectra

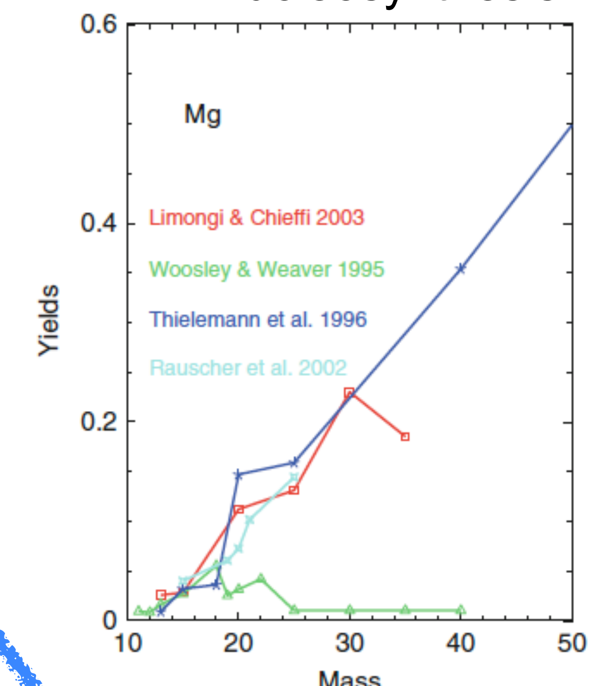




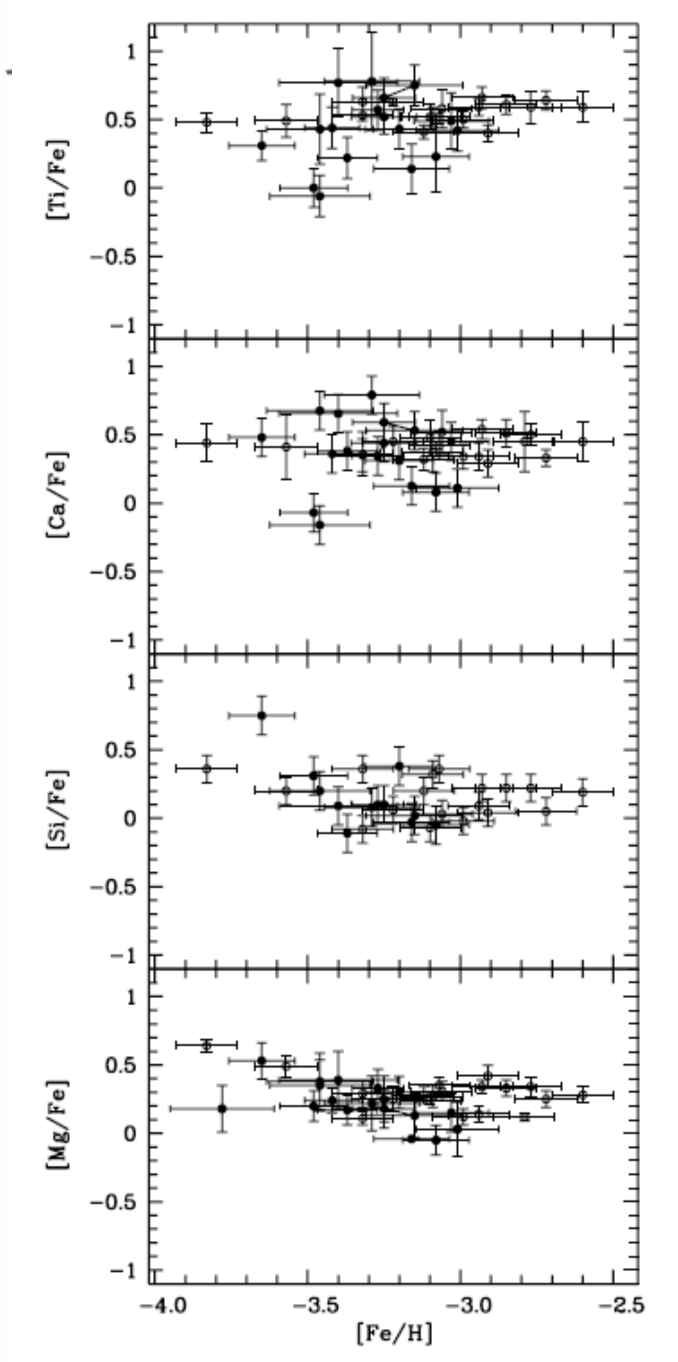
Stellar chemical abundances



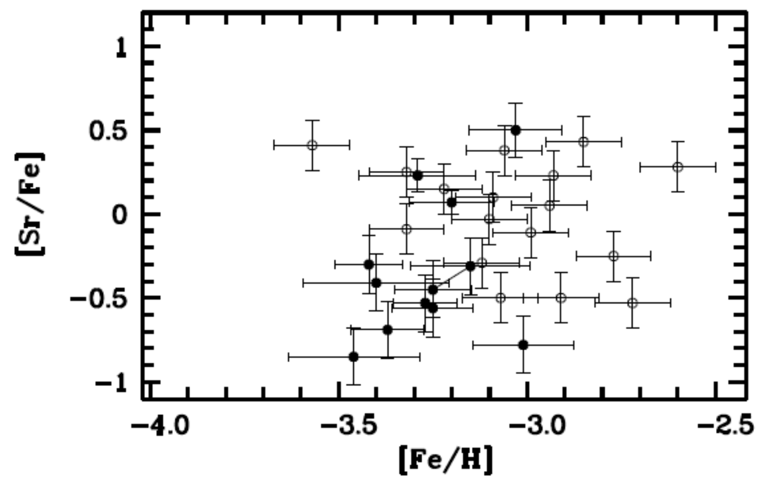
Nucleosynthesis



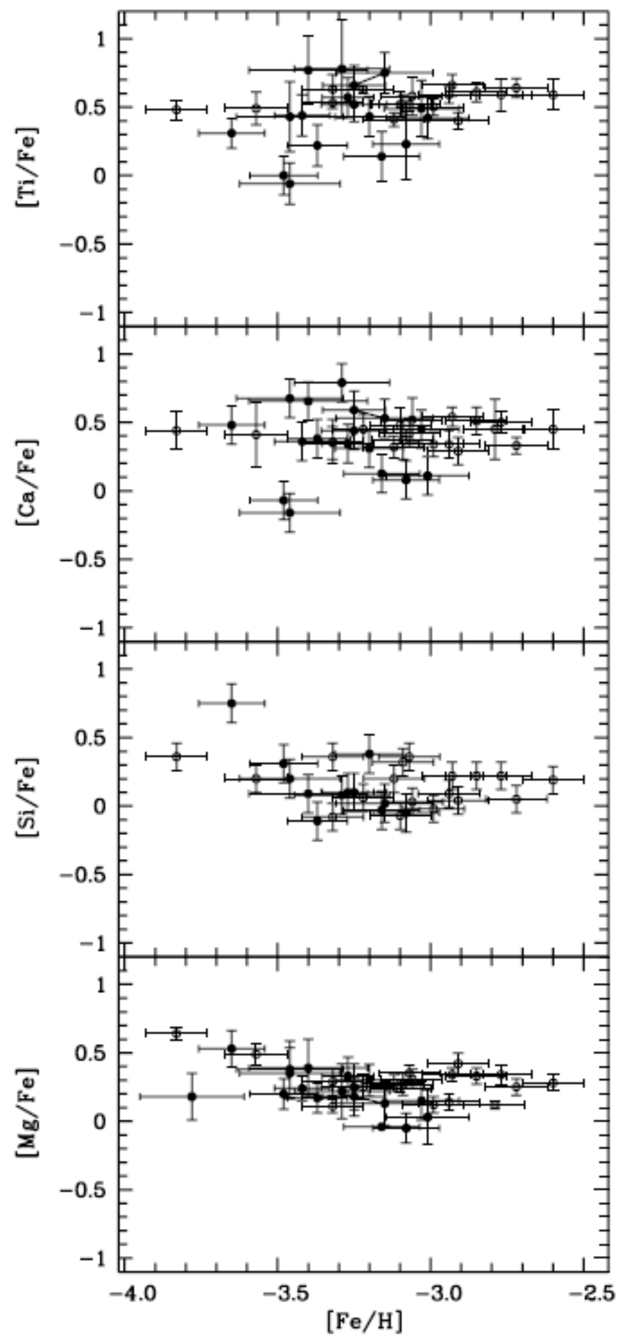
Stochastic chemical evolution models



Problem:
Neutron capture elements present a spread
alpha elements do not



Stochastic chemical evolution models



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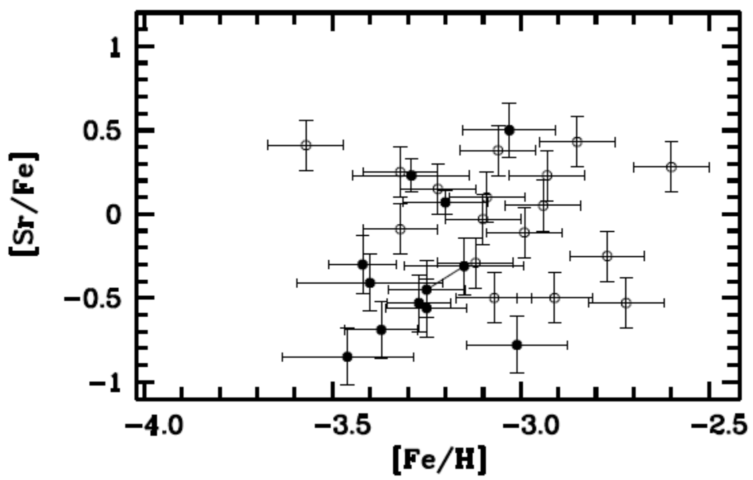
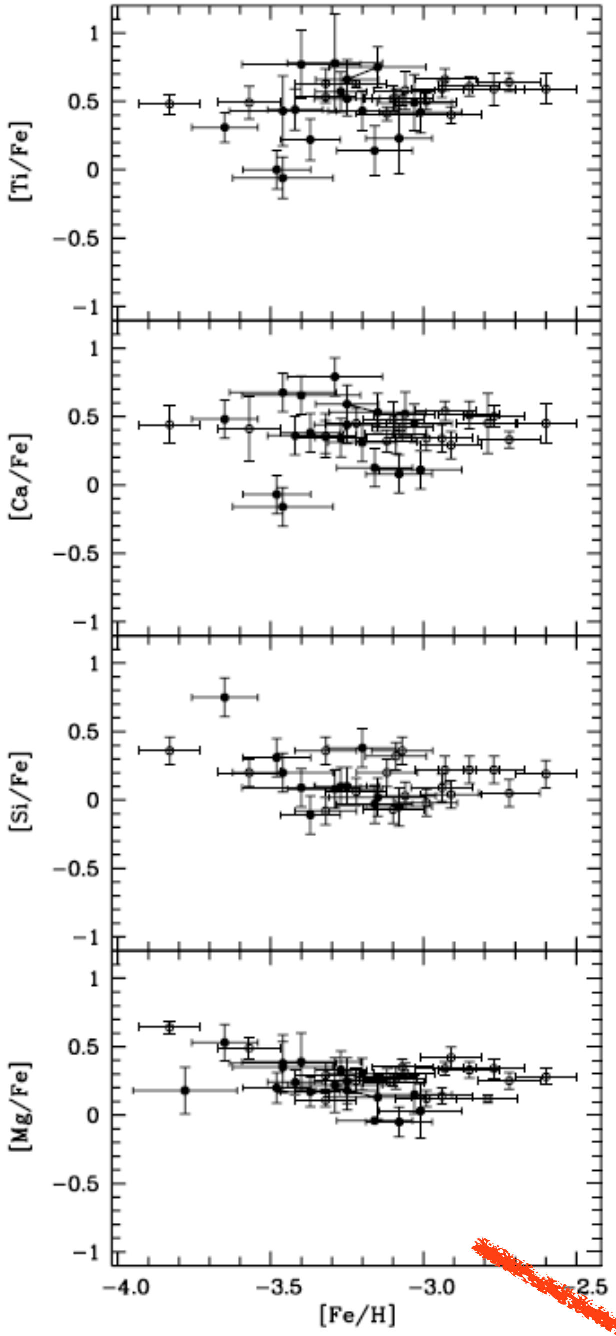
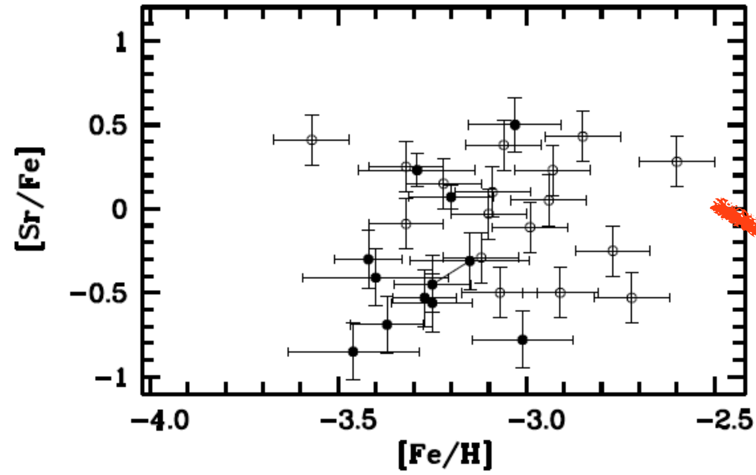


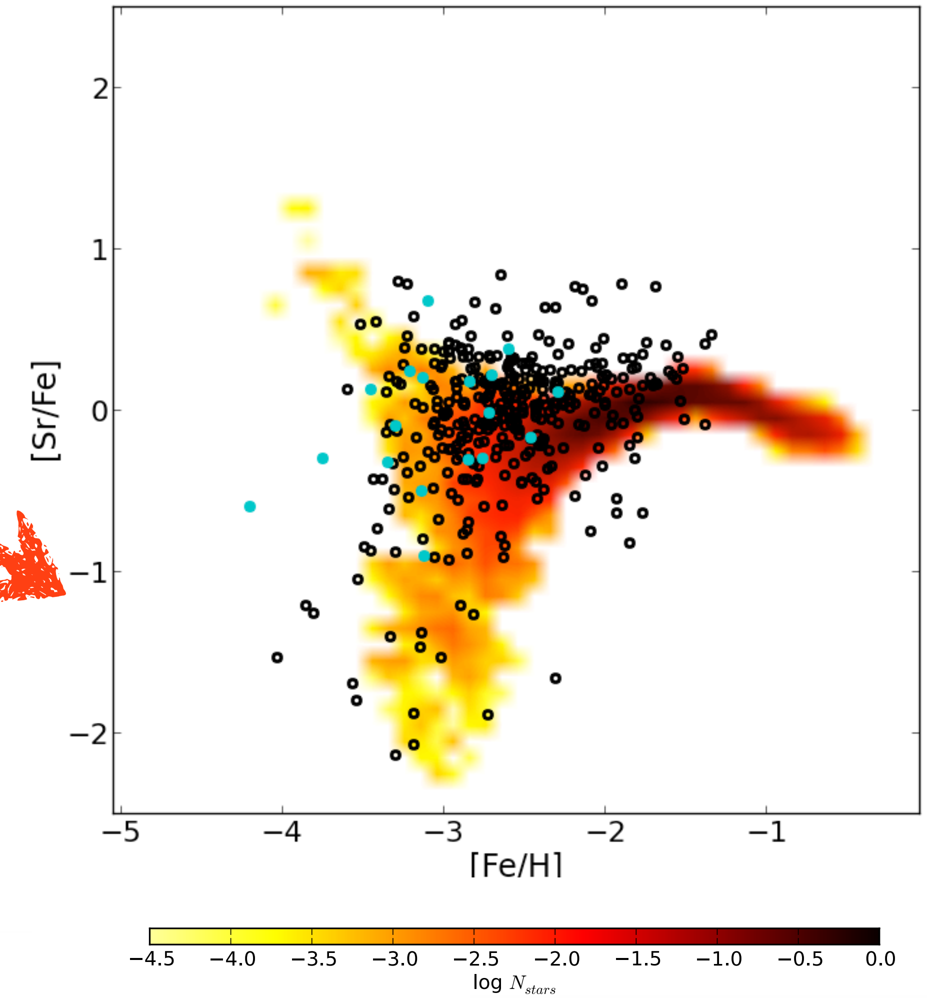
Solution:
At low regime of star formation the IMF is not fully sampled and this can promote spread, if nucleosynthesis of the element is strongly dependent to the mass.

Stochastic chemical evolution models

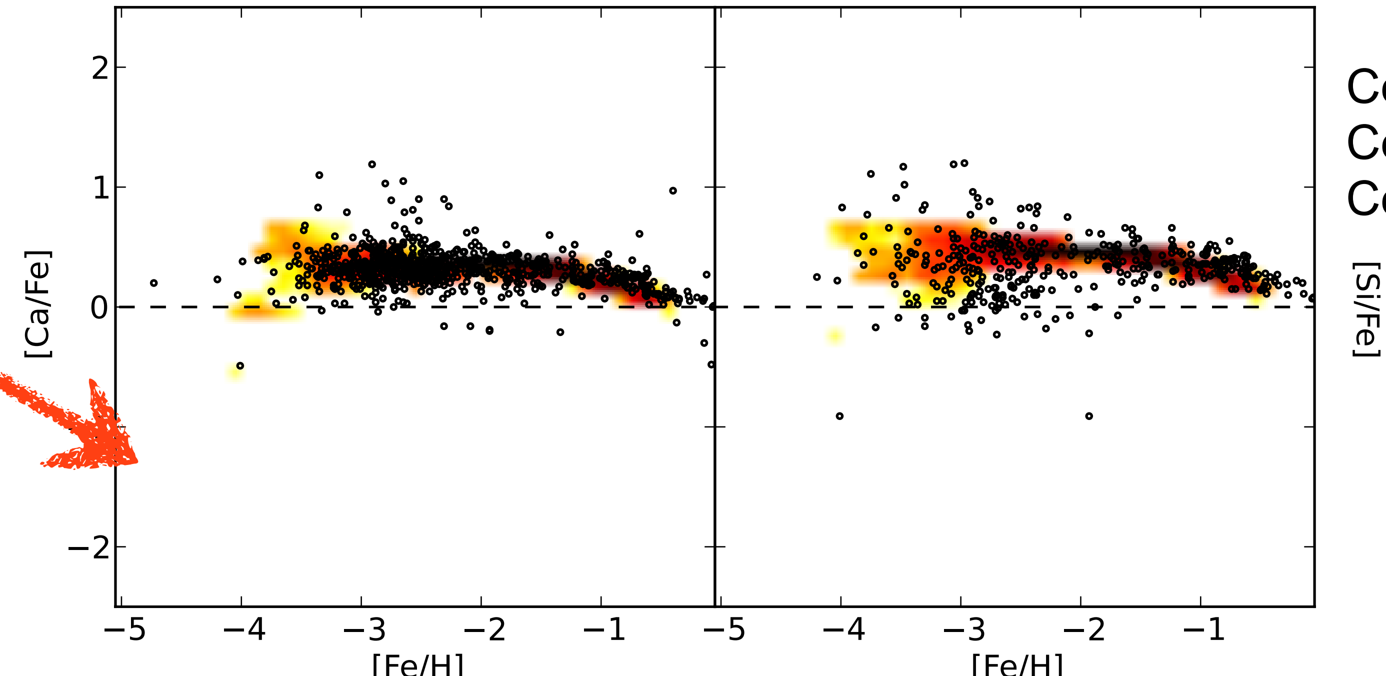


Problem:
Neutron capture elements present a spread
alpha elements do not





Solution:
At low regime of star formation the IMF is not fully sampled and this can promote spread, if nucleosynthesis of the element is strongly dependent to the mass.



Cescutti & Chiappini 2014
Cescutti et al. 2013
Cescutti 2008

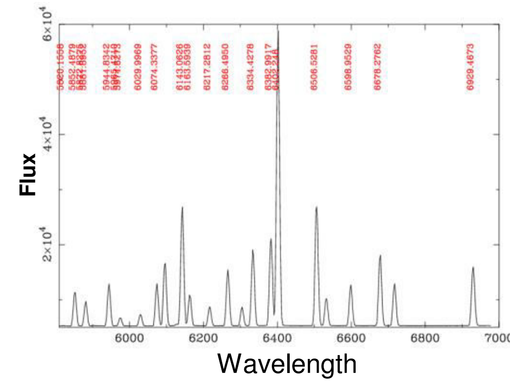
Jose Manuel Chavez-Boggio
innoFSPEC

Wavelength calibration of spectrographs

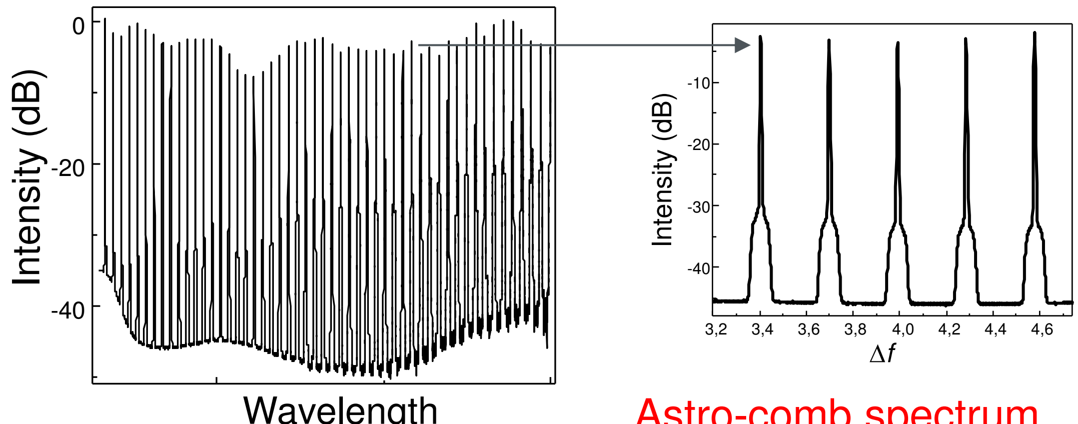
- Accurate astronomical light **wavelength calibration:** comparison with the spectrum of **lamps** of He, Ne, Th/Ar, Hg.

- Calibration accuracy scales with $\sqrt{N}$, *N*: number of lines.

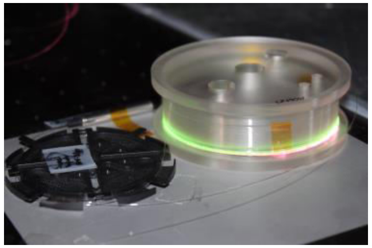
- Development of an improved calibration source: astro-comb.
  - Array of equally intense and equidistant spectral lines.
  - Stable over a long period of time.
  - Comb spacing adjusted for medium- and low-resolution spectrographs.



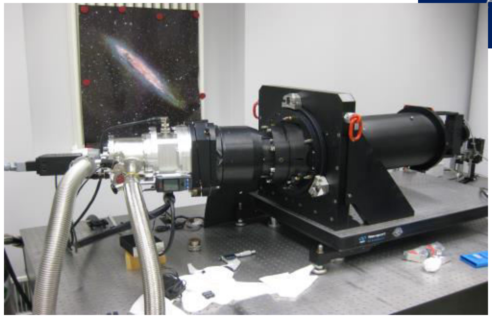
- Astro-comb developed at the innoFSPEC Lab uses an arrange of nonlinear fibers.



Astro-comb spectrum



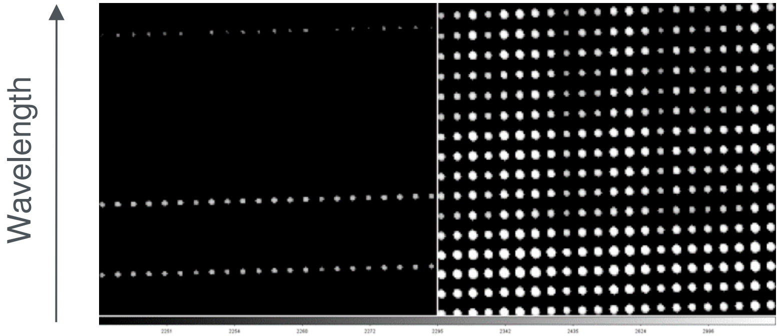
Preliminary test with ERASMUS-F



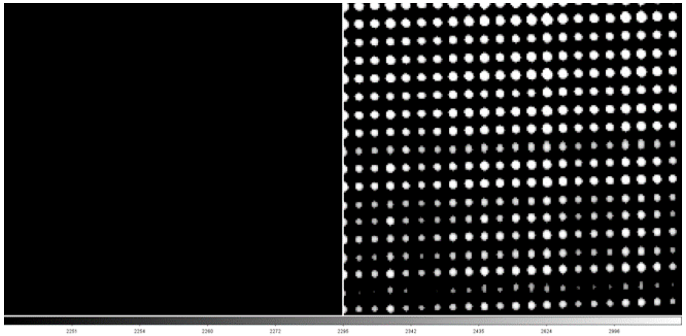
- Astro-comb tested with ERASMUS-F spectrograph:
  - Operating region: 465-930 nm. Resolution: 3000.
  - Spectrograph is calibrated using Hg and Ne lamps.

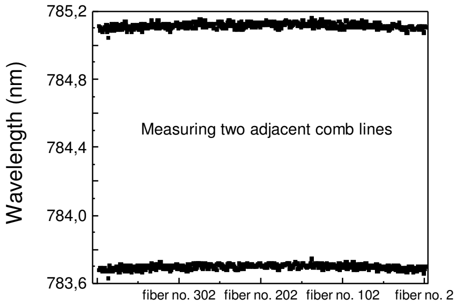
- Astro-comb light provides much more calibration lines.

Spectral region 1

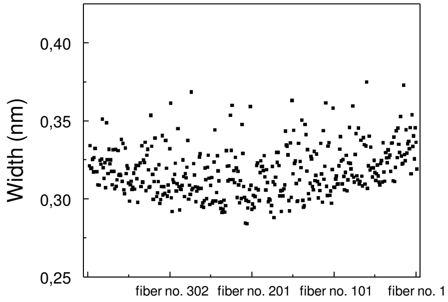


Spectral region 2





Astro-comb identifies calibration shifts due to irregularities in the fiber feeding of the spectrograph.



On-sky test scheduled for October 10-11 using PMAS at Calar Alto Observatory.

Cristina Chiappini

Milky Way and the Local Volume

Galactic Archaeology

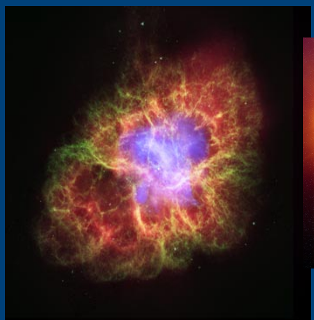
AIP

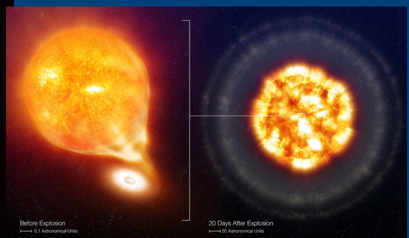
We seek signatures or fossils from the epoch of Galaxy assembly, to give us insight about the processes that took place as the Galaxy formed.

A How were the first stars? How was their chemical and energy feedbacks in the earliest phases of the Universe?

B What is the dominant player in the formation of our Galaxy? Gas infall? Mergers and accretion of stars from other galaxies? How did radial migration inside the disk affect our views on the formation of our Galaxy?

Chemical evolution and our code





Synergy:
Stellar evolution
Nuclear physics

BONUS: The origin of chemical elements

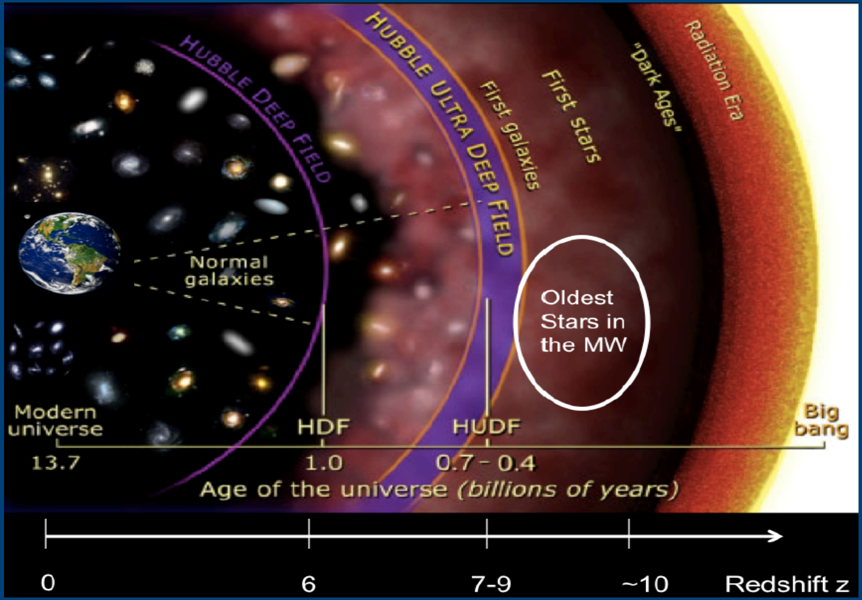
- ✓ Follows the chemical enrichment in the different Galactic components
- ✓ Follows more than 30 chemical elements/isotopes: CNO, iron peak, s- and r- elements
- ✓ Includes the detailed contribution of stars of all masses + lifetimes of stars

(Chiappini et al. 1997, 1999, 2000, 2001, 2002, 2003a,b, 2005, 2006, 2008)

Two simplifying hypothesis -> Check their impact:

- Instantaneous mixing approximation (gas): problematic in the early Universe, but good for solar vicinity ISM
- Galactic disk – independent ring approximation: probably not good if radial stellar migration and radial gas flows are a dominant process

A How were the first stars?



→ Spinstars

Chiappini et al. 2006, 2008, 2011; Chiappini 2013
Cescutti & Chiappini 2010 & 2014;
Cescutti, Chiappini et al. 2013;
Barbuy, Chiappini et al 2014 (subm);
Maeder, Meynet & Chiappini. 2014 (subm)

B What is the dominant player in the formation of our Galaxy?

→ Chemodynamical Model – New approach!

Minchev, Chiappini & Martig 2013, 2014

→ New Observational Constraints: SEGUE/APOGEE/RAVE/CoRoT/GES

Brauer, Chiappini et al. 2014 (in prep) - SEGUE
Santiago, Brauer, Anders, Chiappini et al. 2014 (subm)
Anders, Chiappini et al. 2014 - APOGEE
Boeche, Chiappini et al. 2013 - RAVE
Minchev, Chiappini et al. 2014 ApJL – RAVE + SEGUE
Miglio, Chiappini et al. 2013 - CoRoT
Valentini et al. 2014 (in prep) – CoRoT + GES
Anders et al. 2014 (in prep) – CoRoT + APOGEE

→ 4MOST – Project scientist 2011-Sept/2013

Chiappini et al. 2013, Science Report

Maria-Rosa Cioni

Milky Way and the Local Volume

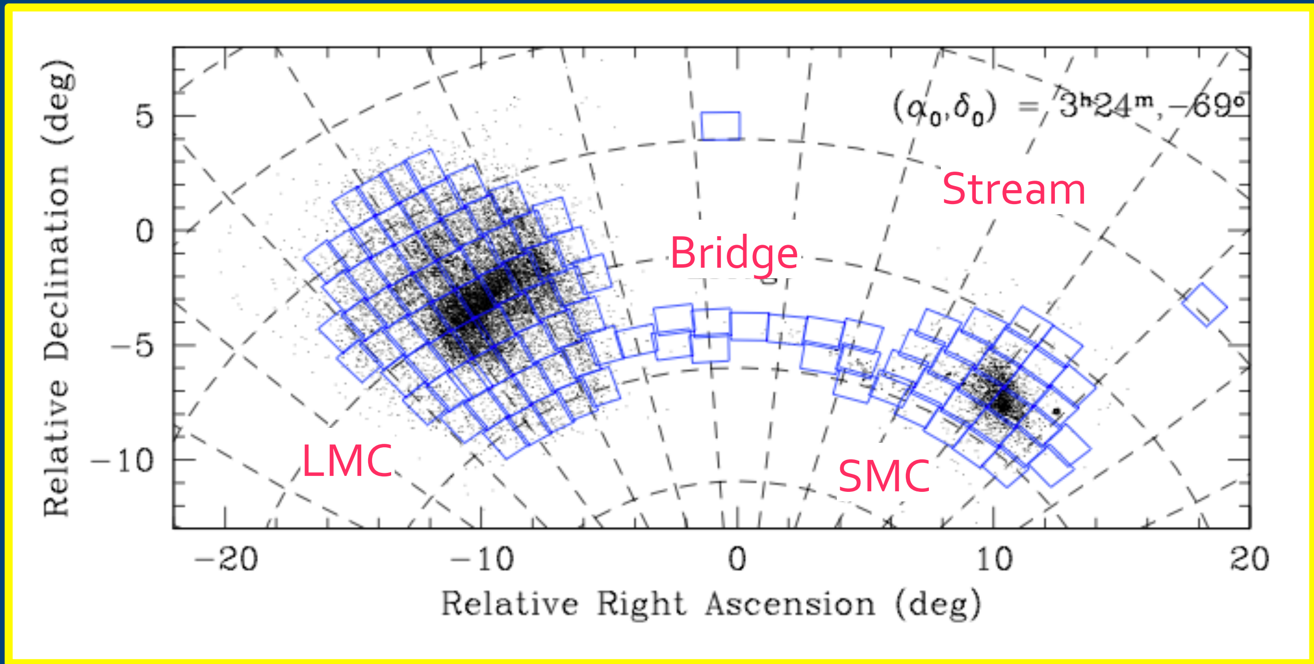
PI: Maria-Rosa Cioni
(University of Hertfordshire; AIP Guest)

Leibniz-Institut für
Astrophysik Potsdam

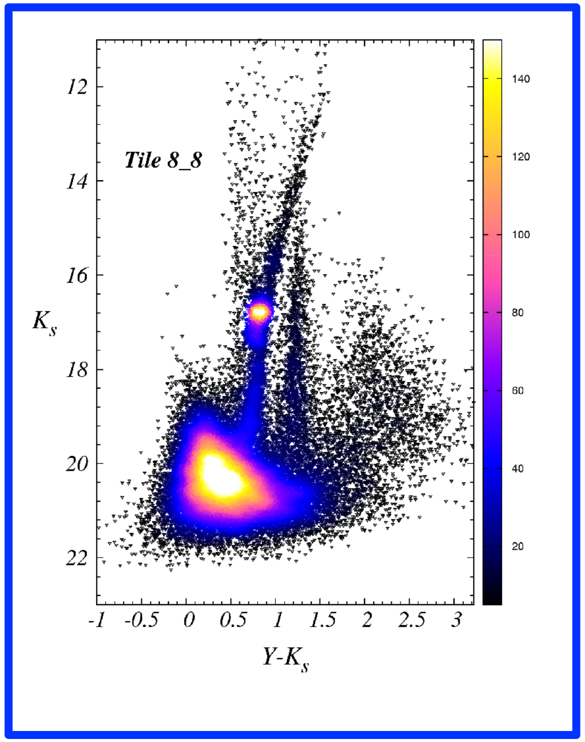
- 170 deg²
- 1900^h
- YJKs ~ 22 mag
- 12 Ks epochs
- 2009-2018
- 50% complete

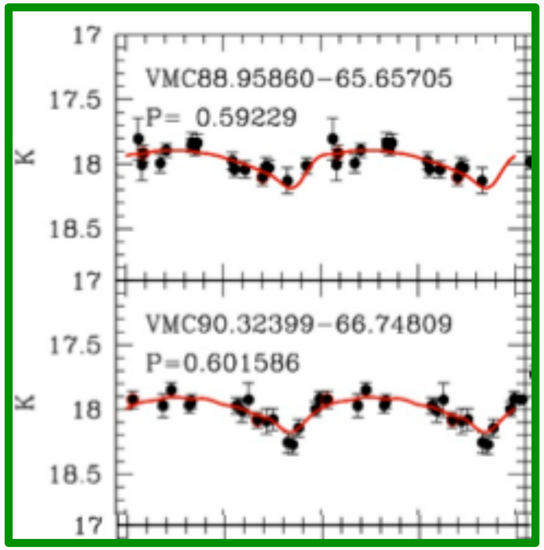
10 papers published and 2 accepted; 140 citations

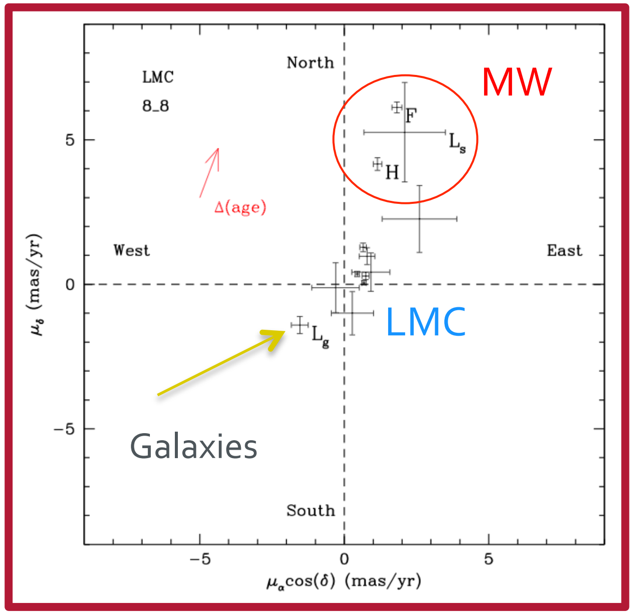
The VISTA survey of the Magellanic Clouds system



http://star.herts.ac.uk/~mcioni/vmc/







CMD of LMC region

CMD down to old main-sequence turn off point

Milky Way stars ($Y-K_s \sim 1.2$) and background galaxies ($Y-K_s \sim 2.2$) well separated

Goal: derive spatially resolved Star Formation History.

RR Lyrae Ks light-curves

Multi-epoch K_s photometry of variable stars: Cepheids, RR Lyrae stars, eclipsing binaries, Long period variables, etc.

Use period-luminosity relations, Ks vs log(P), where P is from other surveys, to trace distance.

Goal: derive the 3D geometry of the Magellanic system.

Proper motion (PM)

Multi-epoch K_s measurements across 1-3 yr for thousands of Magellanic stars and thousands of calibrators (background galaxies) per deg^2.

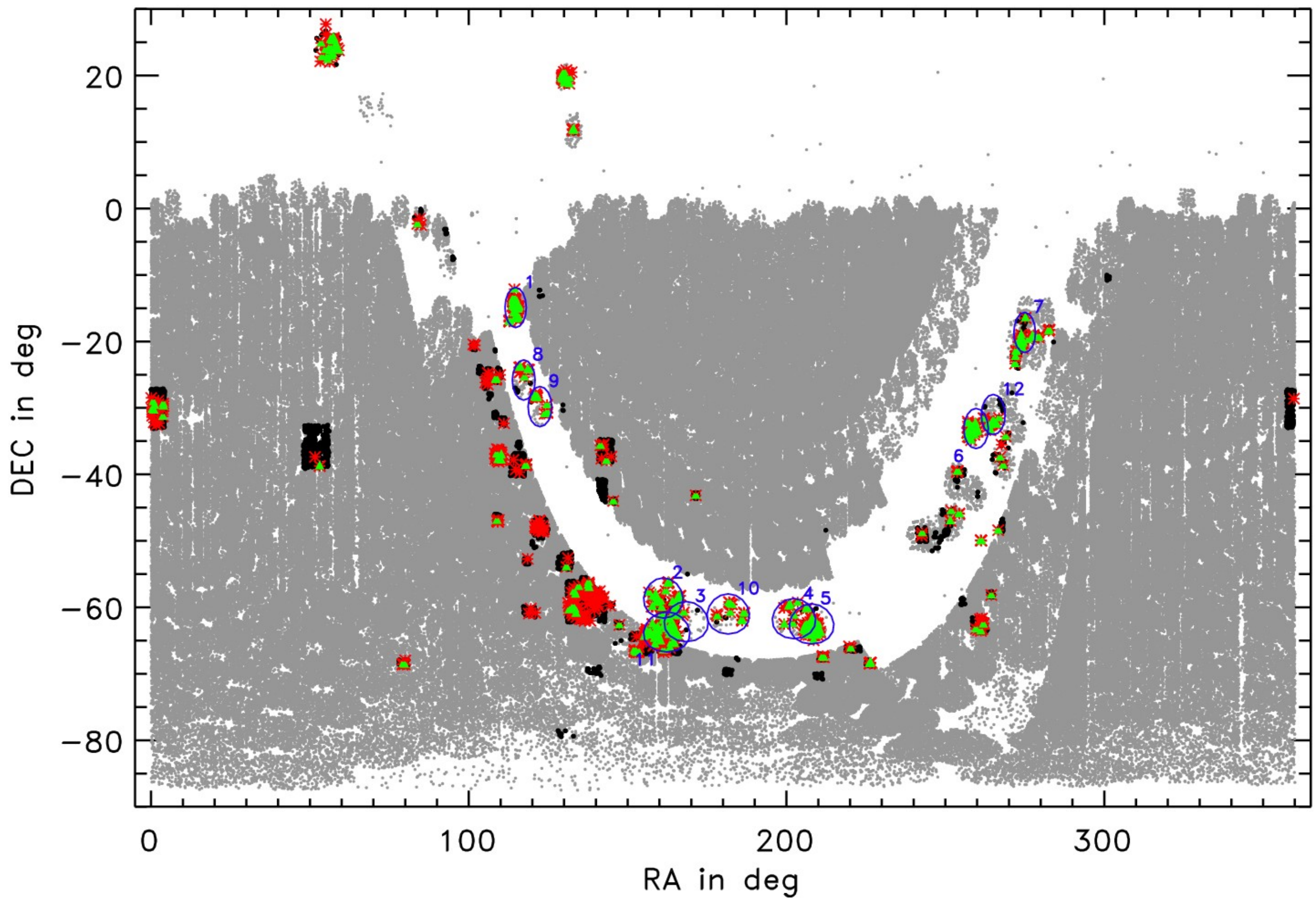
Goal: derive the PM of stellar populations and the internal kinematics of the Magellanic system.

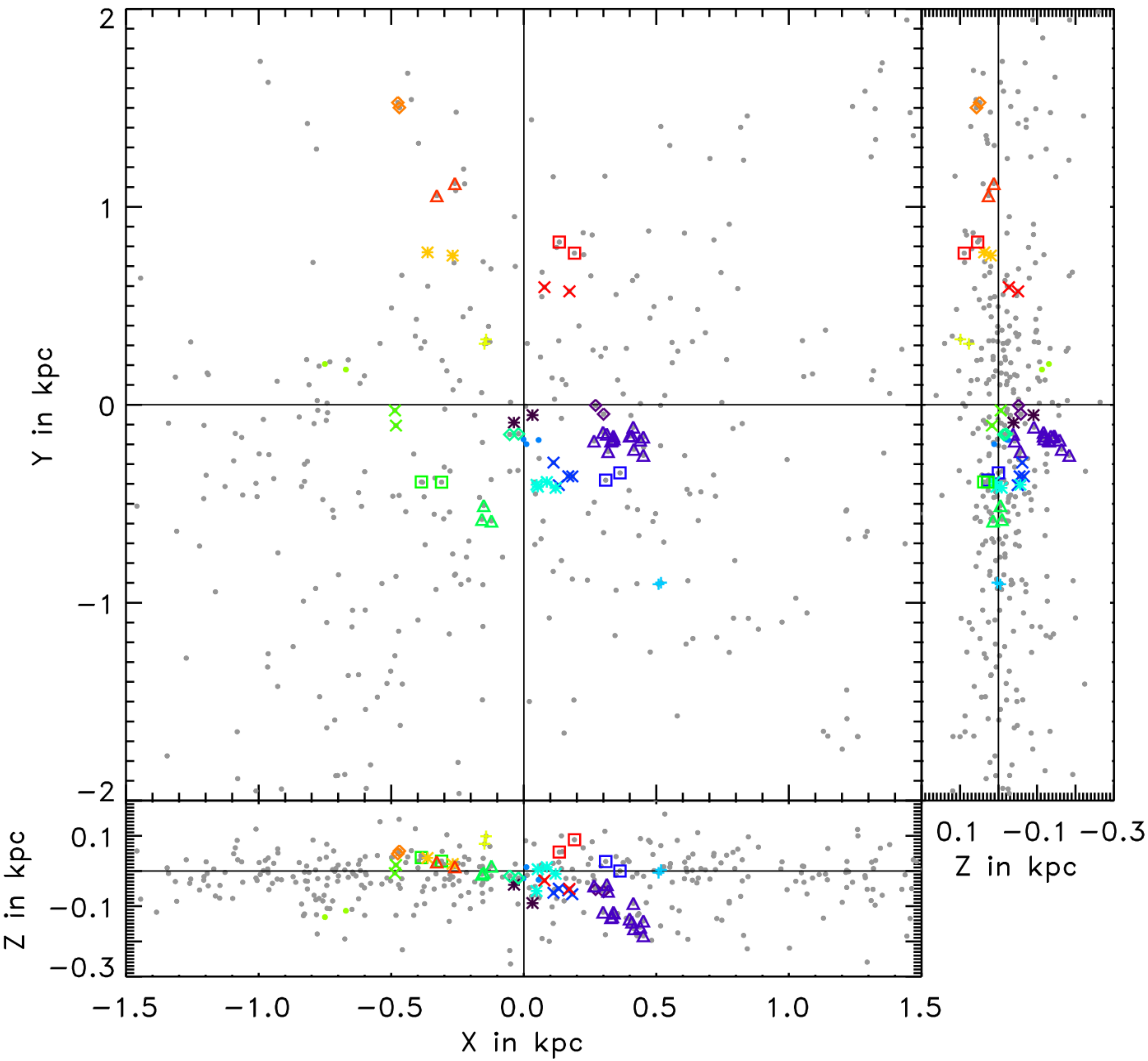
Claudia Conrad

Milky Way and the Local Volume

Galactic Open Clusters

Claudia Conrad, PhD Student





2
1
0
−1
−2
Y in kpc
0.1
−0.1
−0.3
Z in kpc
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
X in kpc
0.1 −0.1 −0.3
Z in kpc

Peter Creasey

Milky Way and the Local Volume

Peter Creasey

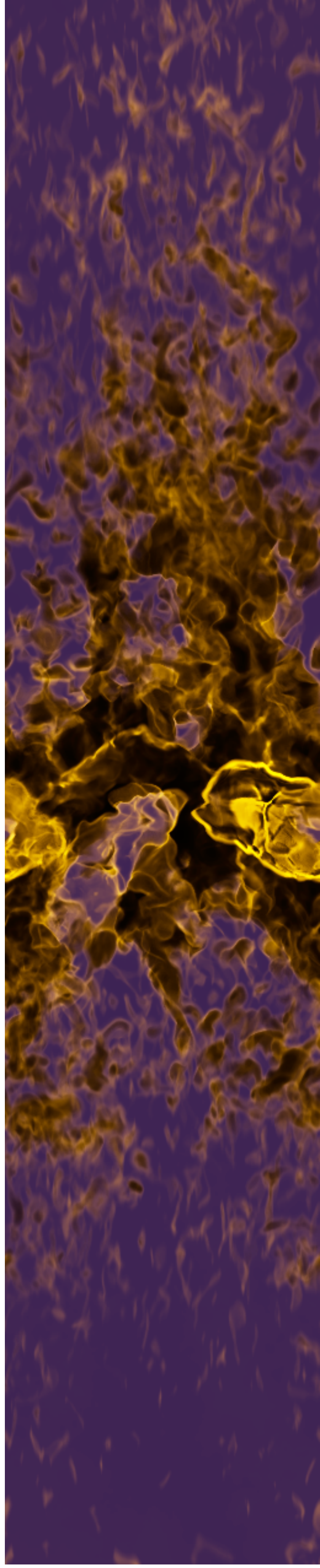
AIP
- Cosmology
  - Galaxy formation (C. Scannapieco)
    - Peter Creasey

Finance
- Stochastic differential equations
- Gaussian (Markov) Random Fields

Software
- iccpy (open source python toolkit for analysis of Gadget/Flash simulations)
- Interactive visualisation with OpenGL

Hydrodynamics
- Shock detection/Riemann solvers/Radiative shocks

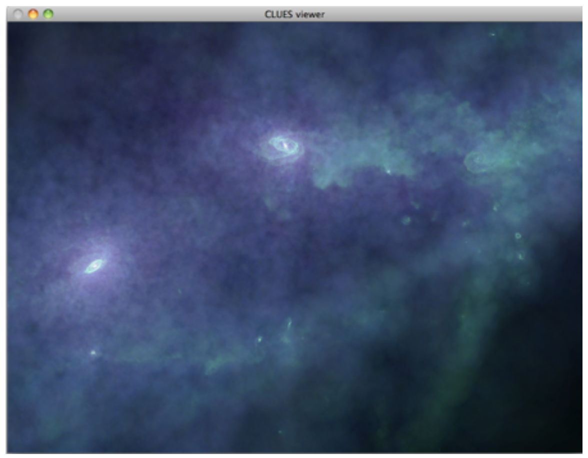
Galaxies
- Stellar mass functions, gas ejection rates, metallicitiy distributions, star-formation driven outflows



Peter Creasey

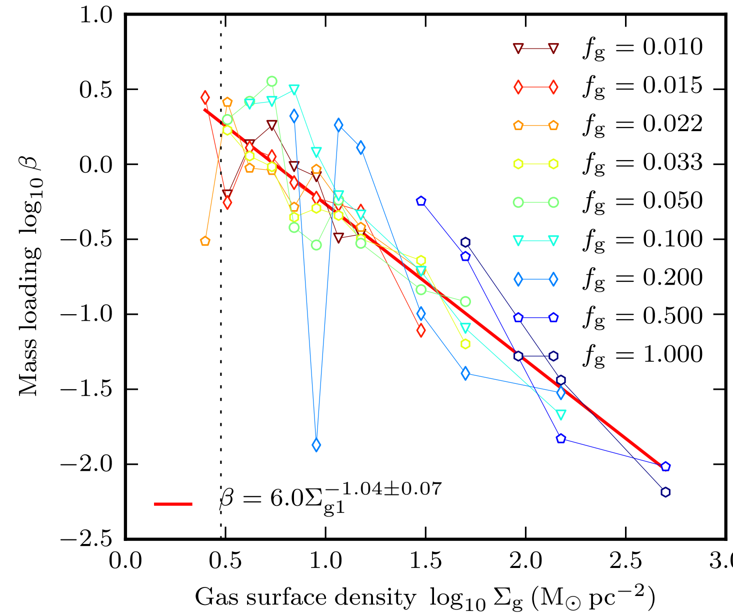
AIP

Cosmological SPH simulations



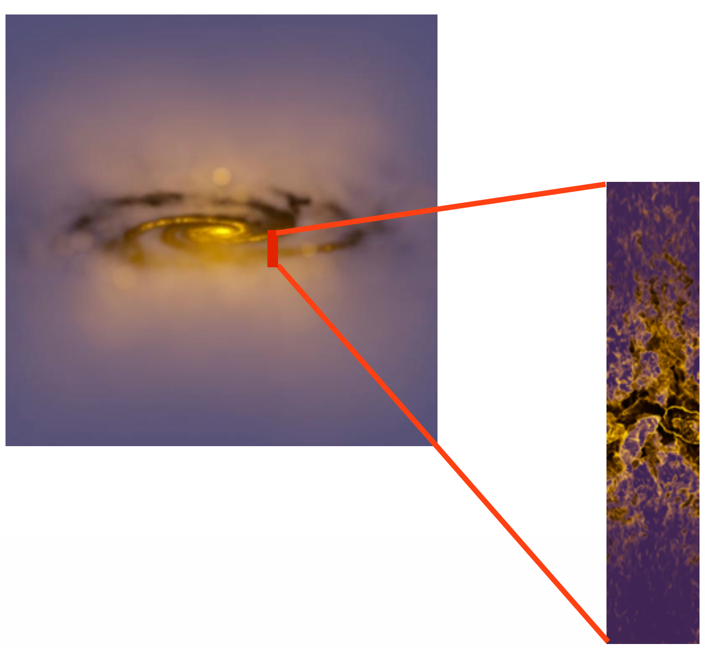
Left: visualisation (Creasey) of a constrained local universe simulation (CLUES, Gottlöber et al., 2010), stellar material in white, coloured material indicates gas (hue variation by temperature).

Mass loading of star-formation driven winds



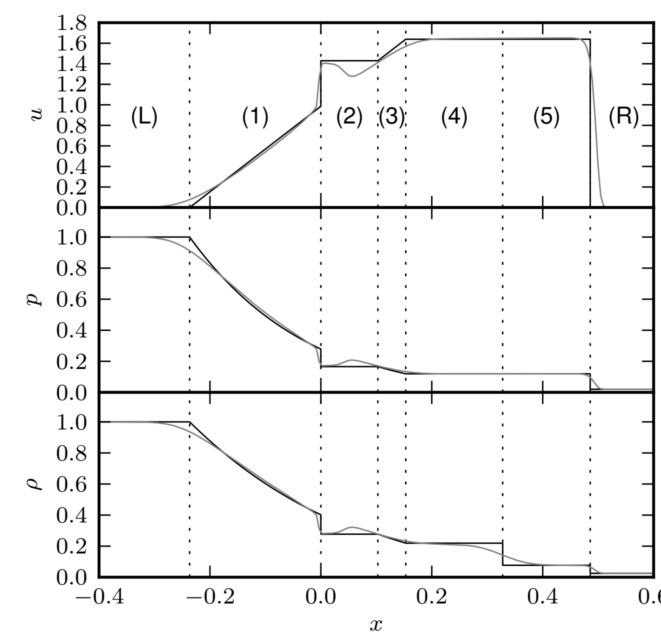
Left: Mass loading as a function of disk surface density, each point is calculated from the time and volume average of a simulation of an idealised disk, line is a best-fit power law (Creasey et al. 2013). The variation is primarily due to the stochastic nature of the prescription for star formation.

The role of stellar feedback



Riemann problems for gravity and hydrodynamics

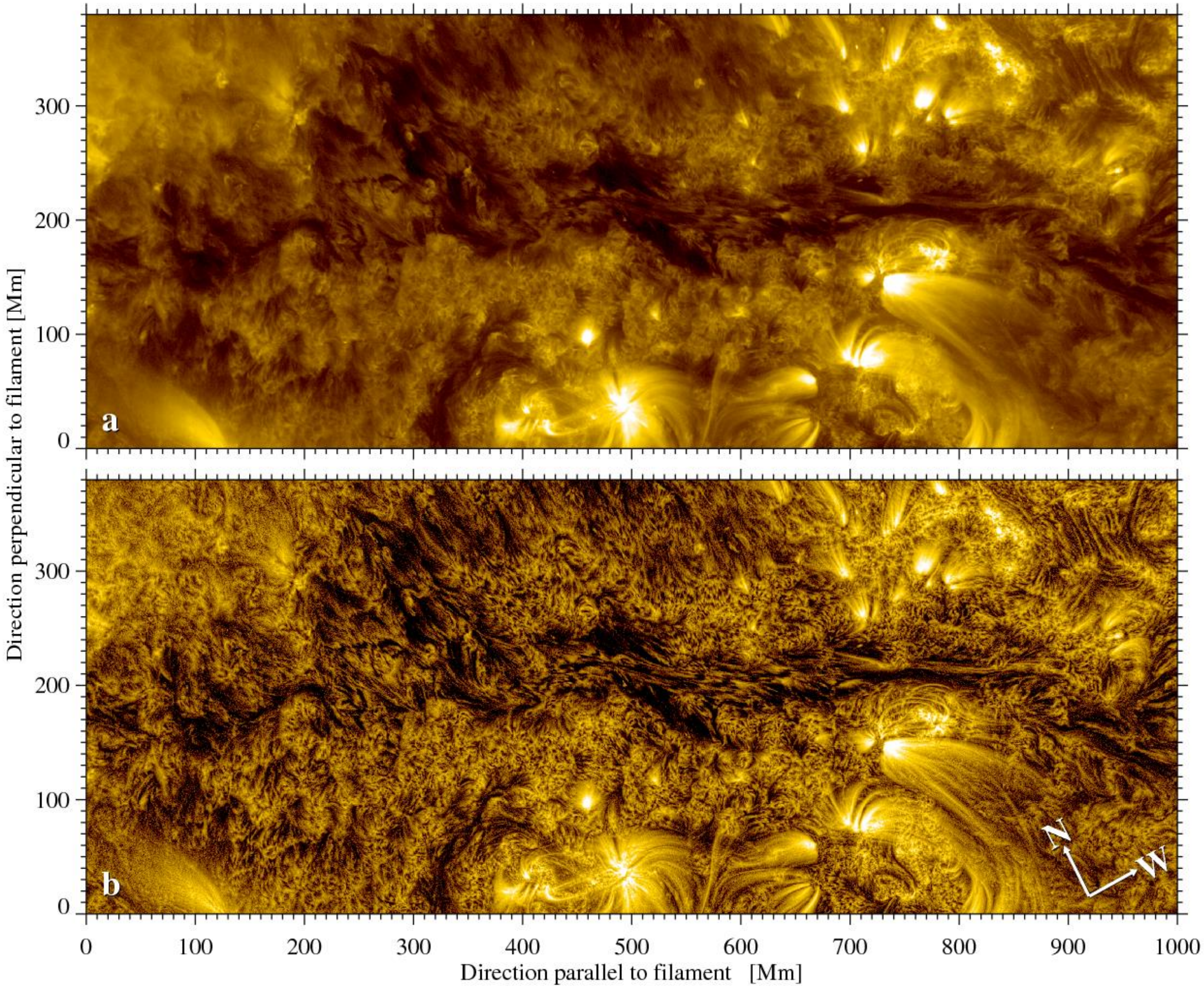
Right: A numerical evaluation of a test-case for hydrodynamics and gravity with a known analytic solution (an extension to the Riemann problem including gravity, Creasey and Scannapieco in prep.).



Andrea Diercke

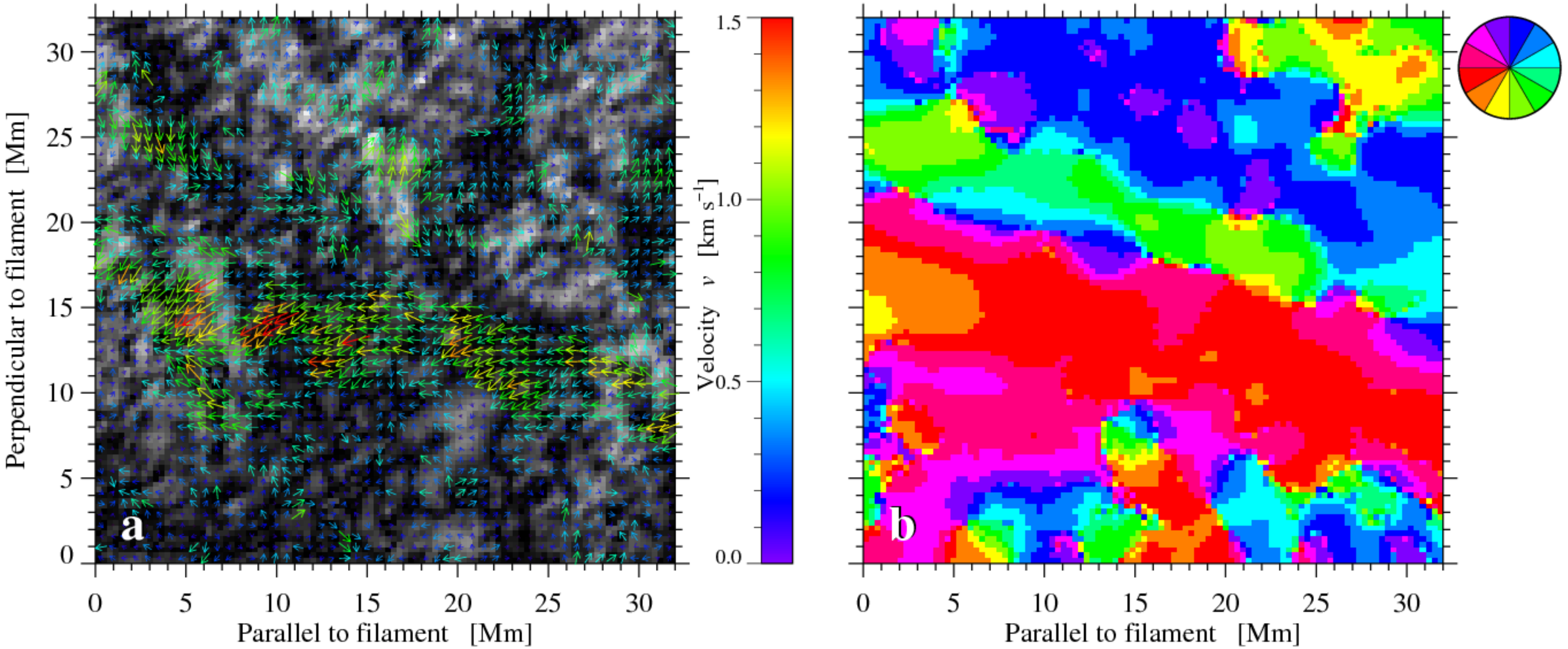
Solar Optical

Dynamics and Evolution of a Giant Solar Filament



- Bachelor thesis
- Observations of the filament with SDO in 171 Å
- Correction of the data with noise adaptive fuzzy equalization (NAFE) method
- Observation of counterstreaming flows in spine (visible in the video)

Verification with Local Correlation Tracking



- LCT: cross-correlation between two images which yields a displacement vector
- Counterstreaming flows are visible in velocity und azimuth maps

http://www.aip.de/de/forschung/forschungsschwerpunkt-kmf/cosmic-magnetic-fields/sonnenphysik/optische-sonnenphysik/publikationen/andrea-diercke-bachelor-thesis

Igor Di Varano
Robotics

Leibniz-Institut für Astrophysik Potsdam

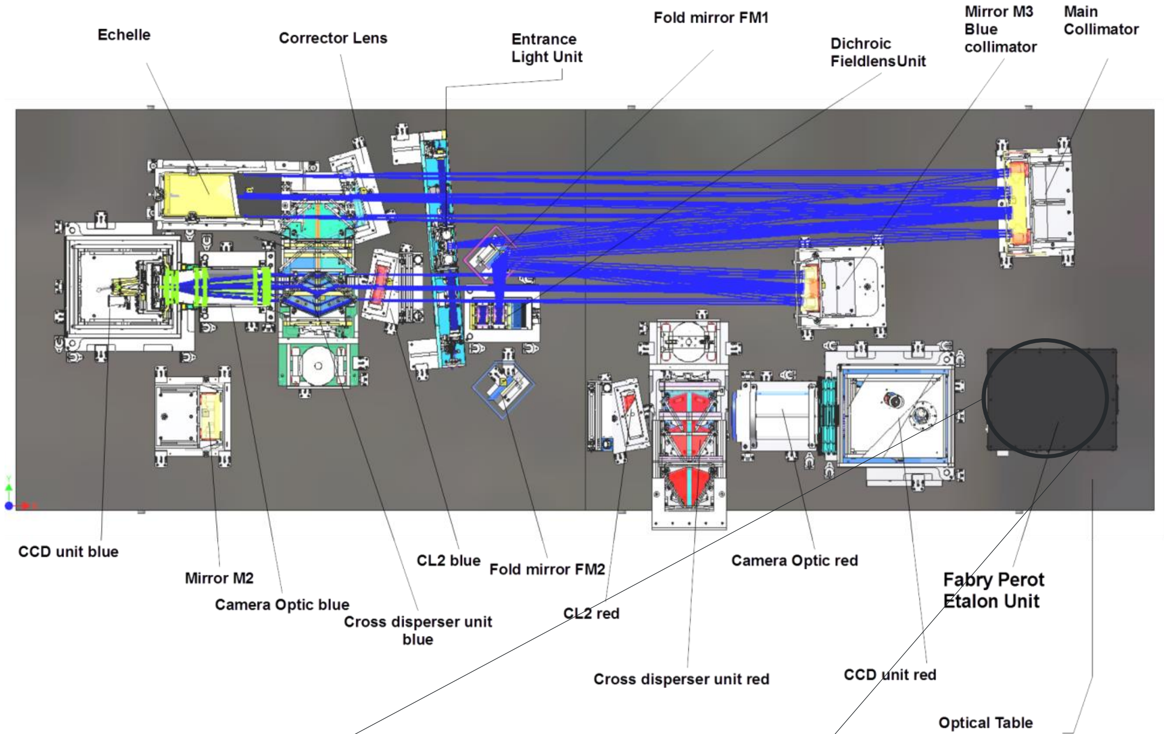
AIP

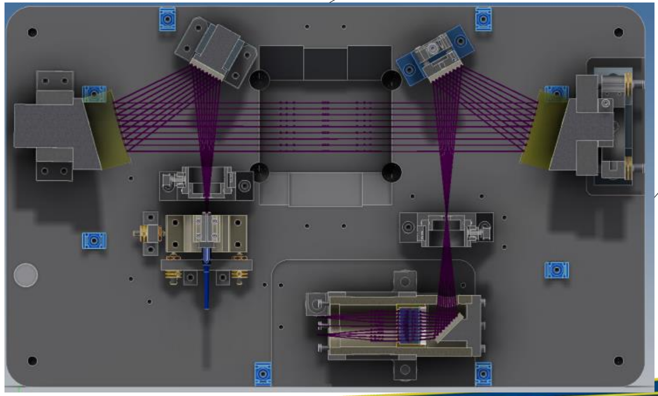
Fabry-Perot Calibration Unit for PEPSI

Igor Di Varano,Ilya Ilyin, K.G.Strassmeier, Manfred Woche, Frank Dionies & Svend M. Bauer

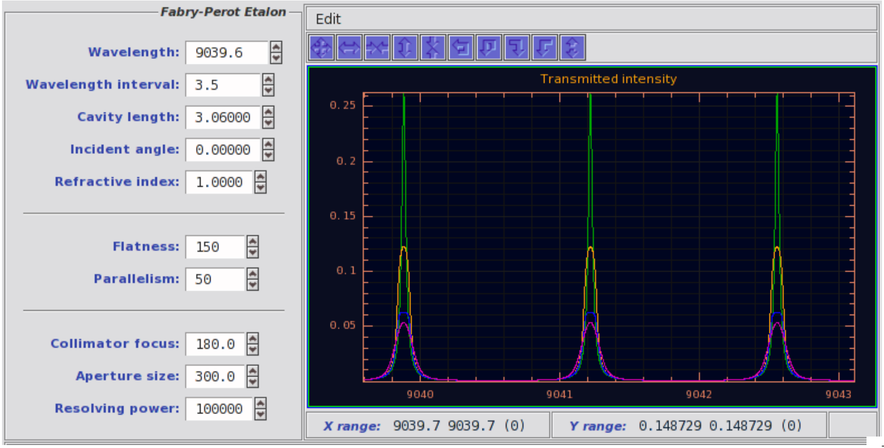
FPEU PEPSI layout

- The F-P Etalon Unit is fed by a Flat Field LOT halogen lamp via one Ø300 µm core fiber 13 m long and redirected via four output fibers (with the same core size) through the fiber switch box to inject into the two target or the two sky fibers for SX & DX LBT foci simultaneously with the target light.
- The incoming light is converted to a parallel beam of Ø30 mm via a Ø3.2mm pinhole and two off-axis parabolas. A triplet of N-BAK1,S-FPL53 and Fused Silica is collimating the beam onto a lenslet array which focuses the FPE light to the four output fibers. The Etalon was manufactured by ICOS Ltd. UK
- To provide a stability of the transmitted peaks to better than $\Delta v=3\ ms^{-1}$ the two etalon mirrors are separated by a Zerodur spacer with minimal coefficient of thermal expansion (CTE=0.01·10-6 /K) .
- Inside the chamber pressure and temperature are controlled within ±0.005K and ±0.015 mbar.





Clear aperture	30 mm
Cavity length	3.06 mm
Cavity spacer	Zerodur
Wedge angle	15’
Coating	90%±3% 380-110 nm
Surface flatness	λ/150 after coating
Surface parallelism	λ/50
Enclosure cell	Unpressurized to 700 mbar



Screenshot from the Fabry-Perot-Etalon simulator.

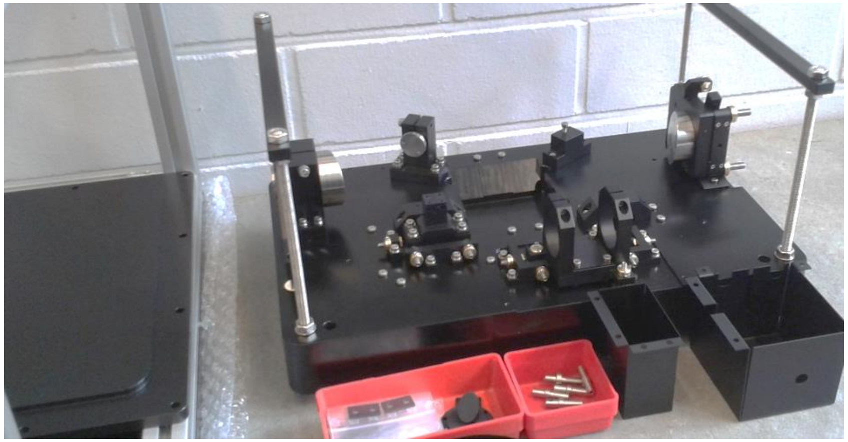
A F-P interferometer is characterized by its effective finesse:

$$\mathcal{F} = \frac{FSR}{FWHM}$$

$$\frac{1}{\mathcal{F}_{eff}^2} = \frac{1}{\mathcal{F}_R^2} + \frac{1}{\mathcal{F}_{SD}^2} + \frac{1}{\mathcal{F}_{DIV}^2} + \frac{1}{\mathcal{F}_f^2} + \frac{1}{\mathcal{F}_{par}^2} + \frac{1}{\mathcal{F}_{sp}^2}$$

		Mirror coating					Etalon finesse					HR		MR		LR	
λ, Å	m	$\mathcal{R}$	$\mathcal{T}$	$\mathcal{A}$	$I_{\min}$	$I_{\max}$	$\mathcal{F}_r$	$\mathcal{F}_f$	$\mathcal{F}_p$	$\mathcal{F}_a$	$\mathcal{F}_t$	$\mathcal{F}_s$	$\mathcal{F}$	$\mathcal{F}_s$	$\mathcal{F}$	$\mathcal{F}_s$	$\mathcal{F}$
4000	15300	71.8	28.2	0.0	2.7	100	9	53	25	47	**9**	20	**8**	7	**5**	2	**2**
5000	12240	89.6	8.2	2.2	0.2	63	29	53	25	59	**17**	25	**14**	8	**7**	2	**2**
6000	10200	91.7	5.4	2.9	0.1	42	36	53	25	71	**19**	29	**16**	10	**9**	3	**3**
7000	8743	90.9	5.0	4.1	0.1	30	33	53	25	82	**18**	34	**16**	11	**10**	3	**3**
8000	7650	91.3	5.0	3.7	0.1	33	35	53	25	94	**19**	39	**17**	13	**11**	4	**4**
9000	6800	92.0	4.1	3.9	0.0	26	38	53	25	106	**19**	44	**17**	15	**12**	4	**4**
10000	6120	92.5	3.8	3.7	0.0	25	40	53	25	118	**19**	49	**18**	16	**13**	5	**5**

Reflective, flatness, parallelism, aperture finesse and the effective finesse relative to the three resolution modes: R_H =320,000, R_M =120,000, R_H =32,000



Mechanical parts installed on the breadboard and the cover plate of the inner box.

Katjana Ehrlich

Milky Way and the Local Volume

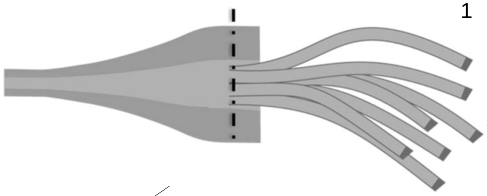
Characterisation of Photonic Lanterns for Applications in Astronomy

- Combining astronomy and photonics:

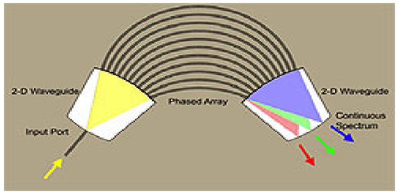
MMF for efficient coupling → Photonic Lantern → SMF for photonic functions

Star

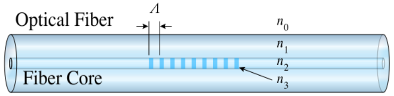
Telescope



[1]

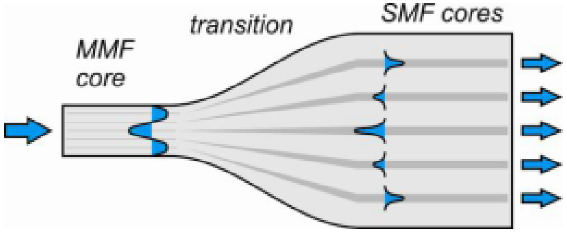


Integrated Photonic Spectrograph[2]



Fibre Bragg Grating[3]

adiabatic low-loss MM-to-SM transition



m non-degenerate supermodes

m degenerate supermodes

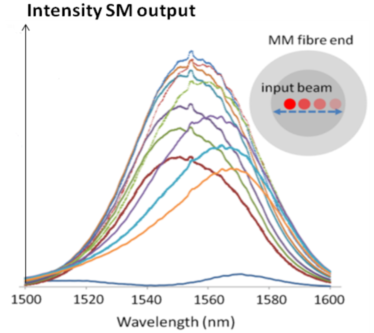
1Saval et al.:Photonic lanterns: a study of light propagation in multimode to single-mode converters, Optics Express, 2010

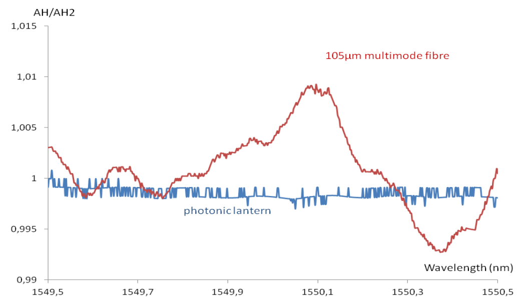
2Courtesy of University of Sydney

3https://en.wikipedia.org/wiki/File:Fiber_Bragg_Grating-en.svg

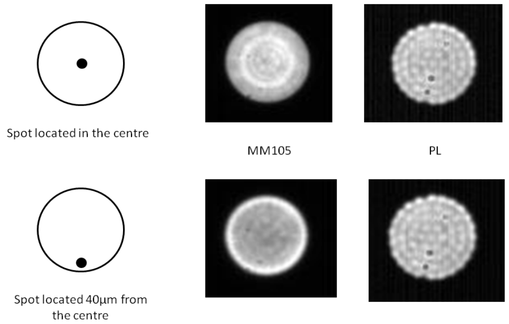
Characterisation of Photonic Lanterns for Applications in Astronomy

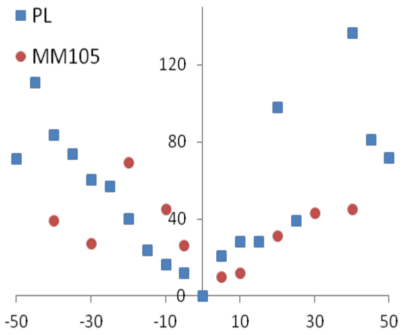
- Characterisation of a 1-61 Photonic Lanterns[1]:
  - Spectral behaviour





  - Scrambling





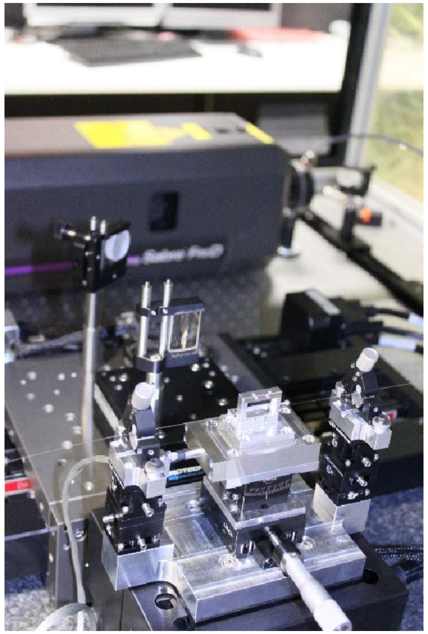
Scrambling gain

$$SG = \frac{d}{f}$$

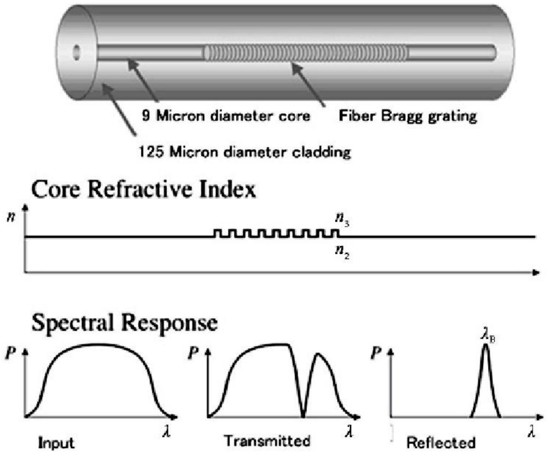
1Olaya, J.C. et al.: 1:61 photonic lanterns for astrophotometry: a performance study, MNRAS, 2012

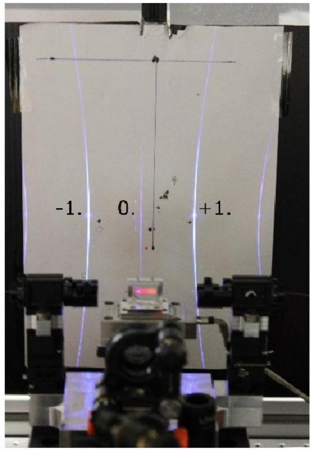
René Eisermann
innoFSPEC

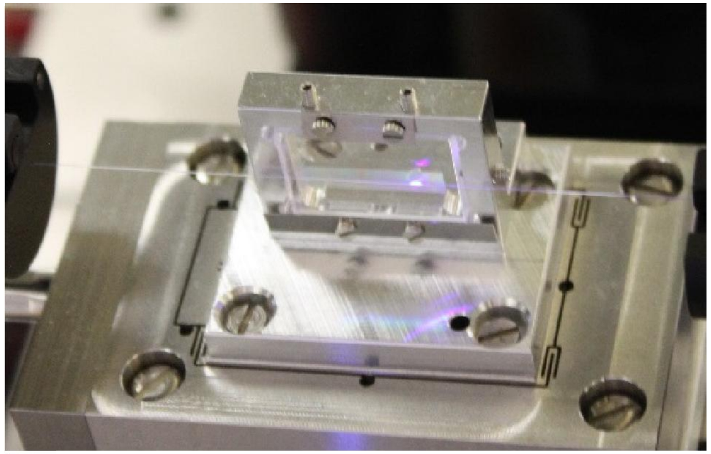
Fibre Bragg grating (FBG) fabrication



- Periodic variation of refractive index cause wavelenght-specific backreflection
- Fabrication methods of FBG:
  - UV Laser (244nm) writing @ AIP:
    - Phasemask scanning (02.2014)
    - Two-beam holographic (in preparation)
  - fs-Laser (800nm) writing @ Golm:
    - Point by point direct writing (06.2014)



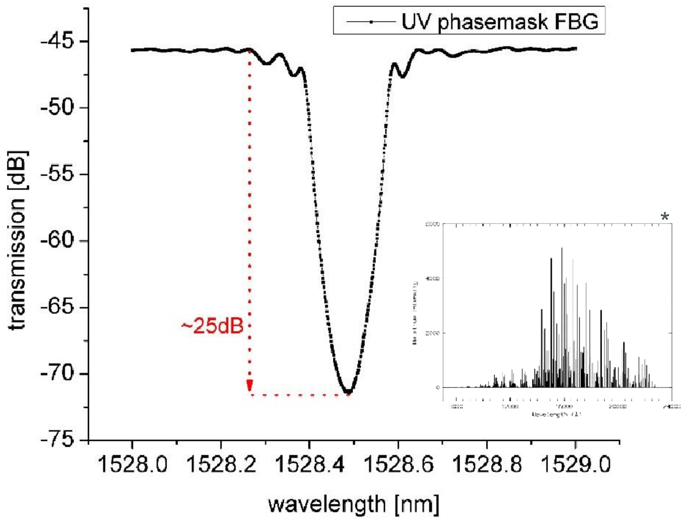




FBG results and goals

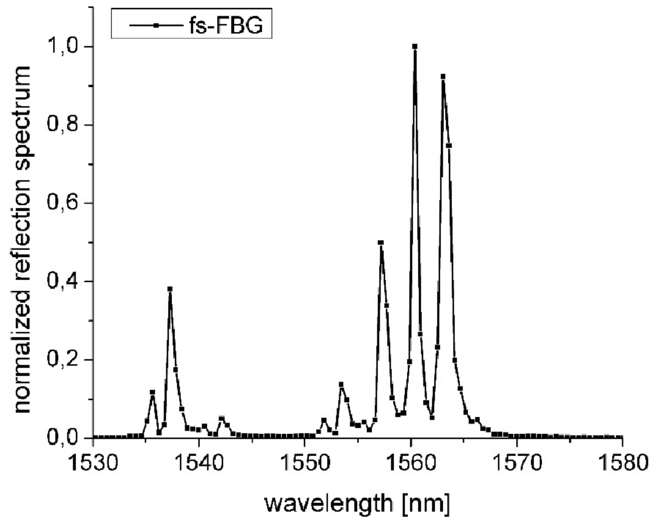
FBG as OH-line filter

- Bright OH-lines in the IR night sky
  - OH-linewidth between 0.01-0.1nm with up to 25dB notch depth
- FBG filter performance (singlecore)
  - FBG with narrow FWHM (-3dB) <0.1nm
  - Suppress >25dB (>99%) of transmission signal
  - First multi notch FBG by fs-Laser



Future goals

- Writing of multi notch FBG in 120 core fibre (MCF) for OH-suppression
- Single core multi notch FBG implementation as strain monitoring for fibre health system



* P. Rousselot et. al. - Night-sky spectral atlas of OH emission lines in the near-infrared (2000)