Leibniz-Institut für
Astrophysik Potsdam

ISC proudly presents:

4. AIP-Jamboree, January 23, 2015

The rules of the game:

- 2 minutes (2 slides)

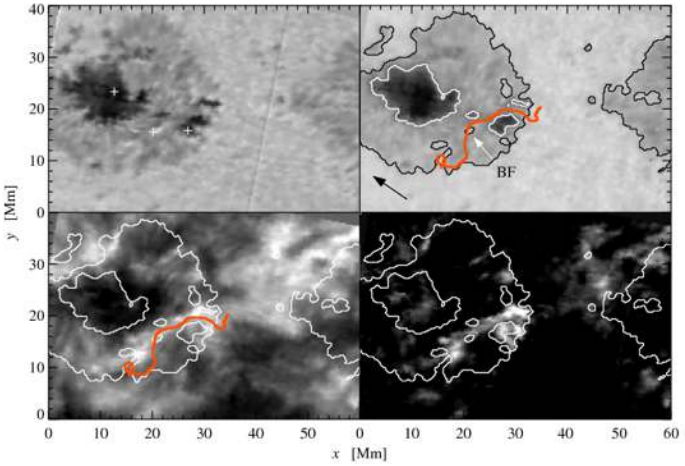
- Present yourself and your work

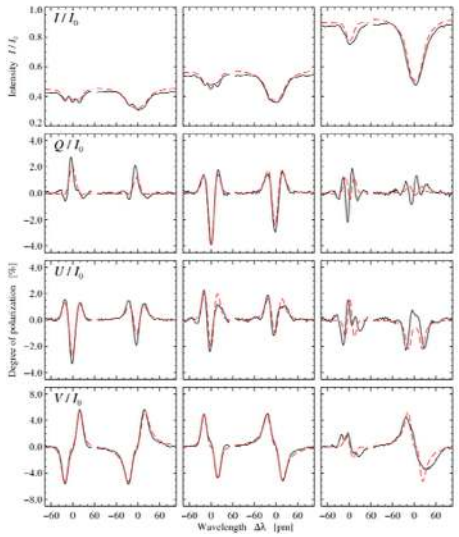
- Get to know the colleagues

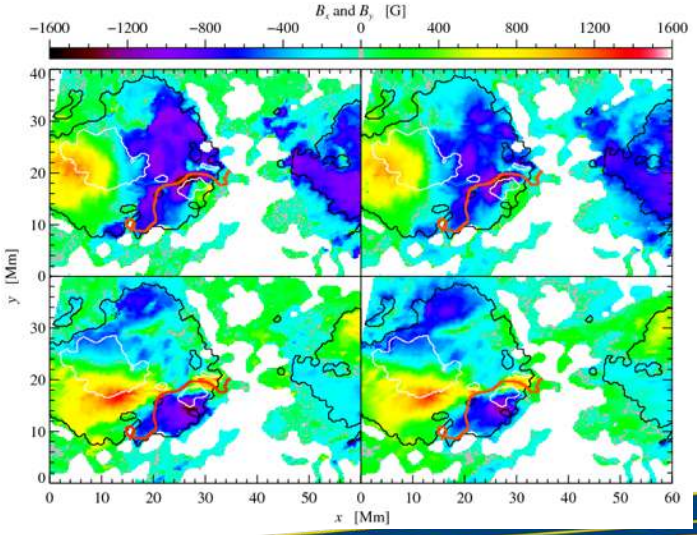
Horst Balthasar
Solar Optical

Magnetic field in sunspots

- Measure the Stokes profiles
- run an inversion code
  (e.g. Stokes Inversion based on response functions, SIR)
- Solve magnetic ambiguity to get the magnetic vector field
- Example: delta spot NOAA 11504

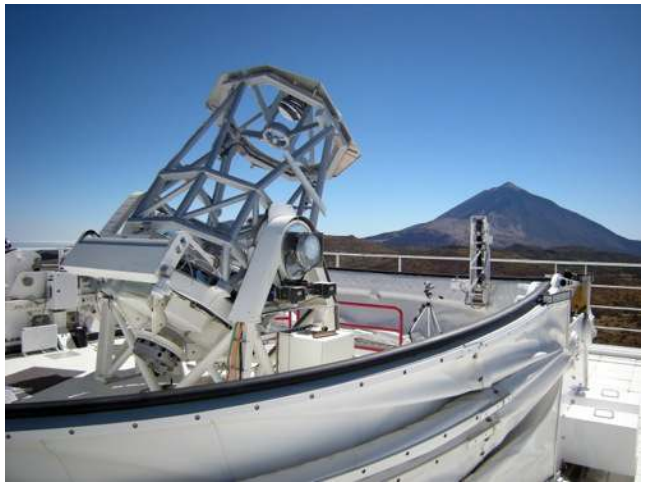






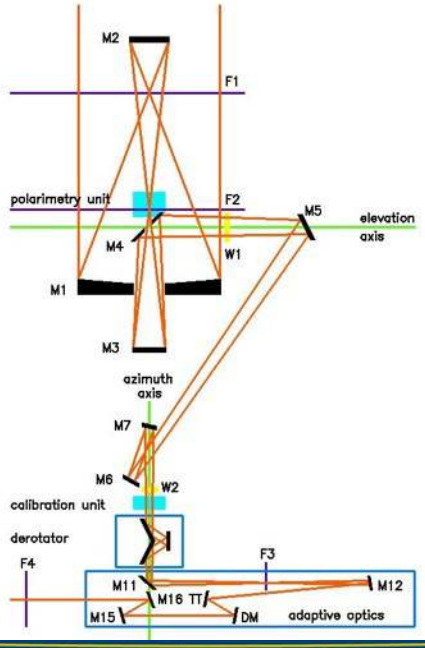
A&A 562, L6 (2014)
ASP CS 489, 39 (2014)

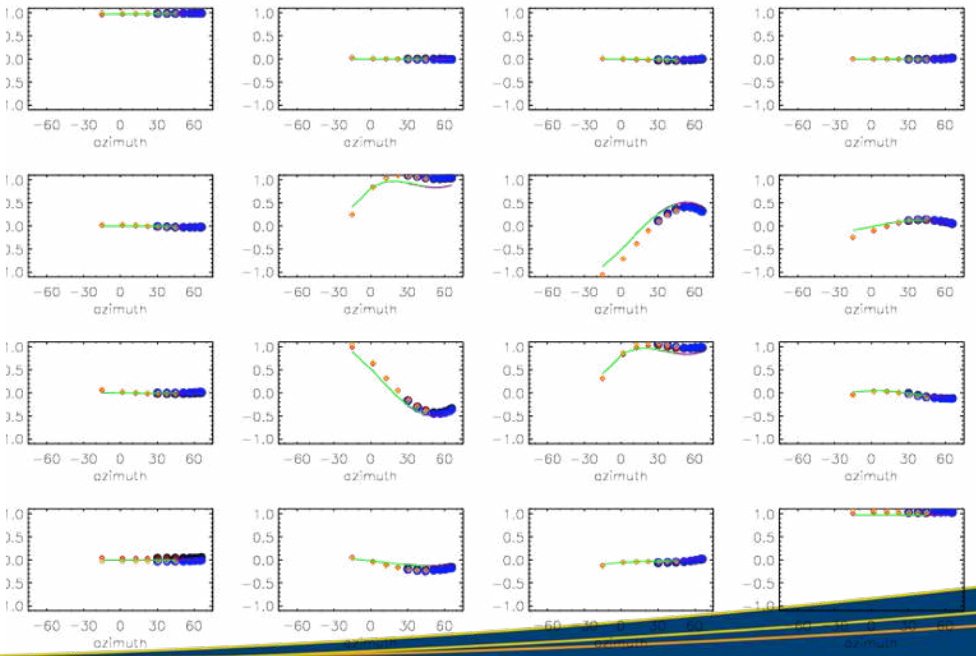
Instrumental polarization of the GREGOR-telescope



- Alt-azimuthal mount — mirrors rotate against each other
- Polarimetric modulation inside the post-focus instruments
- Need for a telescope model to calibrate data

Hofmann et al., AN 333, 854 (2012)

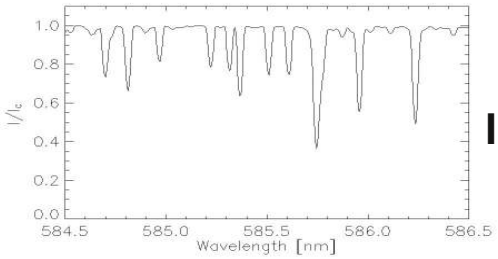




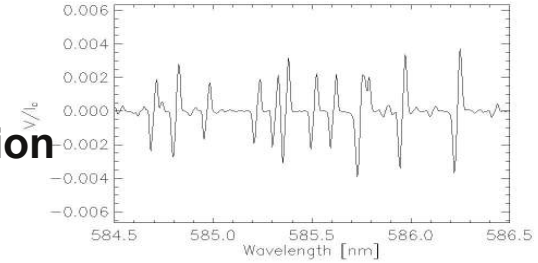
Thorsten Carroll
Stellar physics

Mapping Stellar Surfaces - Zeeman-Doppler Imaging

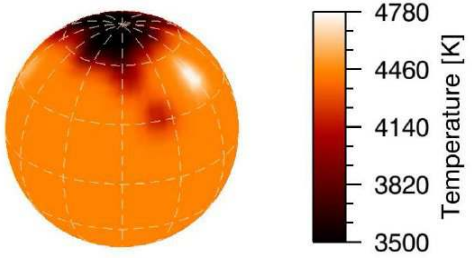
Thorsten A. Carroll – Stellar Physics and Stellar Activity

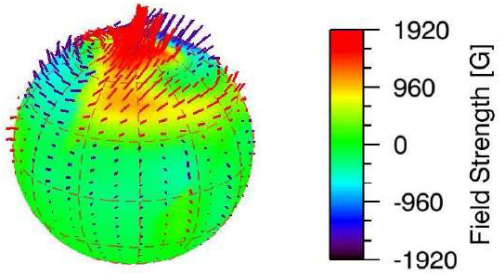


Spectrum
Intensity & Polarization

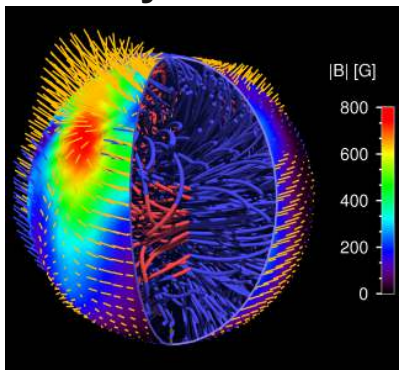


Reconstructed temperature & magnetic field distribution

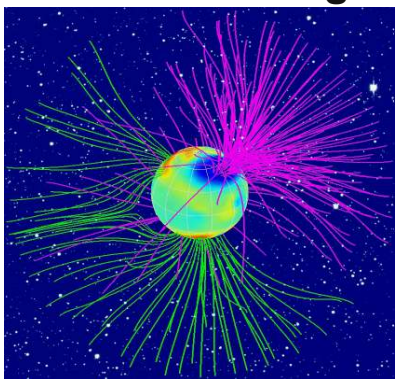




Comparison with theory
Stellar interior



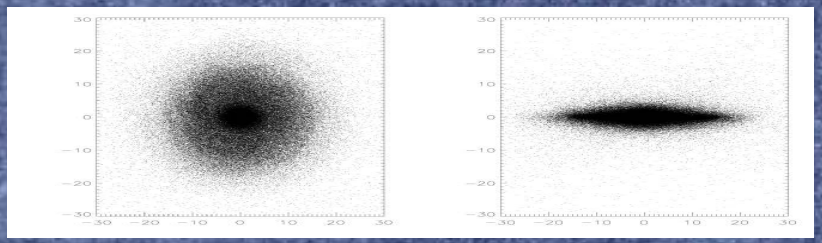
Magnetic field extrapolation
Stellar environment

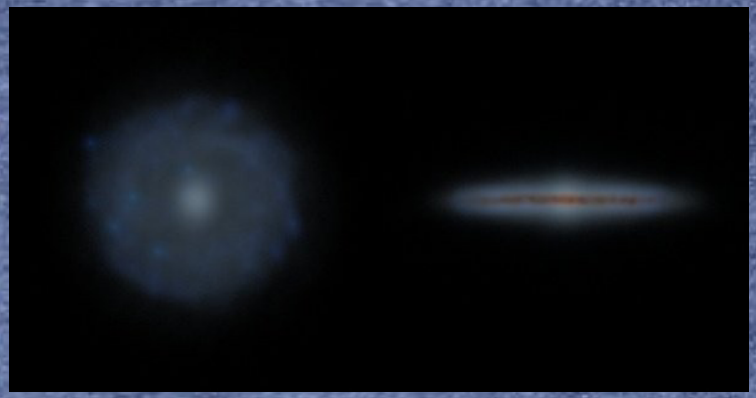


Giovanni Guidi
Cosmology

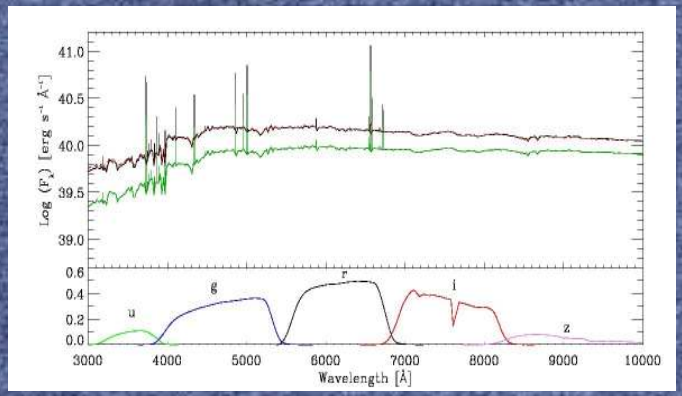
Galaxy formation in cosmological context: Dr. C. Scannapieco (supervisor), Dr. P. Creasey, P. Poulhazan (Ph.D.), me (Ph.D.)

SIMULATION

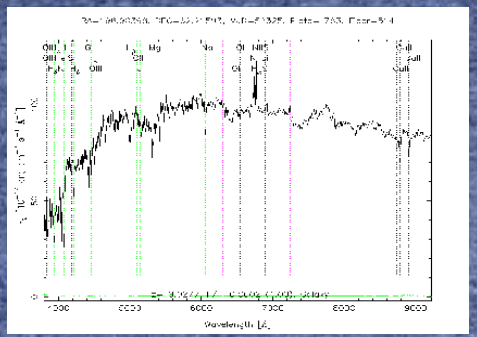




MOCK DATA

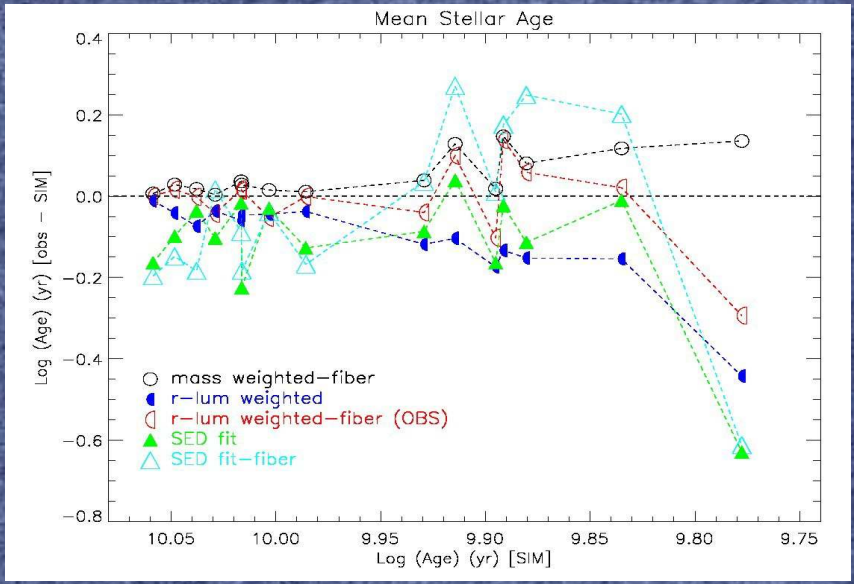


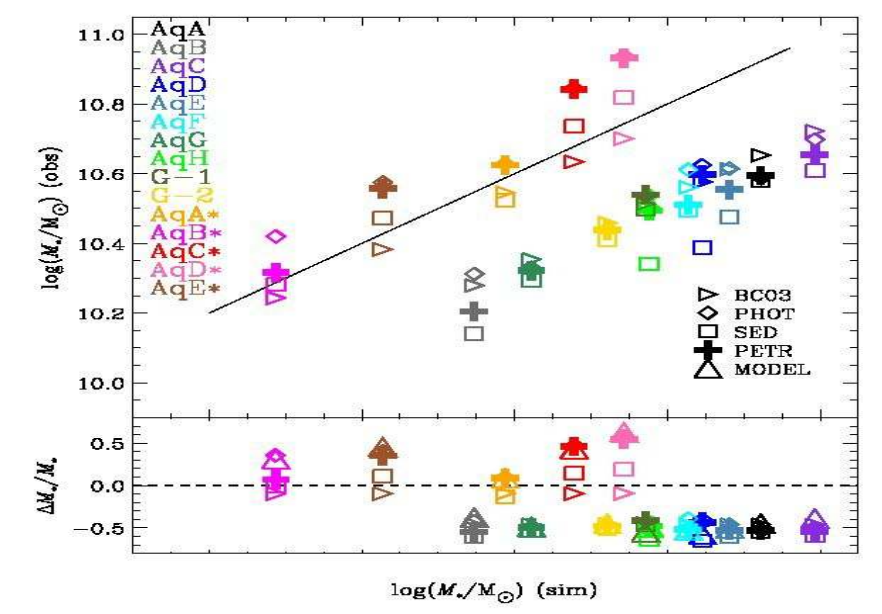
REAL DATA

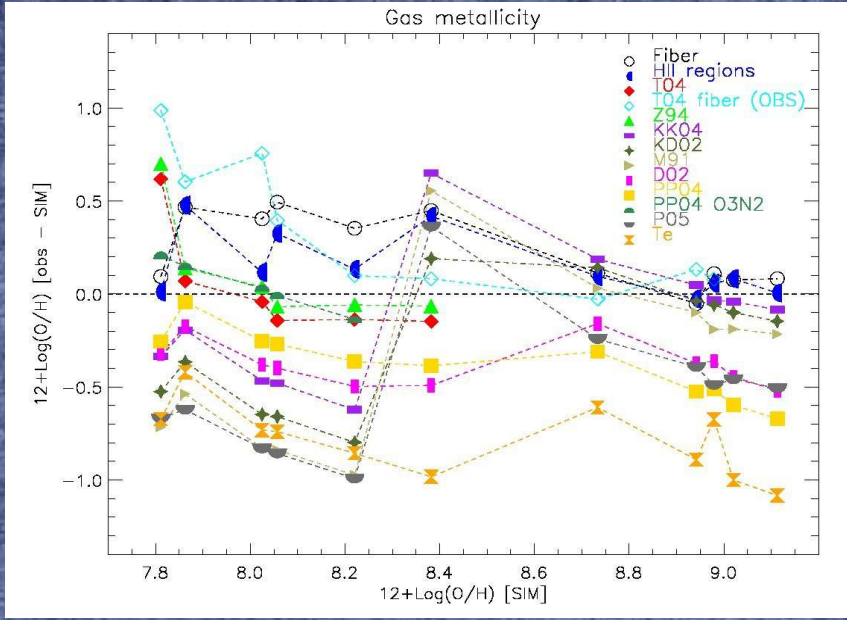


Derive galaxy properties in “observational” way

- Compare simulations and observations in an unbiased manner
- Test the model of galaxy formation
- Test observer's algorithms







Eloy Luis Hernandez Anguizola
innoFSPEC

Background

- Dipl.-Ing. Electrical Engineering
- Experimental setups and data analysis

Karlsruhe Institute of Technology

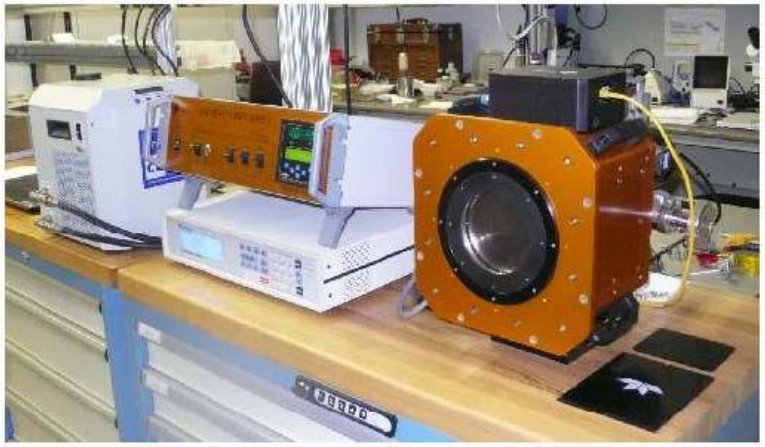
At AIP

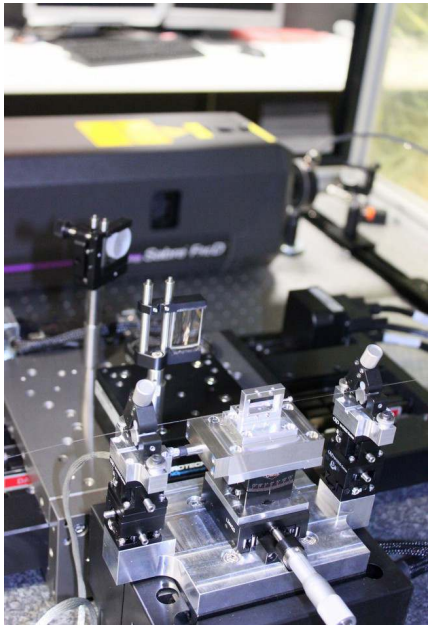
innoFSPEC
Innovative faseroptische Spektroskopie und Sensorik

- April 2014 part of InnoFSPEC
- October 2014 PhD → supervision: Prof. Martin M. Roth
  - Physical Properties of Optical Fibers used for Spectroscopy in the Optical and NIR at Extremly Large Telescopes

Projects

- PRAXIS: OH suppressed fibre spectrograph
  - IR Detector H2RG





- Fibre Bragg Grating (FBGs)

Arto Järvinen
Robotics

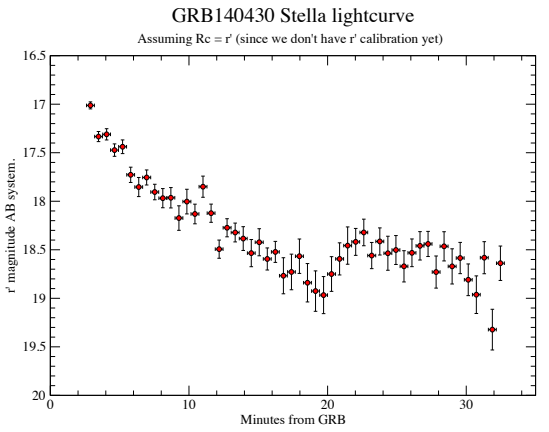
UNIVERSITY of OULU
OULUN YLIOPISTO

- UoO MSc 2002
  - GRB010222
- NOT 2003-2004
  - Student support astronomer
  - ALFOSC, FIES, StanCam
- ESO 2004-2005
  - FORS photometry precision
- AIP 2006...
  - STELLA, RoboTel, PEPSI, Gregor@night

AIP

NORDIC OPTICAL TELESCOPE

ESO

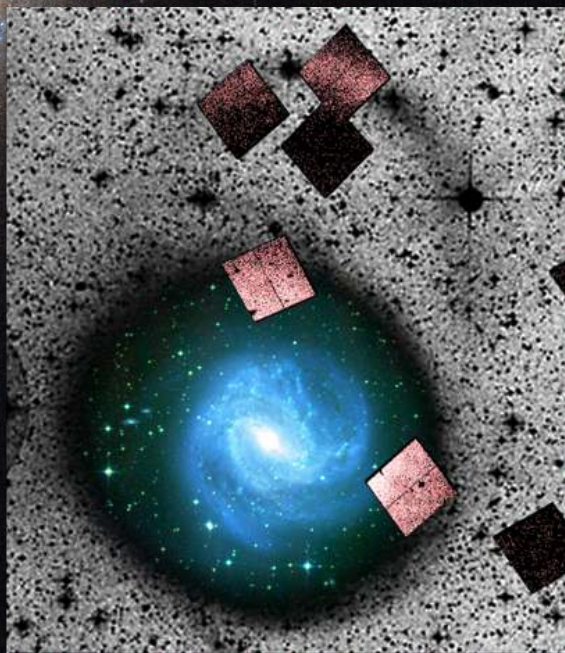

GRB140430 Stella lightcurve
Assuming Rc = r' (since we don't have r' calibration yet)
r' magnitude AB system.
16.5
17
17.5
18
18.5
19
19.5
20
0
10
20
30
Minutes from GRB

Roelof de Jong
Milky Way and Local Volume

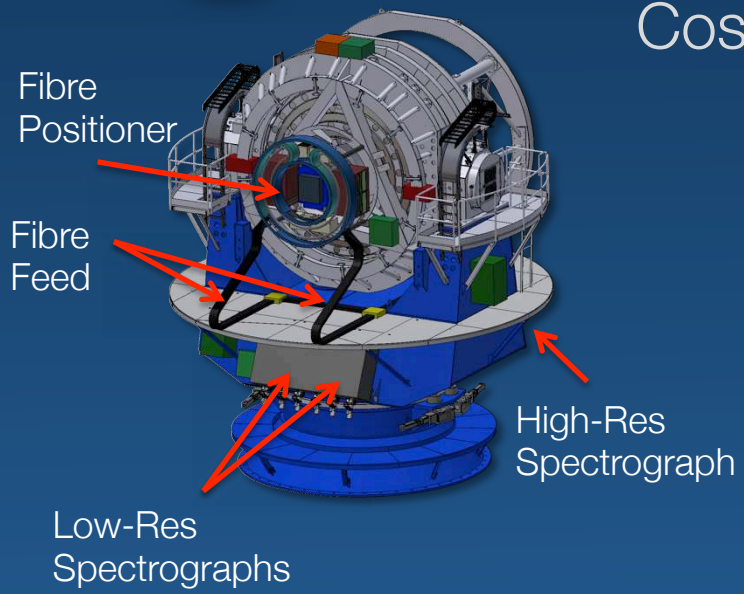
Galaxy formation and evolution

- Roelof de Jong
  - PhD Groningen -> Durham -> Steward Obs. -> STScI -> AIP (July 2009)
  - Head Milky Way and the Local Volume section
    - We study any galaxy that can be resolved into stars
  - PI GHOSTS & 4MOST

Galaxy
Halos
Outer Disks
Substructure
Thick Disks
Star Clusters



4MOST – 4m Multi-Object Spectroscopic Telescope



VISTA telescope

Cosmology & Large Scale Structure (Euclid)
Galaxy Evolution & Dark Matter
High Energy Universe (eROSITA)
Milky Way Formation & Evolution (Gaia)
Exo-planet host stars (PLATO)

Open to anyone at the AIP!

www.4MOST.eu

Thiago Junqueira

Milky Way and Local Volume

Jamboree - AIP

A little bit of My past

Thiago C. Junqueira

Where I'm from

Brazil

But not from Rio

I'm from São Paulo

Where I studied

I did My bachelor in physics at State University of São Paulo 2003 – 2006

unesp

Then My Master and PhD at University of São Paulo 2007 – 2013

OBSERVATÓRIO DE SÃO PAULO
SANCTI PAVLI CÆLVM AGER MEVS
UNIVERSIDADE DE SÃO PAULO
SCIENTIA VINCES

Now here I am

Postdoc since nov – 2013

AIP Leibniz-Institut für Astrophysik Potsdam

Support by

SCIENCE WITHOUT BORDERS

DAAD
Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

How I felt during the word cup

Jamboree - AIP

I'm working ...

... in the Milky Way group

more directly with

Cristina Chiappini

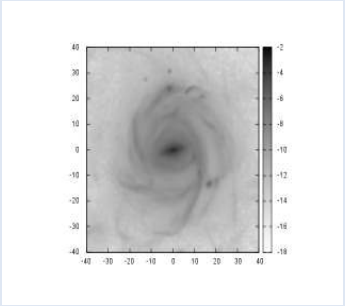
Ivan Minchev

About My work

My work topics are:

Structure of Milky Way:

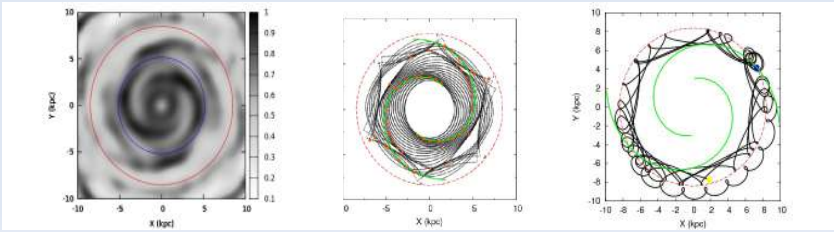
Focus more on spiral arms and stellar dynamics



Chemodynamical evolution

Simulated galaxy from Martig et al. (**2012**)

Stellar dynamics



Interest on the following surveys:

RAVE

SEGUE

APOGEE

GES

and in the near future

Gaia

4MOST

WEAVE.

Francisco Kitaura

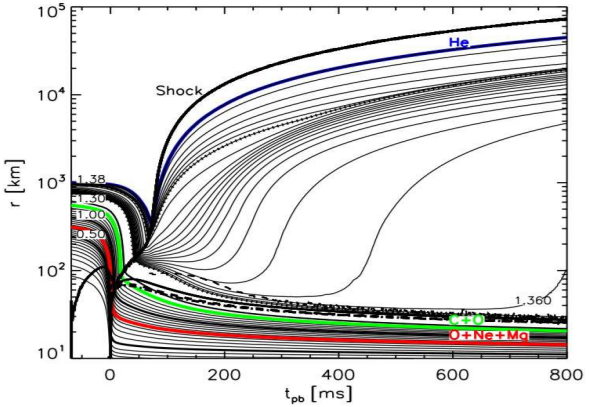
Schwarzschild Fellow

http://www.franciscokitaura.wix.com/home

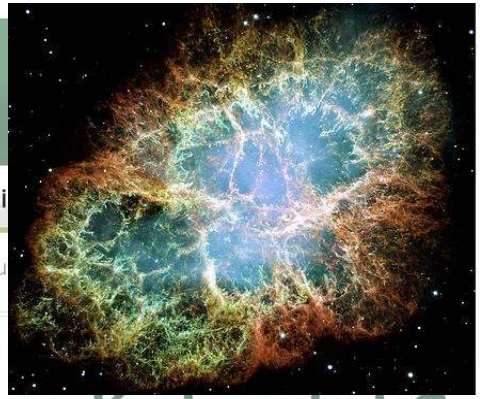
I am Spanish-Japanese (born in Madrid), but raised in the German culture (school+University).

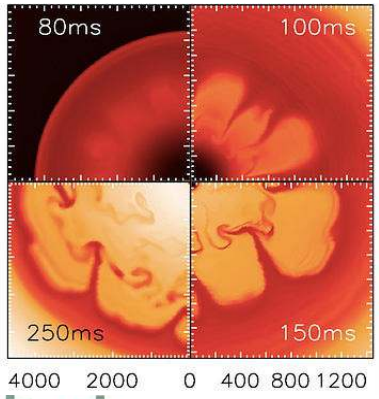
PhD at the Max Planck Insitute MPA Munich.

Before coming to AIP I was Marie-Curie fellow in Italy (Trieste, Pisa) and PostDoc at the Excellence Cluster/MPE (Munich).



I started working in Astrophysics on **Supernova explosions**



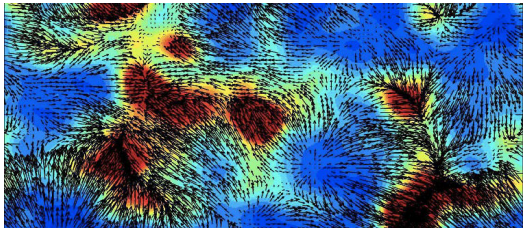


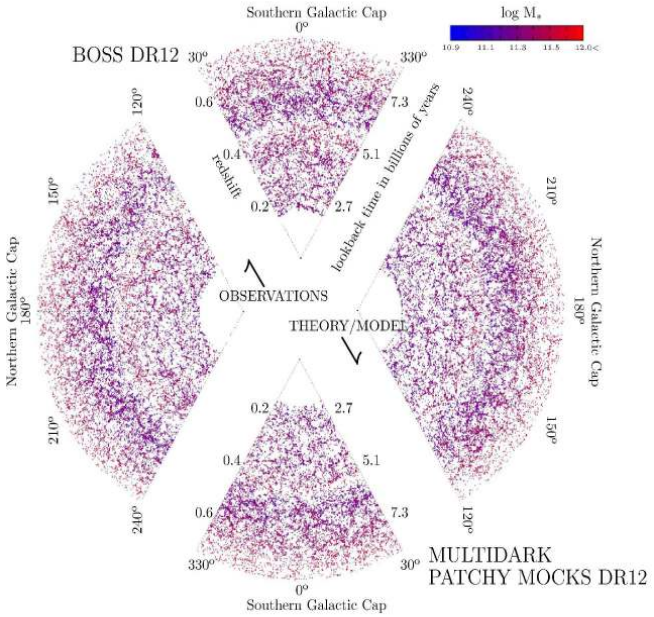
Supernova-Explosion: Forscher simulieren Krebsnebel-Geburt

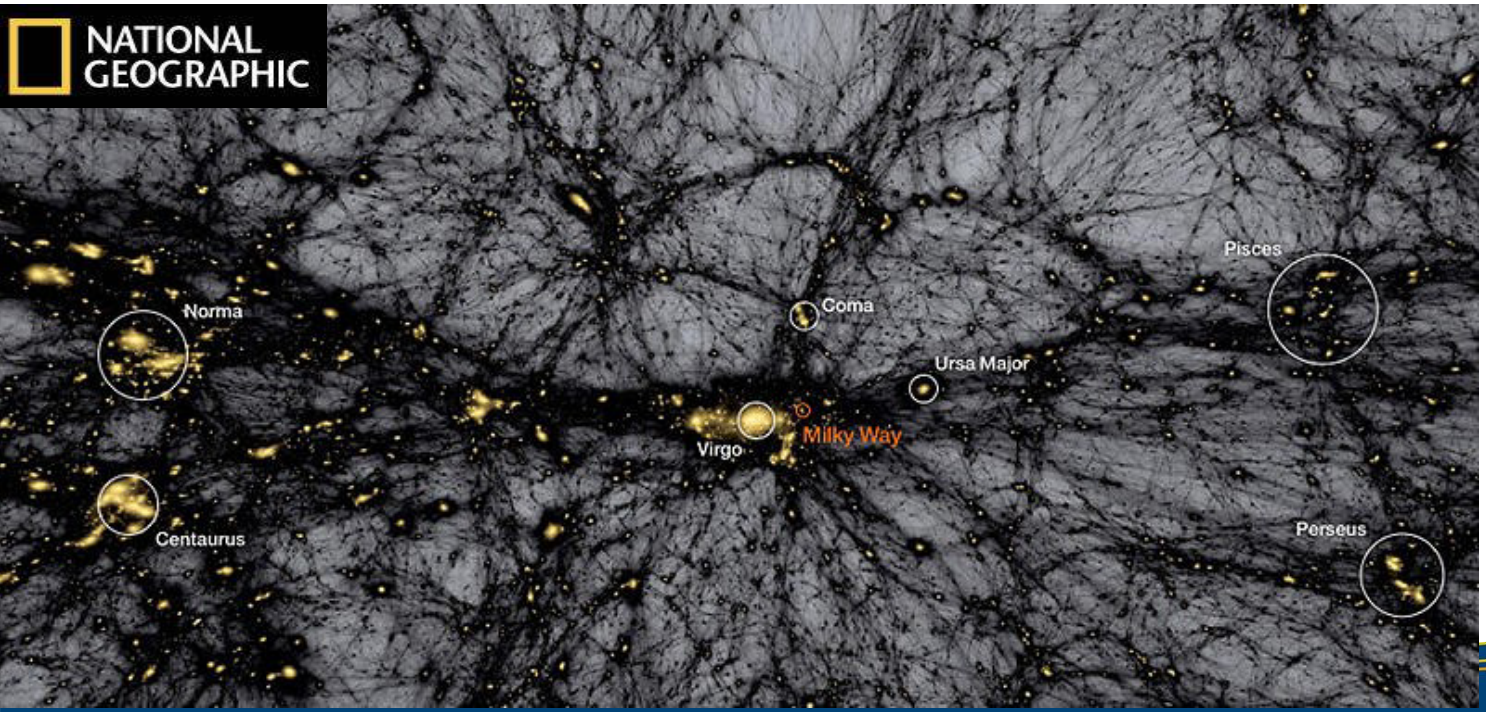
Die Energie von Neutrinos zersprengte vor rund tausend Jahren einen Neutronenstern - dabei entstand der Krebsnebel. Max-Planck-Forscher konnten diese gigantische Supernova-Explosion jetzt erstmals am Computer simulieren und so eine alte Theorie beweisen.

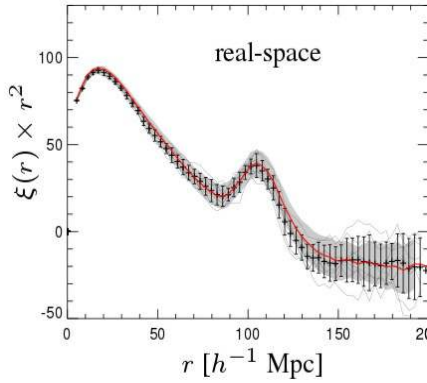
Cosmology: Theory+Data Analysis

- PI cosmology science case 4MOST
- Co-lead BAO reconstruction WG EUCLID
- Co-lead Data Analysis WG J-PAS
- Working for BOSS on galaxy mock production and clustering analysis.
- Work on the Local Universe





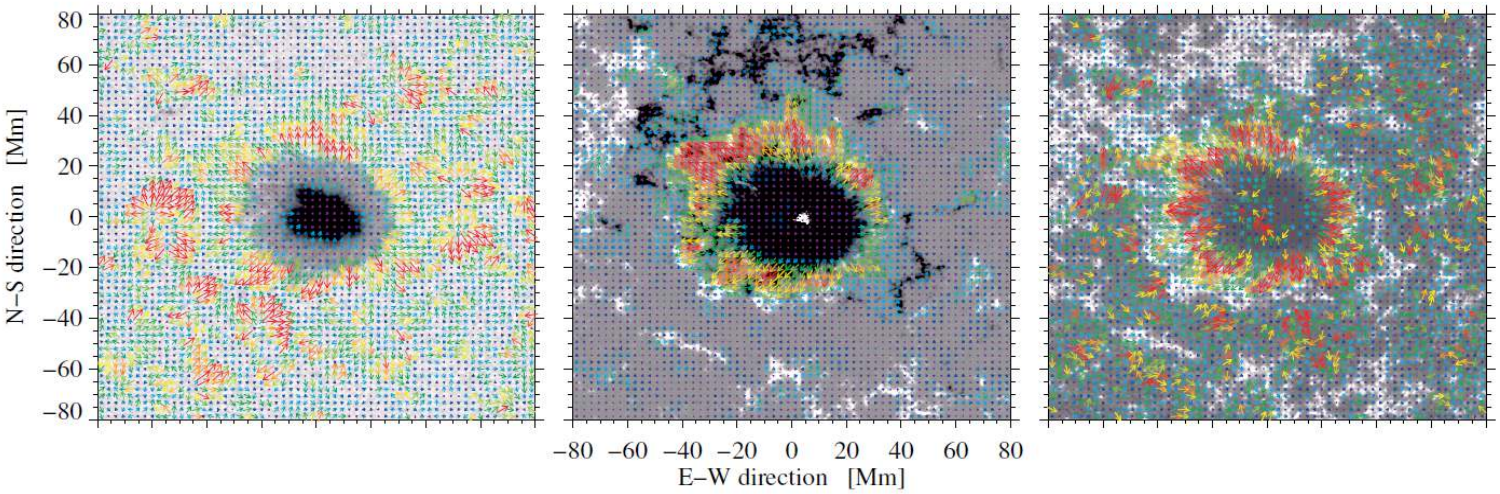




Philipp Kummerow
Solar Optical

Horizontal proper motions in and around “theoretican’s sunspots”

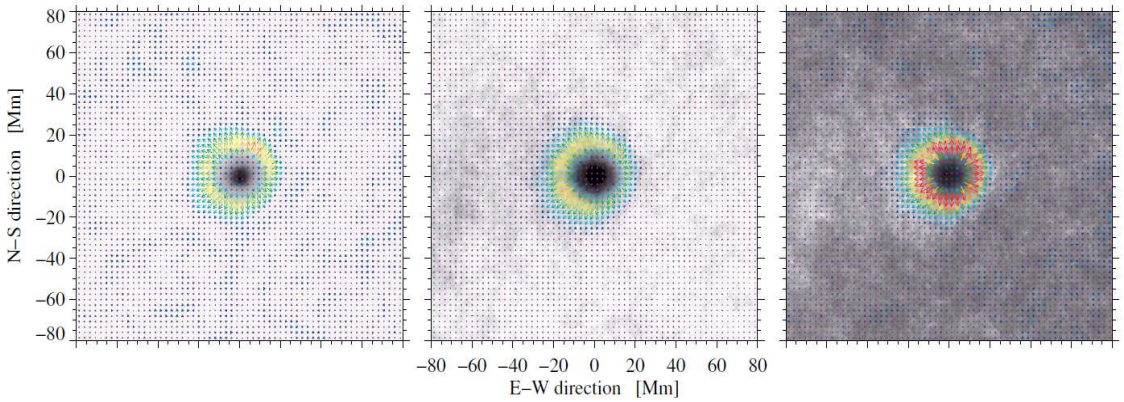
- Philipp Kummerow
- Master’s student at the university of Potsdam
- In the Optical Solar Physics Group



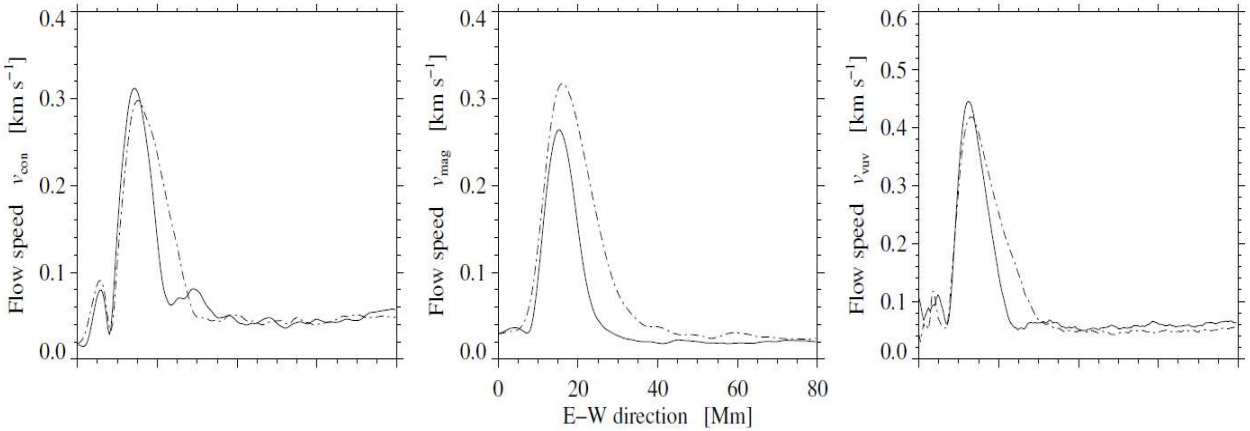
- Continuum intensity I, magnetic flux density B and EUV λ160 nm for 26 axis-symmetric sunspots
- rainbow-colored vectors represent magnitude and direction of the

  horizontal proper motions

East-west asymmetry of sunspot moats



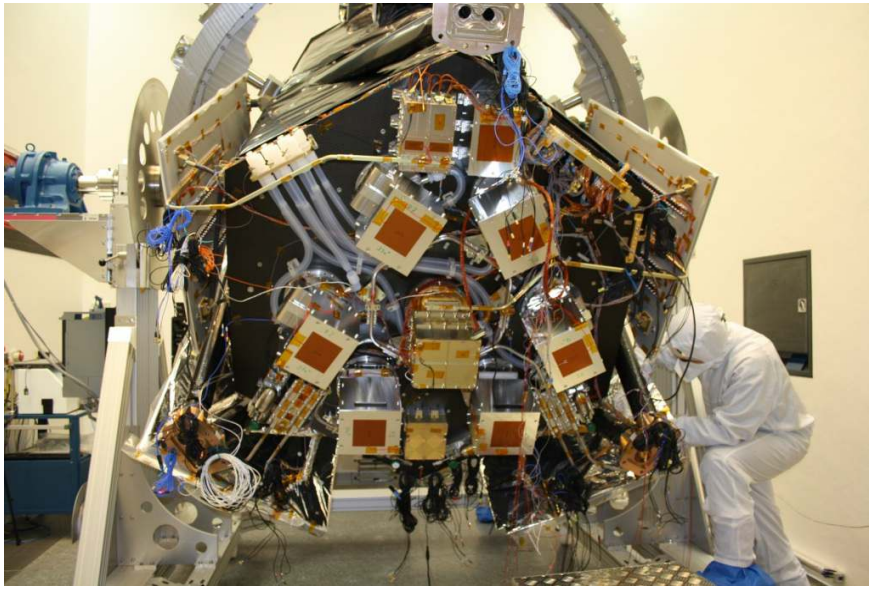
- Average sunspot
- moats are clearly asymmetrical in the east (dash-dotted)-west direction



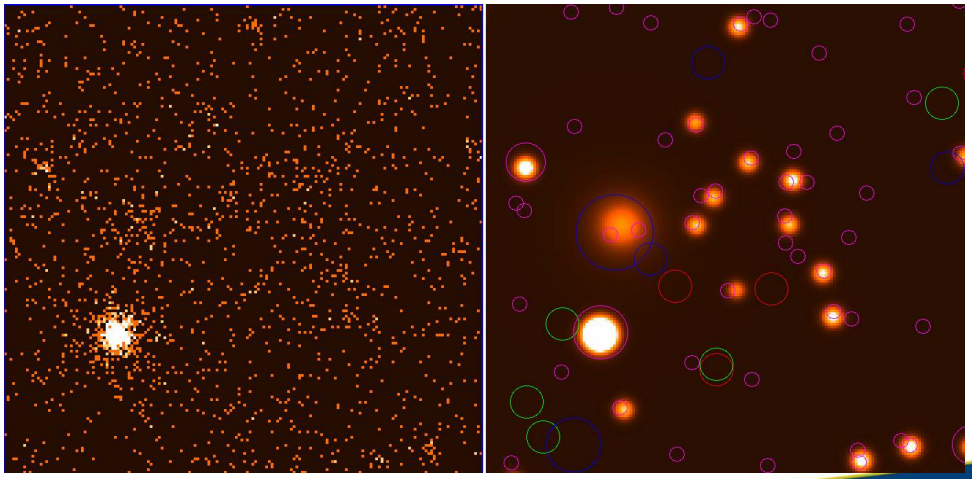
Georg Lamer
Galaxies

Data analysis software for X-ray missions

XMM-Newton



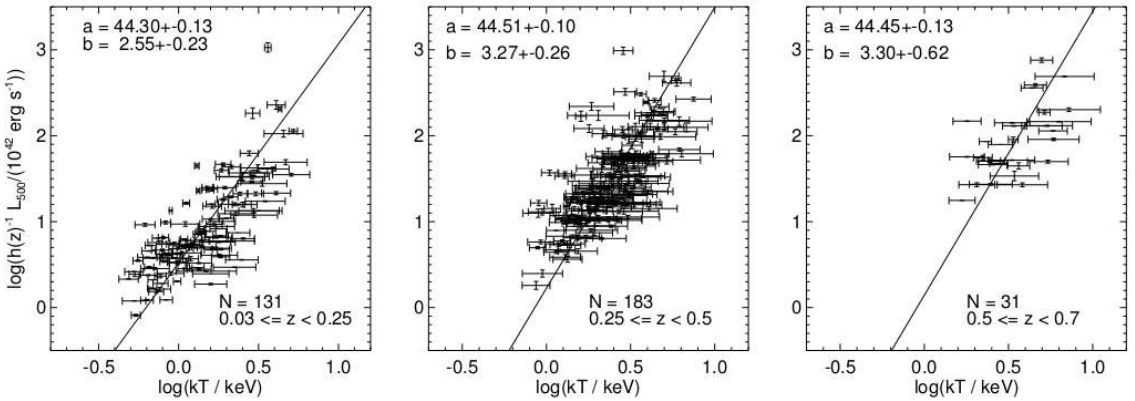
eROSITA focal instrumentation



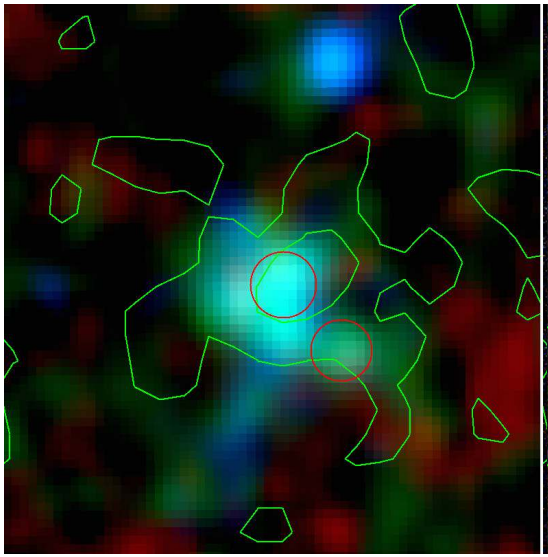
eROSITA simulation and source detection

X-ray surveys for galaxy clusters

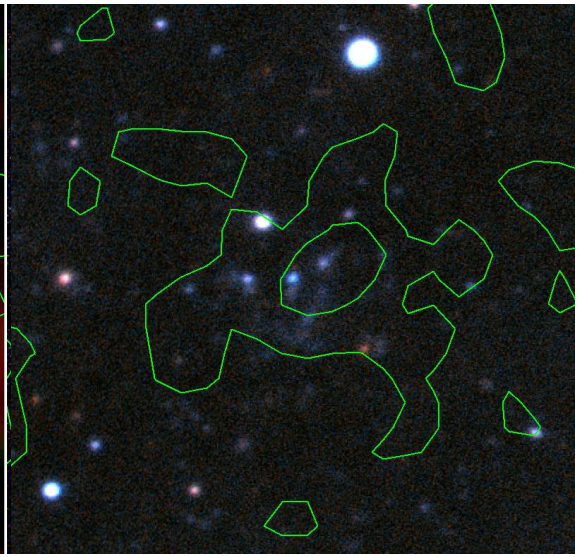
Massive cluster at z = 0.99
XMM/LBT



X-ray luminosity-temperature relation for 2XMM-SDSS clusters (Takey et al. 2013)



X-ray countour on WISE IR image



LBT r-z image

Umberto Maio
Cosmology

The birth of the first stars and galaxies

Umberto Maio

umaio@aip.de

cosmology group

Leibniz-Institut für Astrophysik Potsdam (AIP)

In collaboration with: K. Dolag, B. Ciardi, M. Petkova, L. Tornatore, S. Khochfar, J. Johnson, R. Salvaterra, N. Yoshida, V. Müller, V. Biffi, L. Koopmans, M. Viel, …

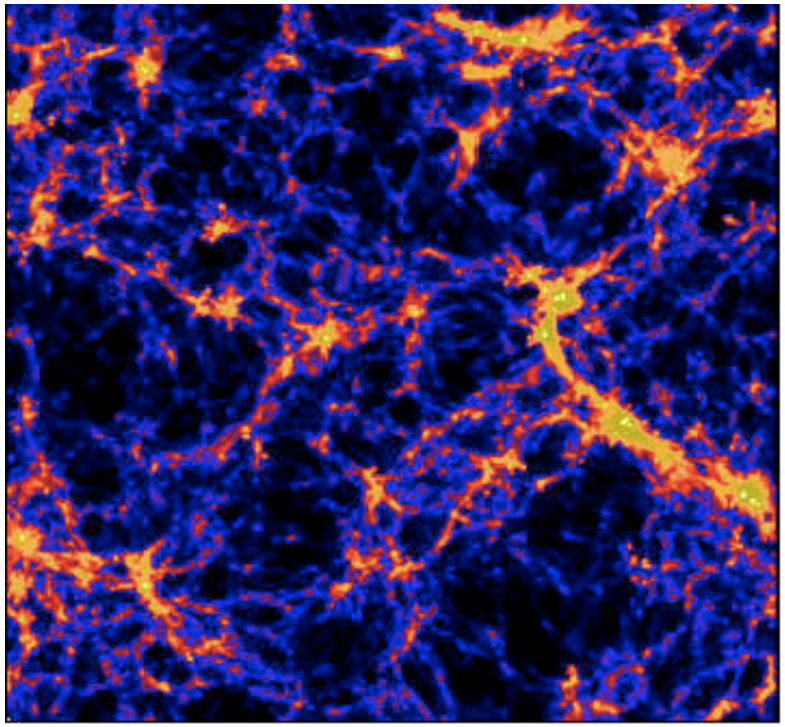
Goals

- Early Structure evolution
- Formation epoch
- Astrochemistry – molecules & Z
- Role of popIII and popII
- Comparisons to observables

Relevance

Upcoming international missions:

SKA, JWST, E-ELT



Simulations

N-body + hydro + cooling & SF

Non-equilibrium molecular chemistry (e^-, H, H^+, H^-, He, He^+, He^{++}, H_2, H_2^+, D, D^+, HD, HeH^+)

Metal spreading for He, C, N, O, Si, S, Mg, Ca, Ne, Fe, etc.

Different cosmologies (ΛCDM, non-Gaussian, warm dark matter, ...)

Observables:

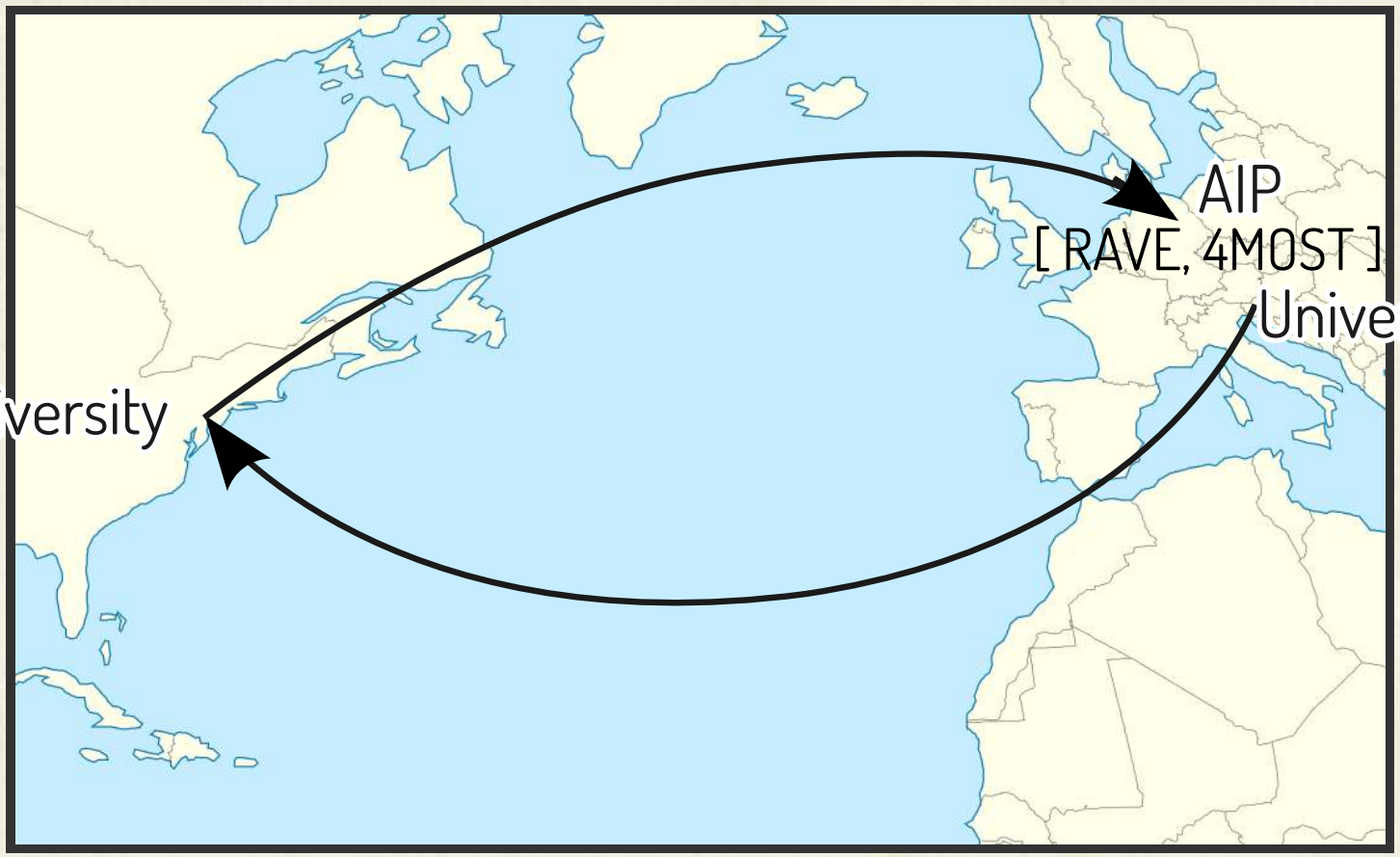
- Luminosity functions
- SFRD and sSFR
- Chemical features

Theoretical Predictions:

- Baryon properties in early objects
- Implications for GRB and DLA hosts
- Effects of different cosmologies

Gal Matijevic
Milky Way and Local Volume

Gal Matijevič



application of

(probabilistic) data analysis &
machine learning techniques

to astronomical
datasets

RAVE Explorer

t-SNE projection of RAVE spectra

Gravity

S/N

Temperature

- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt

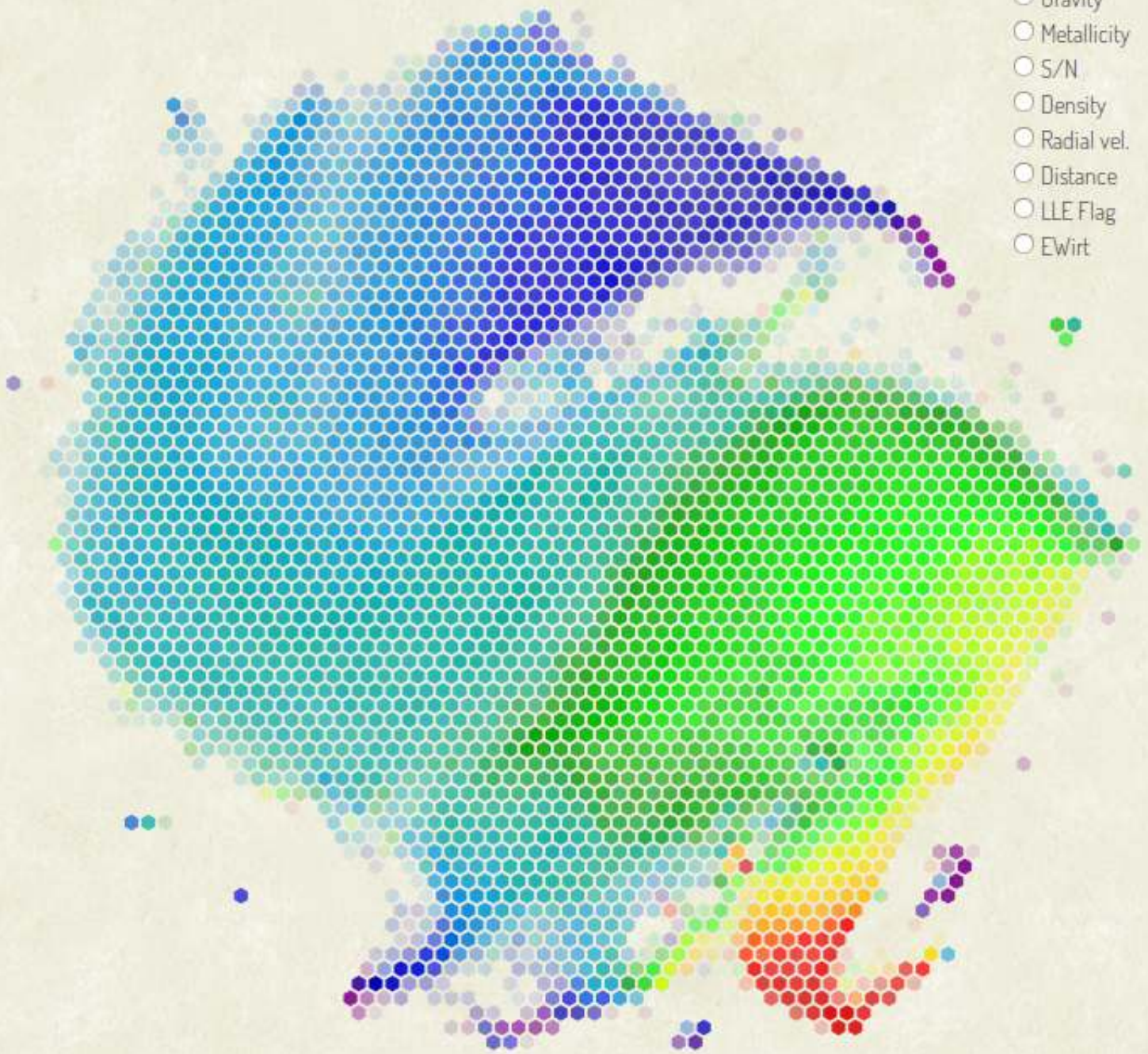
RAVE Explorer

t-SNE projection of RAVE spectra

Gravity

S/N

Temperature



None
Temperature
Gravity
Metallicity
S/N
Density
Radial vel.
Distance
LLE Flag
EWirt

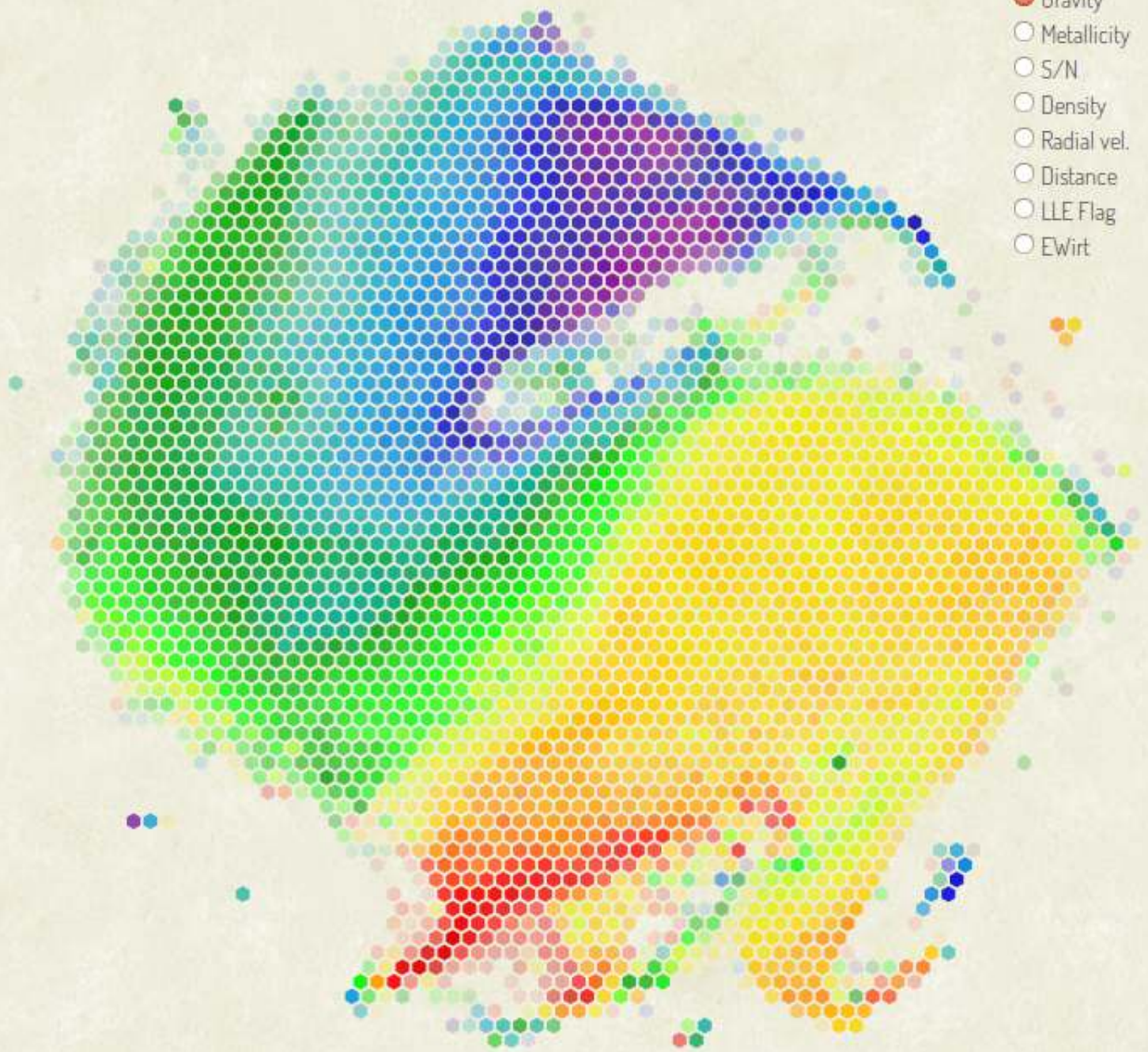
RAVE Explorer

t-SNE projection of RAVE spectra

Gravity

S/N

Temperature



- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt

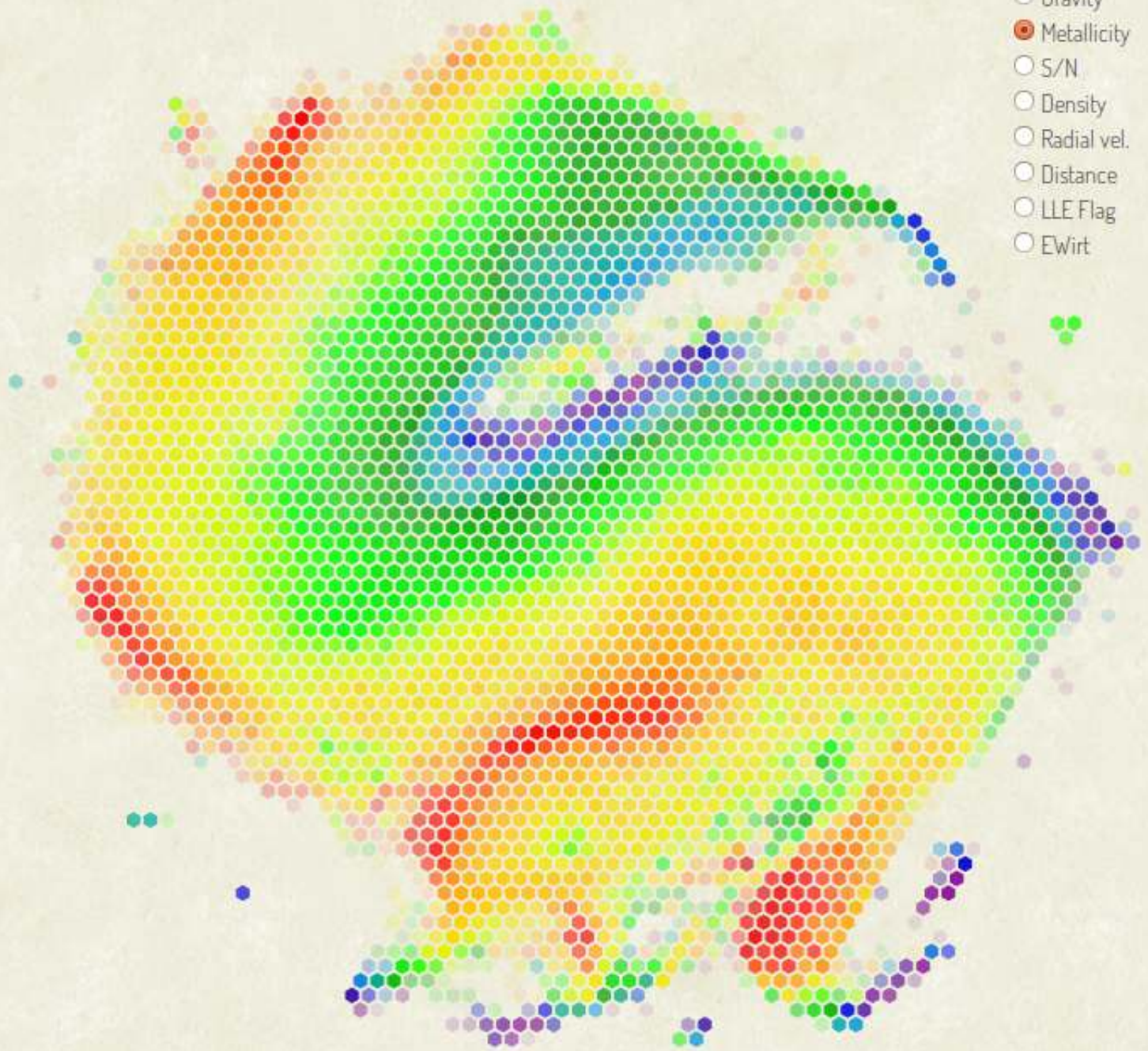
RAVE Explorer

t-SNE projection of RAVE spectra

Gravity

S/N

Temperature



- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt

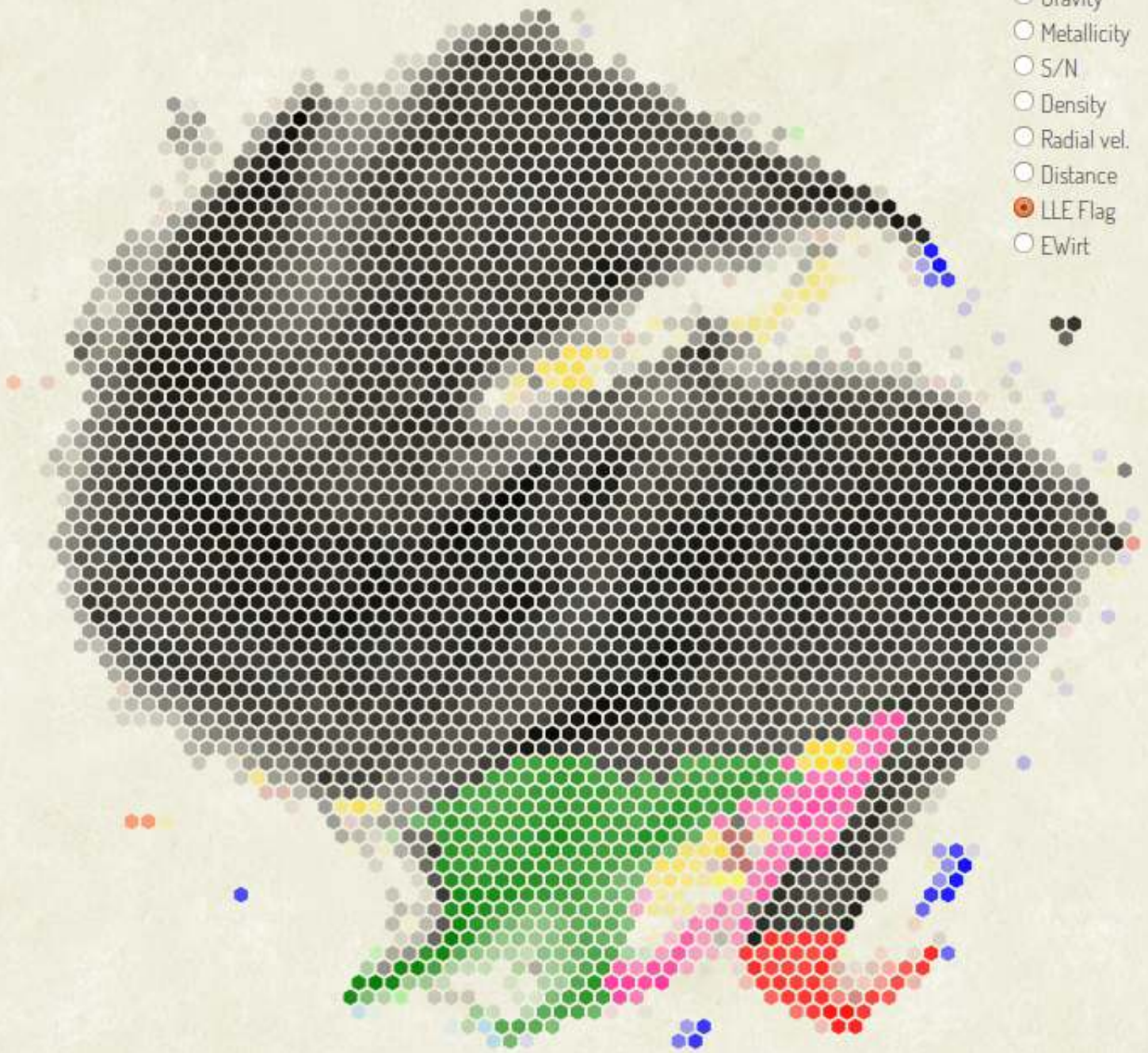
RAVE Explorer

t-SNE projection of RAVE spectra

Gravity

S/N

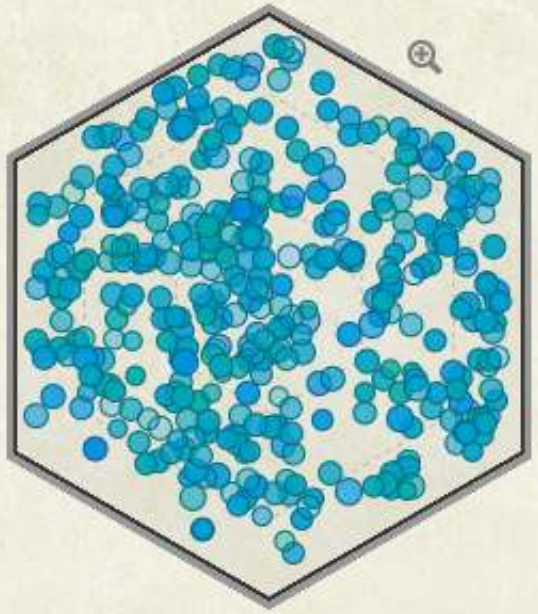
Temperature



None
Temperature
Gravity
Metallicity
S/N
Density
Radial vel.
Distance
LLE Flag
EWirt

RAVE Explorer

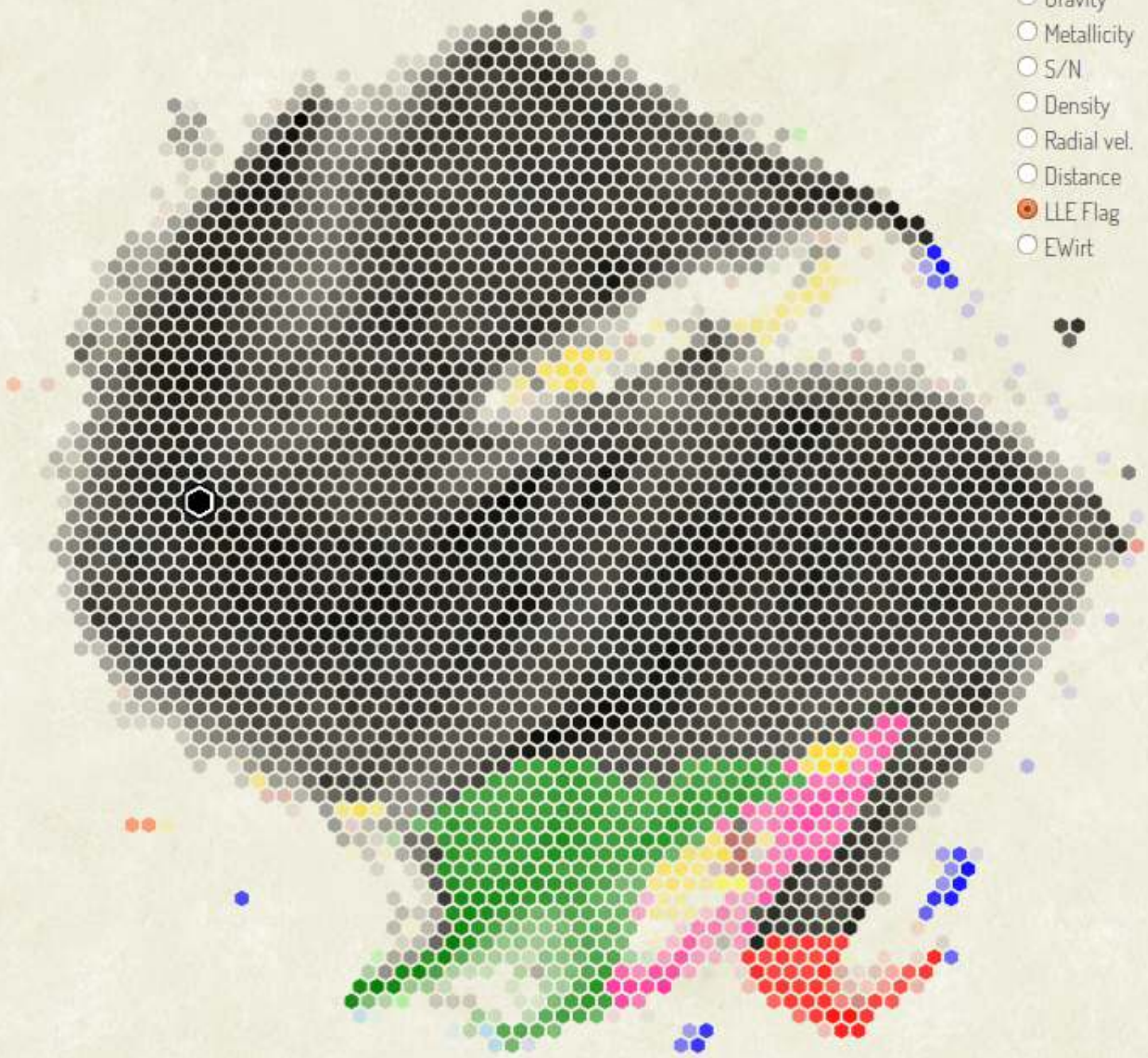
t-SNE projection of RAVE spectra



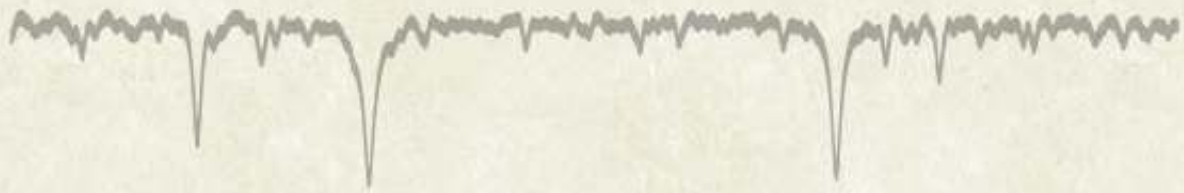
Gravity

S/N

Temperature

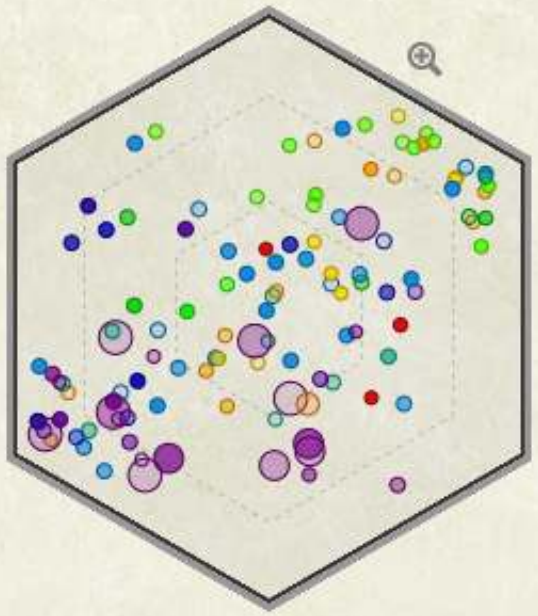


- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt



RAVE Explorer

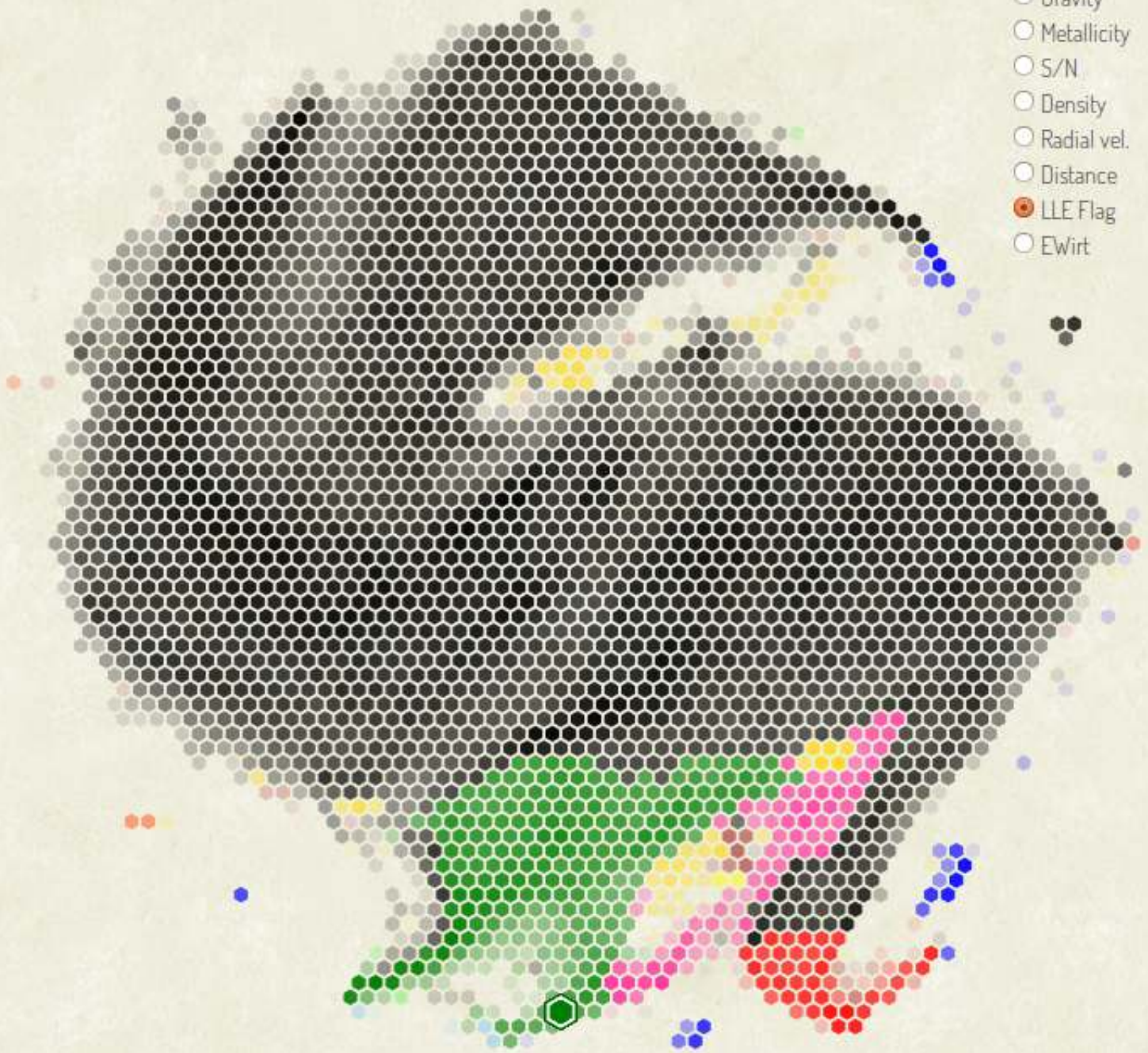
t-SNE projection of RAVE spectra



Gravity

S/N

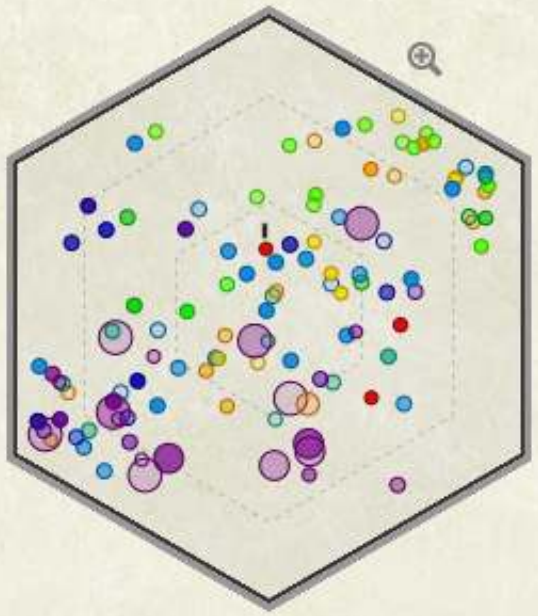
Metallicity



- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt

RAVE Explorer

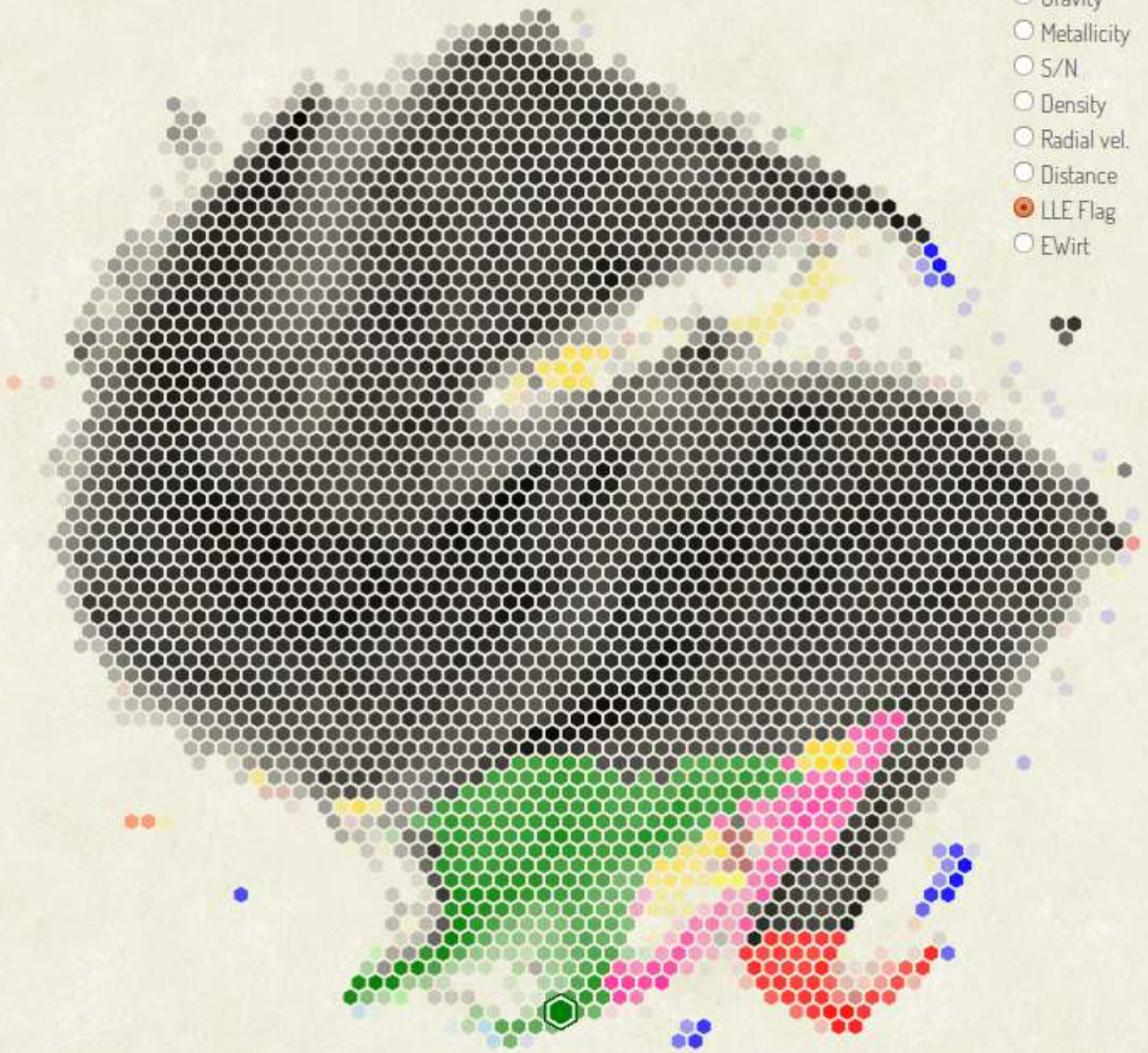
t-SNE projection of RAVE spectra



Gravity

S/N

Metallicity

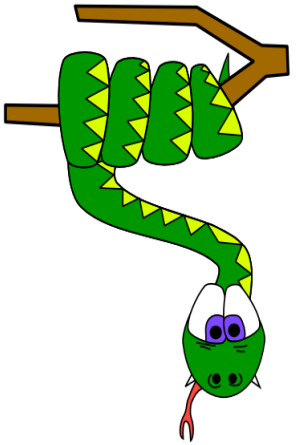


- None
- Temperature
- Gravity
- Metallicity
- S/N
- Density
- Radial vel.
- Distance
- LLE Flag
- EWirt

Alexey Mints

Galaxies

Who I am: Alexey Mints



What I do: The Integrated cluster finder

ARCHES cross-matching tool

+

SDSS + UKIDSS + AllWISE catalogs

+

Redshift-color relation

↓

Cluster candidates

3XMMe + Cluster finder

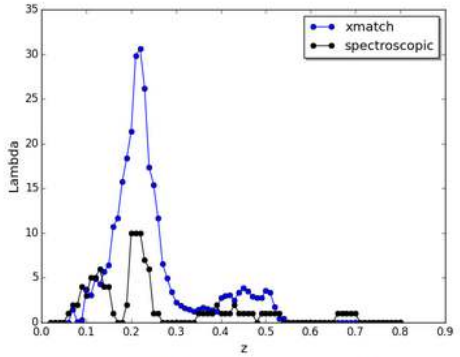
Full list

XMM Source ID: 129421

ICF iid: 24773

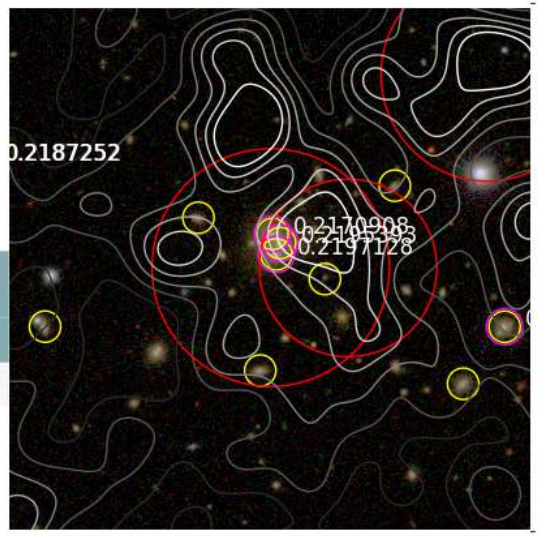
Detections data:

Catalog	Redshift	Redshift error	N spectra	Redshift (spectroscopic)	Lambda	BCG distance (Mpc)	Weighted radius (Mpc)
xmatch	0.2157	0.0302	9	0.21798	27.75	0.97	0.08



Cross matches:

Catalog	ID in the catalog	Redshift	Separation(arcmin)
Takey2	8084	0.21	0.06
RedMapper	3514	0.22	0.17
MAXBCG	8495	0.23	1.57



3XMM detections

Detection ID	OBS ID	Flux (Band 8)				Detection likelihood (Band 8)				EP Extent		
		EP	PN	M1	M2	EP	PN	M1	M2	extent	error	ML
21251	0303562201	2.382e-13	2.055e-13	8.871e-13	2.015e-13	70.32	34.59	16.60	19.31	29.6653	3.39529	29.415

XSPEC fits

Redshift	OBS_ID	kT	kT (lower)	kT (upper)	L
0.21567	0303562201	2.497	-0.669	1.261	9.494e+42
0.21567	total	2.497	-0.669	1.261	9.494e+42

Martin Mitzkus

innoFSPEC

Martin Mitzkus – PhD student

Göttingen:

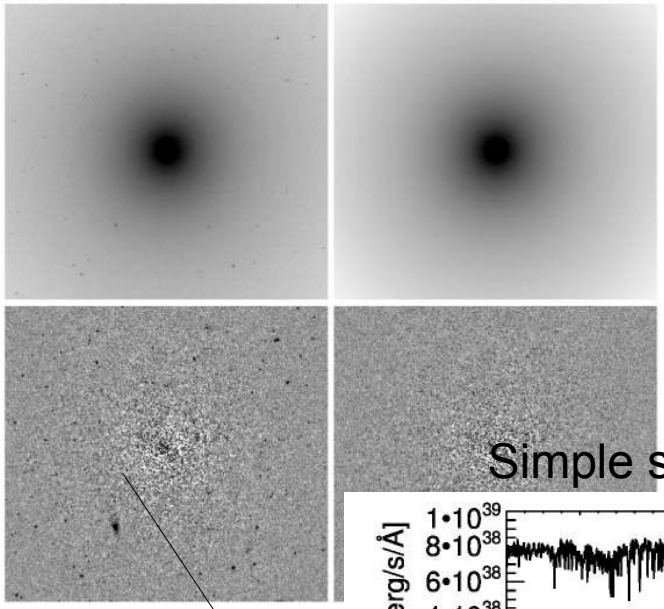
Bachelor & Master of Physics

GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

INSTITUT FÜR
ASTROPHYSIK
GÖTTINGEN

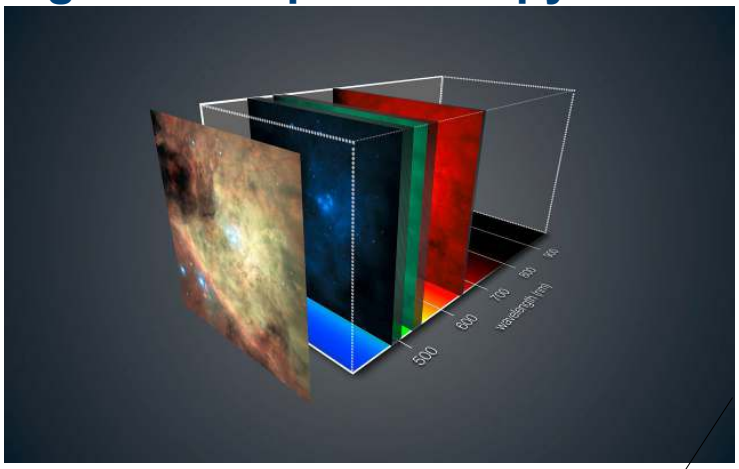
Spectroscopic SBF

Surface Brightness Fluctuations



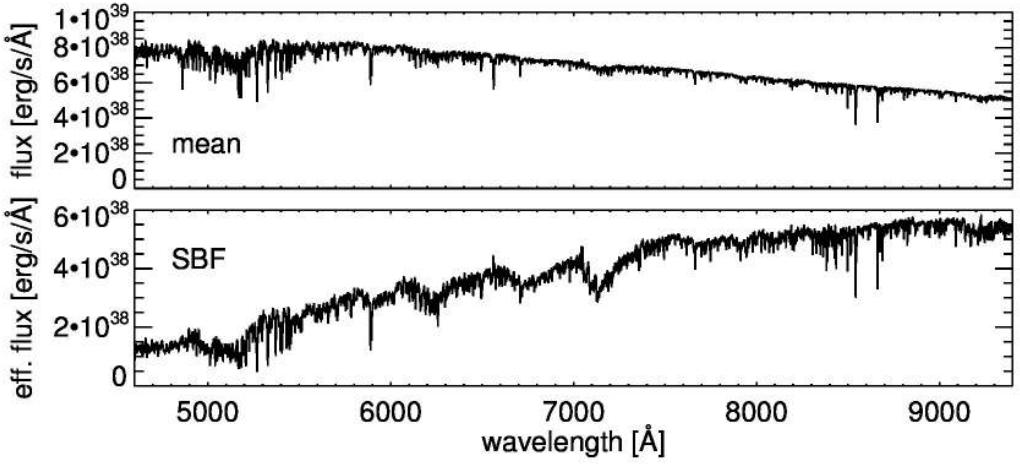
Cantiello et al. 2005

Integral field spectroscopy: MUSE



Credit: ESO

Simple stellar population (10 Gyr, z=0.004)

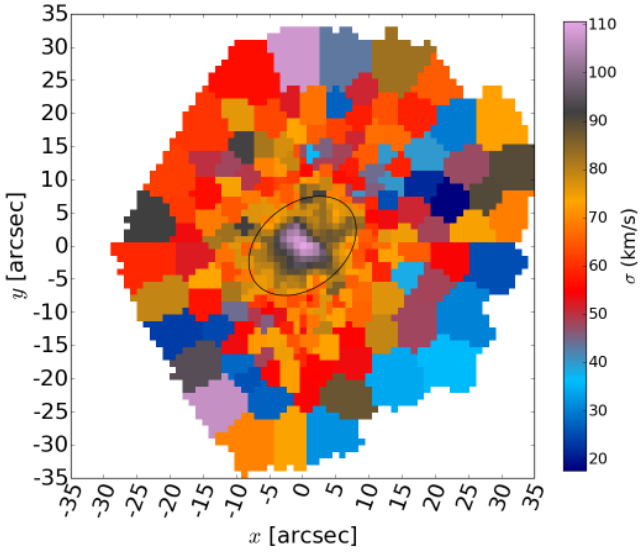


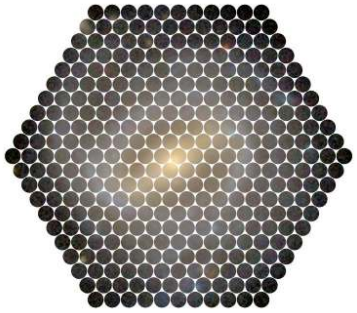
Justus Neumann
Galaxies

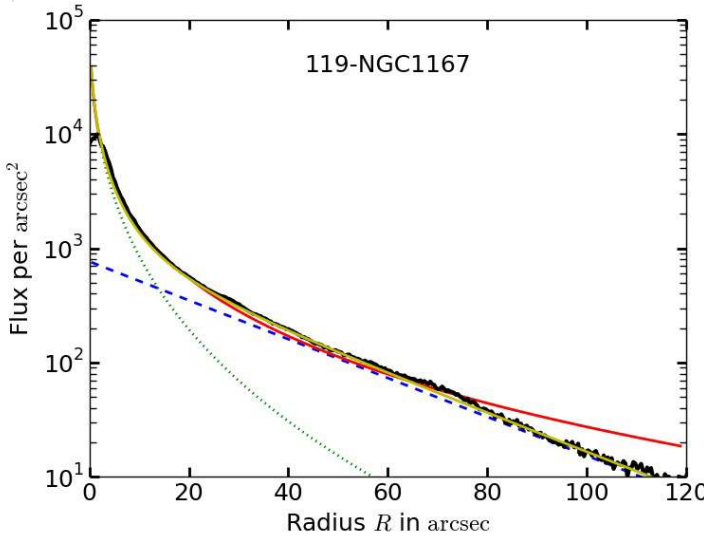
Bulges in CALIFA Galaxies

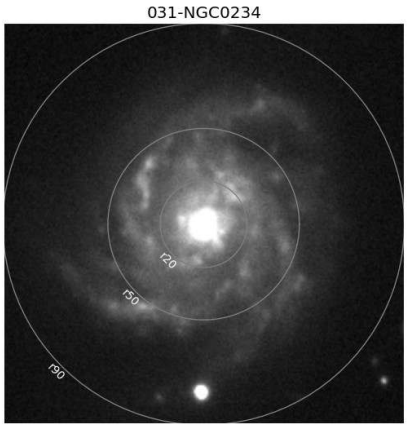
Diploma Thesis

- Detection and classification of bulges
- Using visual, photometric and spectroscopic approaches





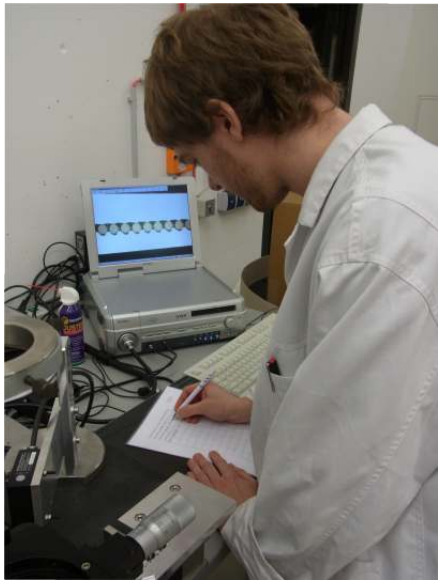




VIRUS Quality Control

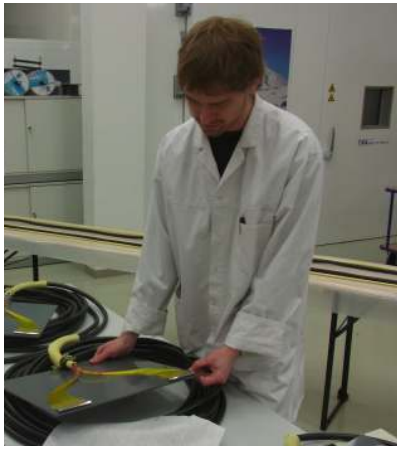
Student Assistant

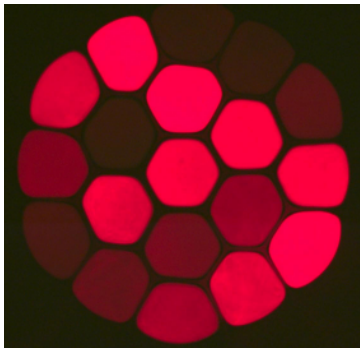
+ ERAMUS-F & 4MOST

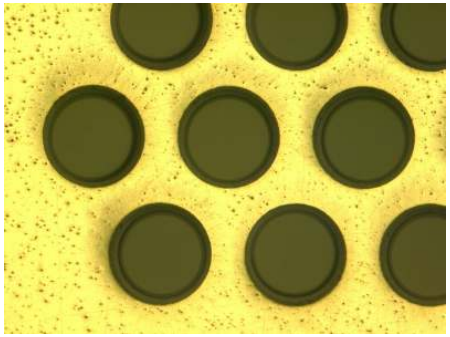


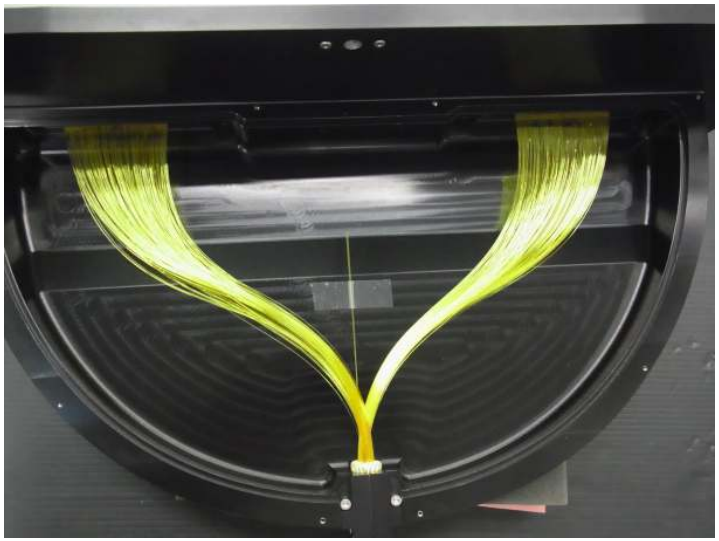
Quality control of VIRUS fibre bundles:

- Polishing inspection
- Focal ratio degradation evaluation
- Relative throughput measurement









Alejandro Paredes
MHD

Something about me:

- **Career path**
  - **BSPhy.** **National University of Engineering (Peru 1998 -2004)**
  - **Master of Physics** **Aix-Marseille Université** **(France 2007-2009)**

    Theoretical physics
  - **Phd. Fluid Mechanics** **Aix-Marseille Université** **(France 2009- 2013)**

    Numerical simulations for edge plasma in tokamaks
  - **Postdoc MHD group** **AIP - MHD group** **(Germany 2013-)**

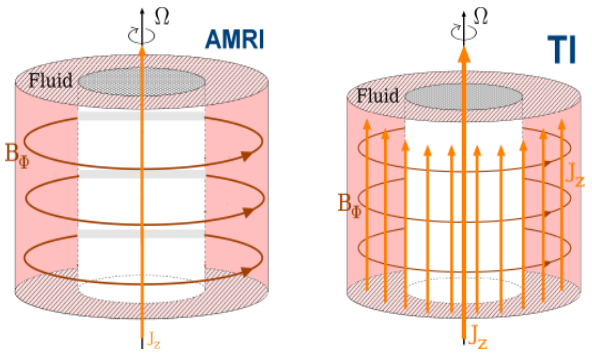
    Numerical simulations for MRI

- **Interests:**

  Computational Fluid Dynamics, High Performance Computing

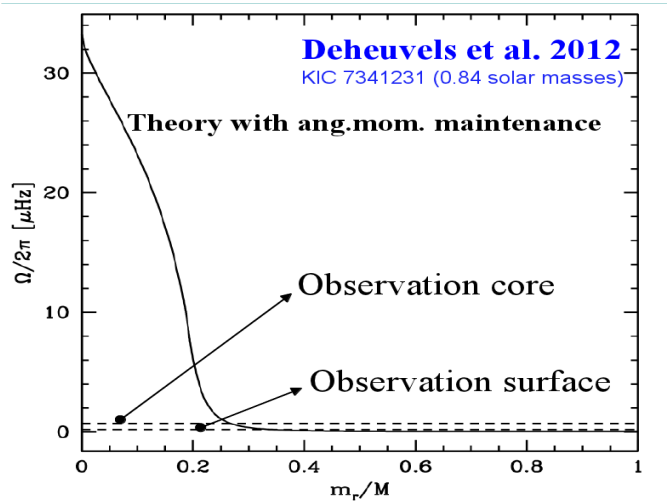
My topic

- MHD Numerical Simulations
- MRI



- FSEM code :
  MHD in Taylor Couette set-up

Why?



Candidate to explain disagreement

My contribution

Implement a solver in FSEM code : MHD + Pm << 1

This means to solve : $\nabla^2 \vec{b} = \vec{F}$, $\nabla \cdot \vec{b}$ + B.C.

Daniel Phillips

Milky Way and Local Volume

What have I been doing Professionally?

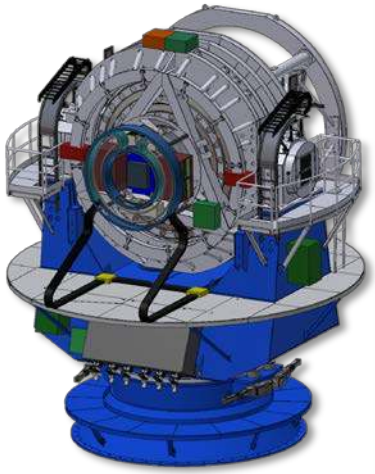
- Educational Backround: Bachelor of Science & Master of Civil Engineering
- 13 yrs construction & contracting, NE USA

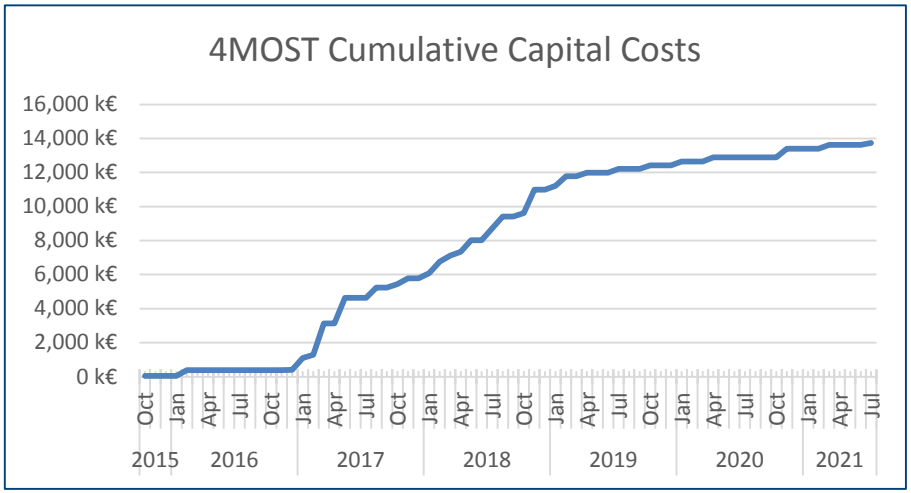
- 4 yrs with Cerro Tololo Inter-American Observatory in La Serena, Chile; Facilities Group

- 1 year with LSST; Telescope Site Leveling Project

- Now: Project Controller for 4MOST
  - Range of Project Management Activities in the 4MOST Project Office
  - Scheduling
  - Budget Control
  - Developing Project Management documents and tools

- 4MOST has completed the Conceptual Design Phase.
- Preliminary Design Phase Kick-off: Just done!
- AIP contributes >40% of the staff effort and ~25% of the HW by Capital Cost, + Science
- Project Control: Support On-time and On-Budget Completion of 4MOST by interacting closely with PM and consortium partners.



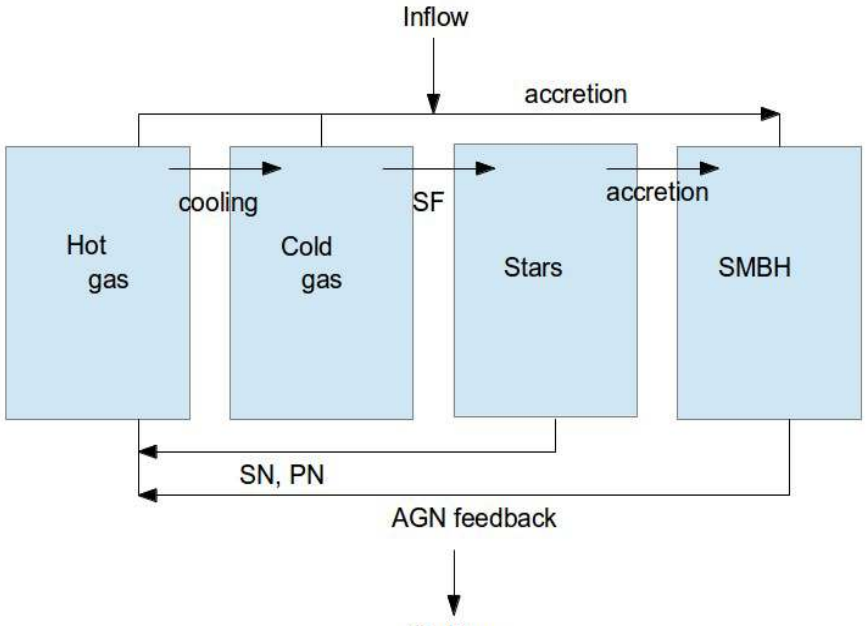


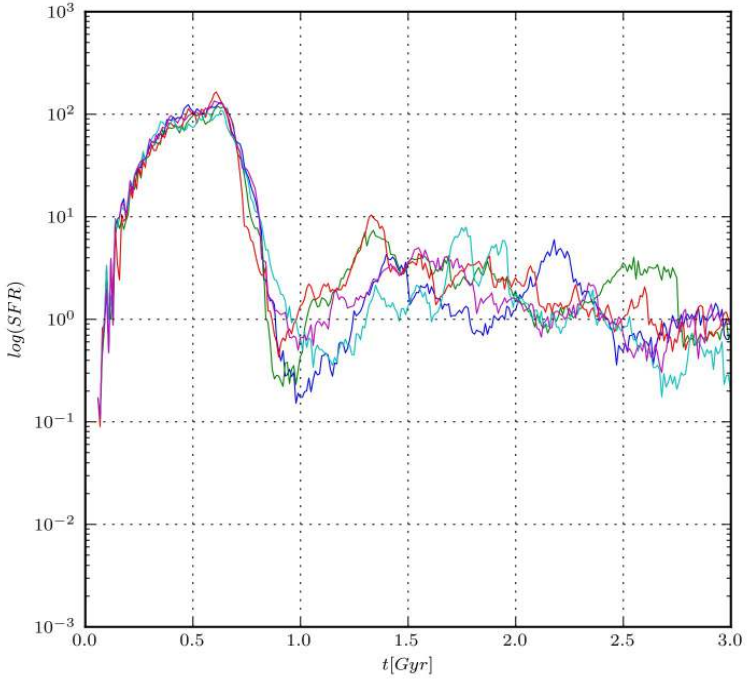
Project Phase	Staff FTE
Preliminary Design	41.4
Final Design	57.0
MAIV	117.3
Transport	2.7
Integration & Commissioning	21.6
Total:	**240**

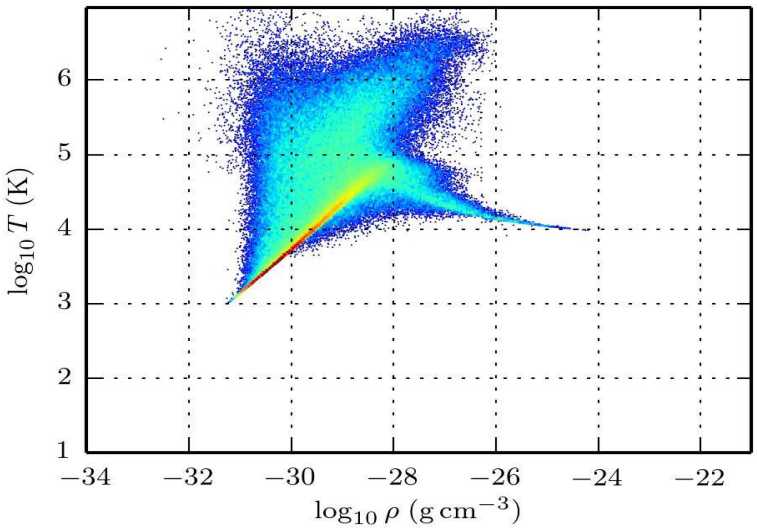
Pierre-Antoine Poulhazan
Milky Way and Local Volume

Chemical Enrichment in cosmological SPH simulations

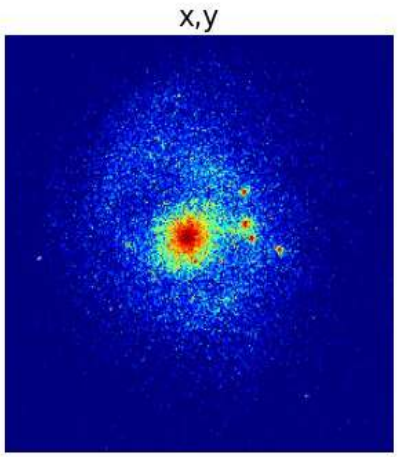
- Initial Mass Function
- Life-times of progenitor stars
- Rates of SNIa, SNII and AGB events
- Chemical Yields
- Cooling

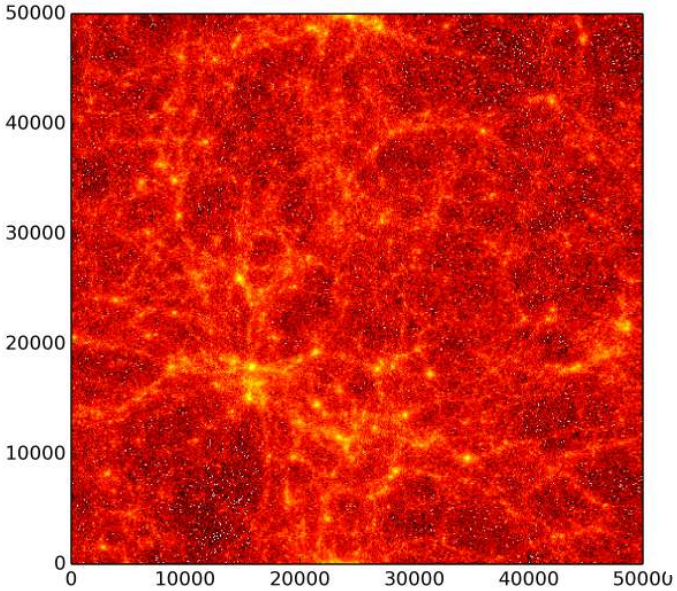


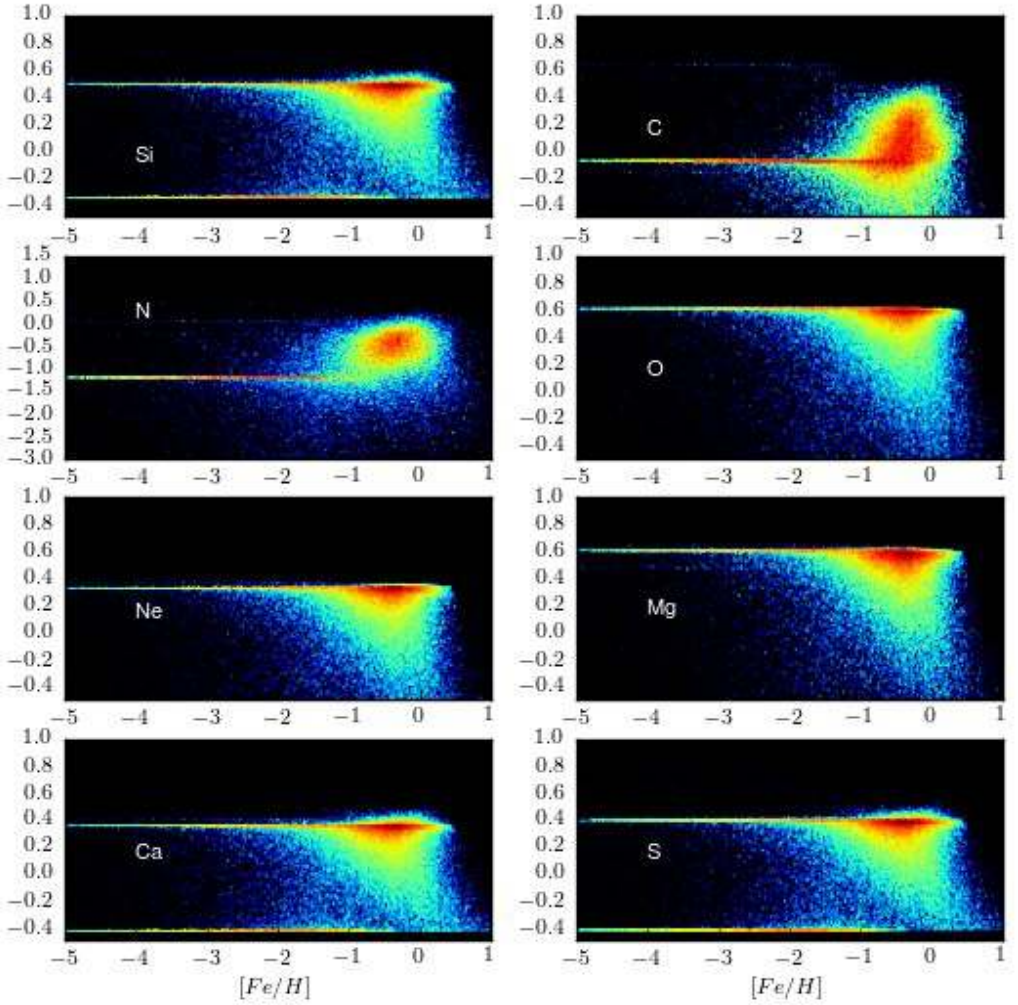




Chemical Enrichment in cosmological SPH simulations







Andreas Rabitz
Galaxies

Background

- AIP history: student worker & Diploma thesis
- PhD student (galaxy clusters) – Axel Schwope

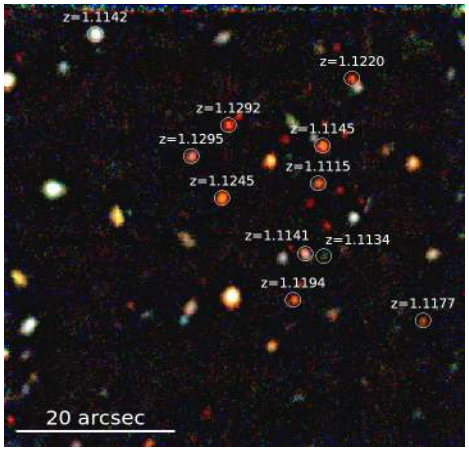
- observer (opt./near-IR imaging & spec.)

Recreation

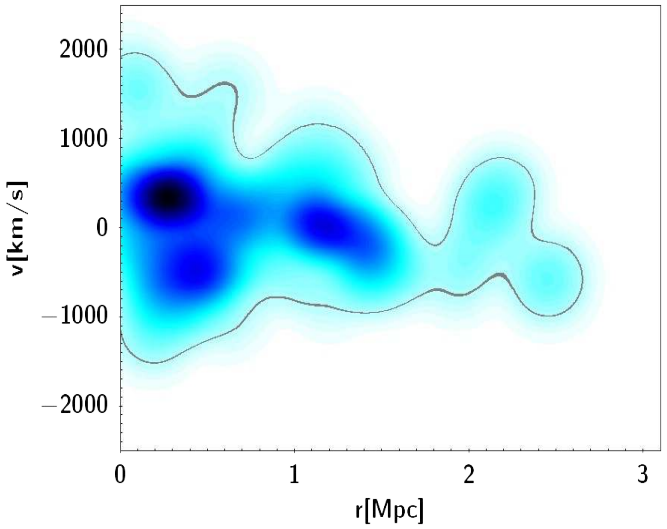
- biking, ca. $\left(1.2^{+2}_{-3}\right)\times 10^{17}\,\text{Å}\cdot yr^{-1}$
- swimming

current projects

- Cluster survey (LBT)
  (G. Lamer, A. Schwope)
  → X-ray, opt.follow-up, spec.
  → IR-selection (PhD)



- MUSE-SV
  (G. Lamer, A. Schwope)
  one shot – one cluster



- S1101 – detailed cluster study
  (Y. Zhang)

Knowledge

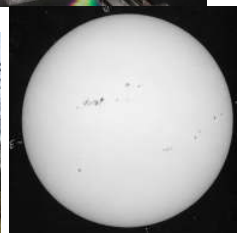
- scripting: bash, STilts
- data reduction: imaging & spectroscopy
  → „Bertin-tools“, Theli, MIDAS (mosp, O2K), EZ, …

Jürgen Rendtel
Solar Optical

Solar Optical

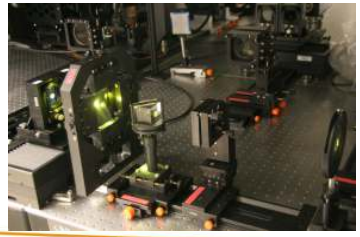
Spectropolarimetric Lab
Einsteinturm, Potsdam

- instrument setup and testing
- student lab. (sunspot magnetic fields)
- digitization of solar plates



Telescopes (VTT & GREGOR)

and post focus instruments, Izaña, Tenerife

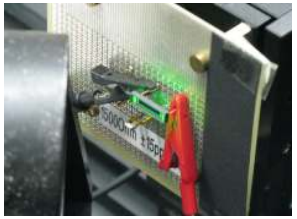


Polaris. Calibr. Unit
GFPI

Solar Radio

STIX team member

- optical tests for aspect system
- scheduling

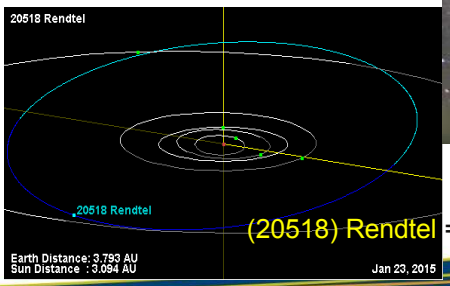


Other activities:

Enquiries from public & media

- astronomy in general
- transient phenomena

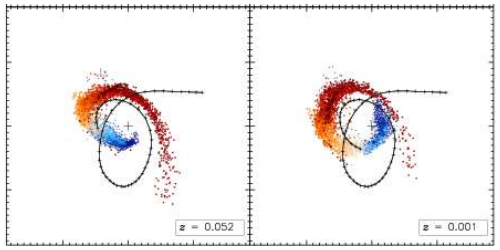
Internat. Meteor Org. (IMO)
Vice President



Kristin Riebe
e-Science

About me

- Studied physics in Heidelberg
- Diploma thesis at Astronomisches Rechen-Institut Heidelberg
- Short HPC-project at University of Edinburgh, EPCC
- PhD at AIP, cosmology group
- Since then: E-Science



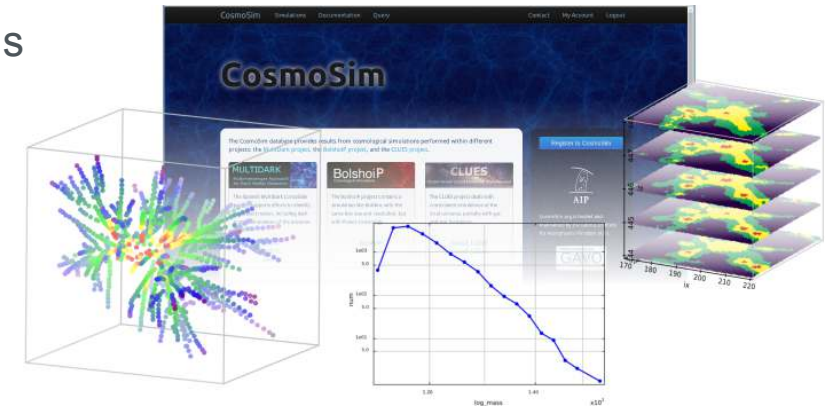
Private

- Two children
- Computer graphics, illustrations

Work

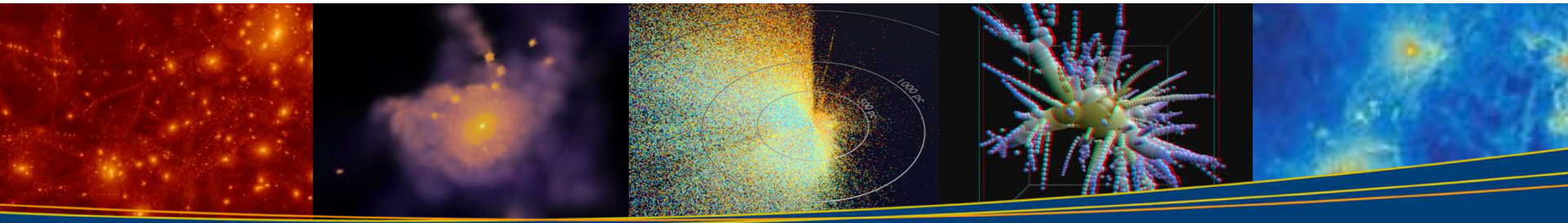
GAVO project

- German Astrophysical Virtual Observatory
  - Data publication
  - Databases, web services, standard definitions
- CosmoSim
  - database for cosmological simulations



Visualisation

- cosmological simulations (PMViewer)
- RAVE stars, 3D demos (Blender)

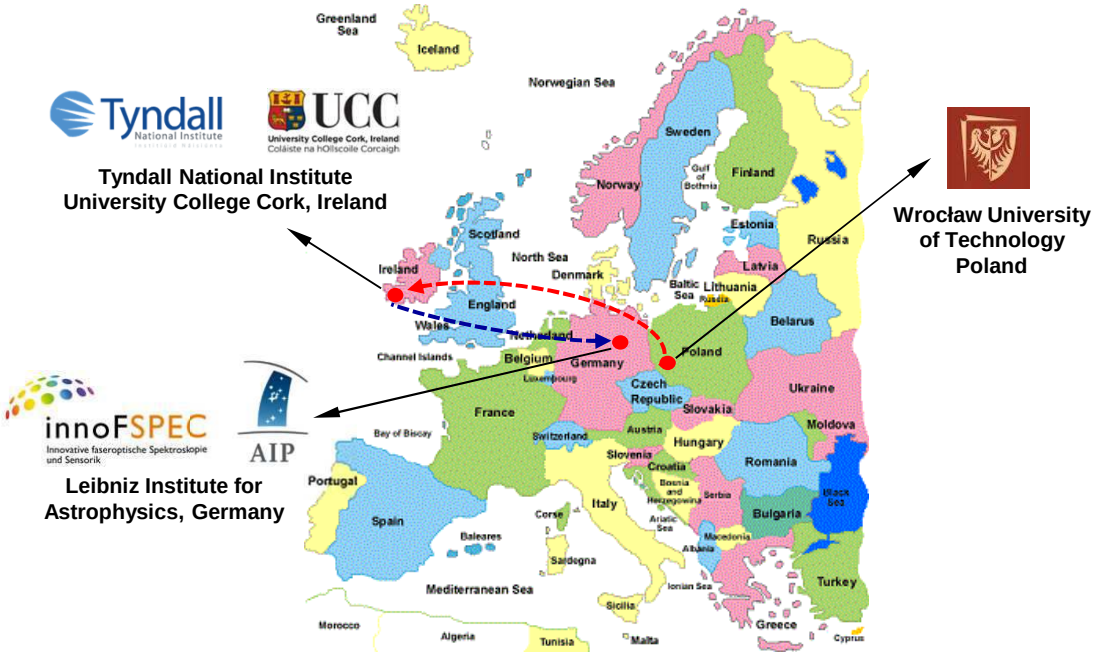


Monika Rutowska

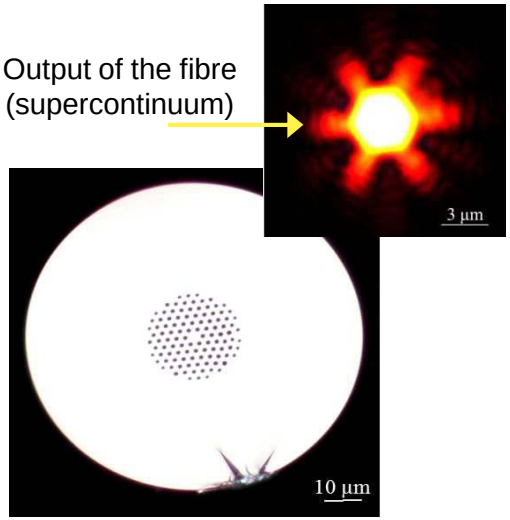
innoFSPEC

File Edit View Bookmarks Settings Help

```
/?/ who am I
monika
/?/ show tools
2003  M.Eng in Applied Physics Wrocław, Poland
2012  PhD in Physics Cork, Ireland
/?/ what am I
InnoFSPEC
/?/ ls -lrt
2012 raman spectroscopy
2012 p3d data reduction
2013 testing optical fibre bundles
2013 erasmus and virus spectrographs
2014 frequency comb
```

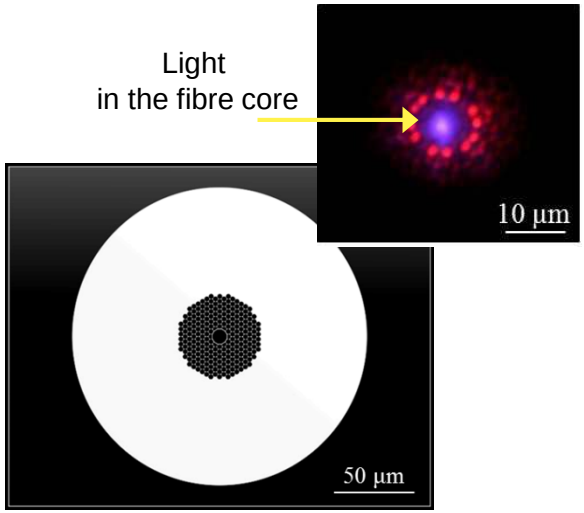


Output of the fibre (supercontinuum)



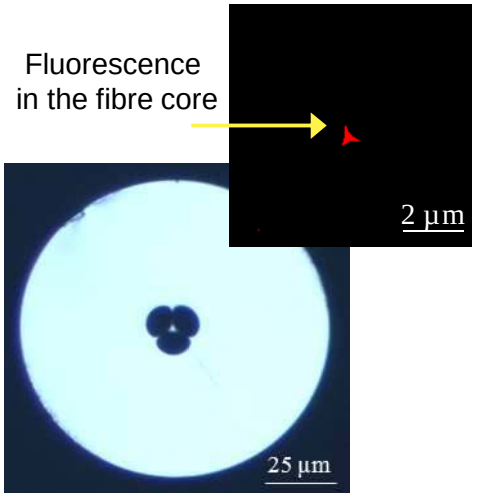
Highly-Nonlinear Photonic Crystal Fibre

Light in the fibre core



Hollow-Core Photonic Crystal Fibre

Fluorescence in the fibre core



Suspended-Core Optical Fibre

Applied for supercontinuum source
(it is a broad spectrum 350nm – 1700 nm)

Applied for sensors: DNA and liquid viscosity

The AIP story begins with…..

1. Multichannel Raman Spectroscopy (MRS)

The first results for combining:

1. Erasmus-F Spectrograph
2. Fibre Bundle (400 optical fibres)
3. Microscope objectives and filters
4. Organic and non-organic samples

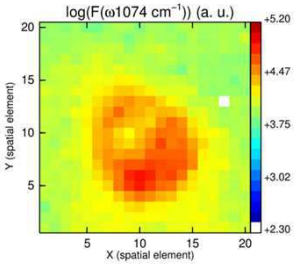


Fig. Map of a pork sample

Because of MRS……

2. Data reduction using **p3d**

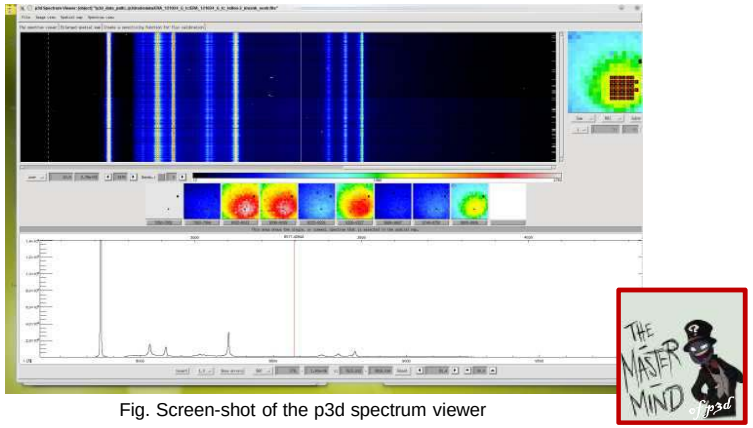


Fig. Screen-shot of the p3d spectrum viewer

Cool, now you work with….

3. Data reduction and analysis for:

Optical fibre bundels connected to:

1. Erasmus-F Spectrograph
2. VIRUS Spectrograph

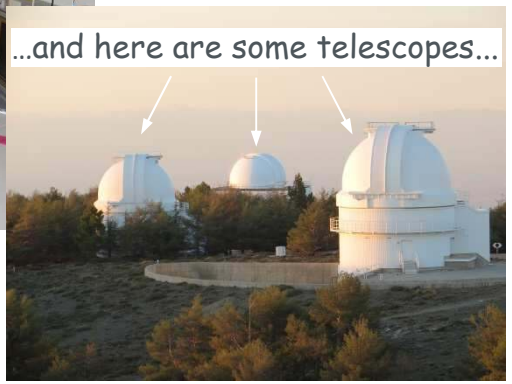
And, as well….

4. Frequency comb

1. Testing the frequency comb with Erasmus-F
2. Preparing the optical setup for transport to Calar Alto and to Potsdam
3. Data reduction and analysis

But…sometimes there are surprises in the story:

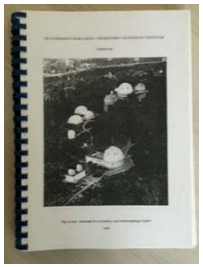
as attending the first sky-test of the frequency comb in Calar Alto Observatory , Spain (!)



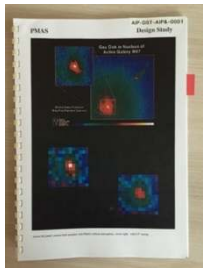
….to be continued…..

Martin M. Roth
innoFSPEC

Zielplanung AIP (1995)



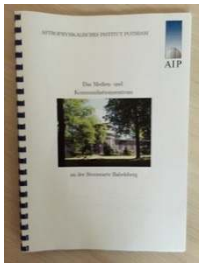
PMAS (1996)



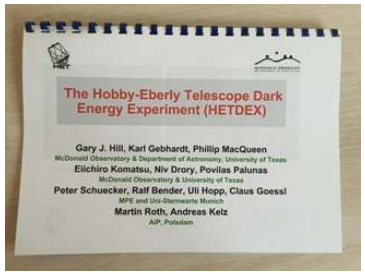
innoFSPEC (2008)

(2015)

MCC (1999)



VIRUS (2002)

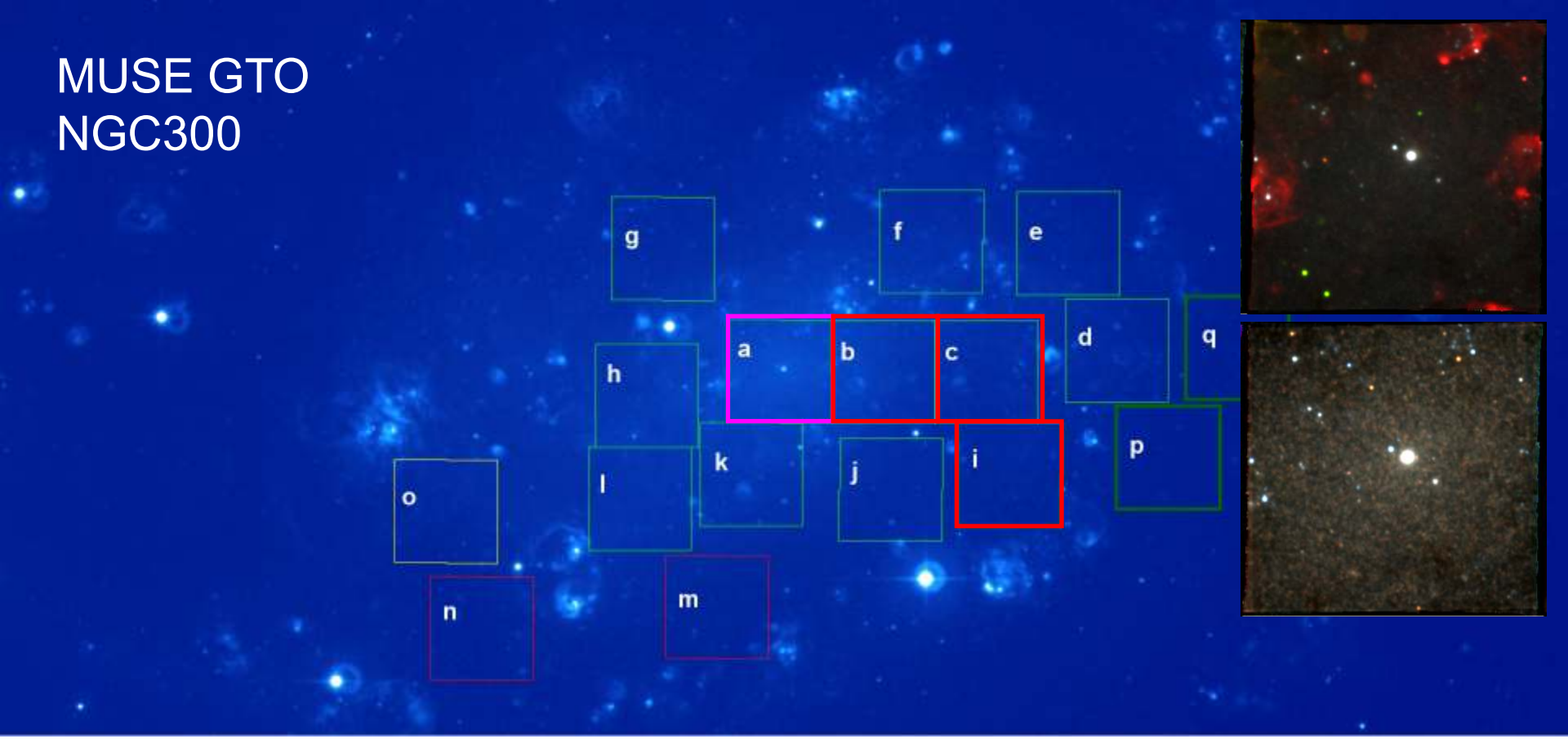


3Dsensation (2013)

MUSE (2003)

Multiplex Raman (2012)

MUSE GTO
NGC300



GTO-01-P93

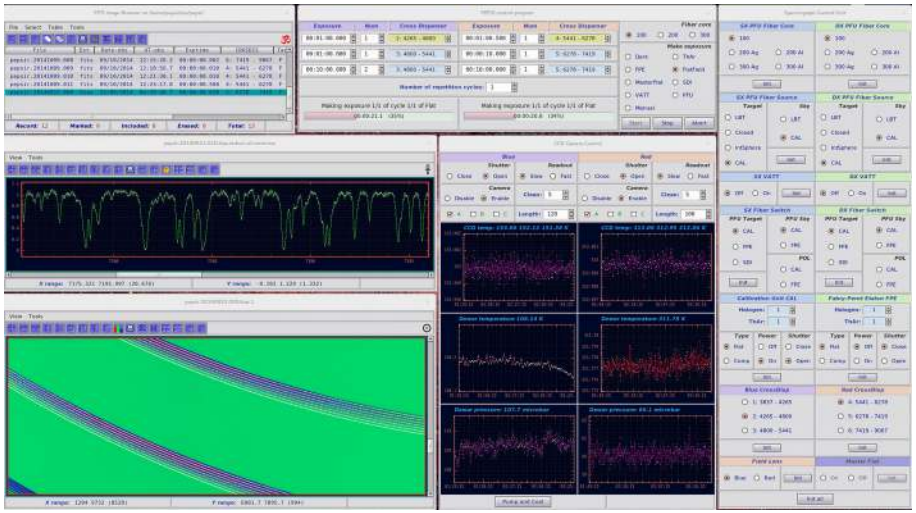
094.D-0116(B)	NGC300	9	2.0h	1.6h	1.6h								0.57 – 0.63	0.07
094.D-0116(B)	All	9	2.0h	1.6h	1.6h									
094.D-0116(B)	A+B only		2.0h	1.6h										

GTO-02-P94

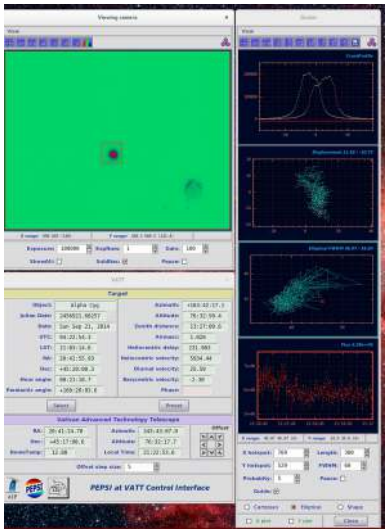
094.D-0116(A)	NGC300-B	6	1.4h	1.1h			1.1h						0.83 – 0.96	1.13 – 16.36
094.D-0116(A)	NGC300-C	9	2.2h	1.6h	1.6h								0.57 – 0.72	-7.77 – 48.20
094.D-0116(A)	NGC300-I	3	41.4m	32.0m	32.0m								0.50 – 0.51	15.65 – 22.85
094.D-0116(A)	All	18	4.3h	3.2h	2.1h		1.1h							
094.D-0116(A)	A+B only		4.3h	3.2h										

Ilya Ilyin
High-res Spectroscopy

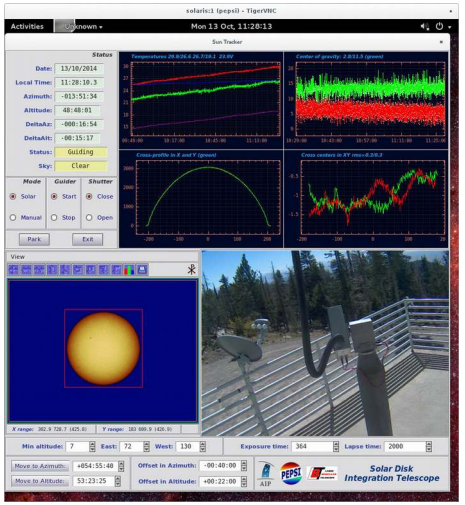
S4S is an object-oriented software is used to control various components of PEPSI hardware and for the data reduction of echelle images and analysis of high-resolution integral light and polarized spectra.



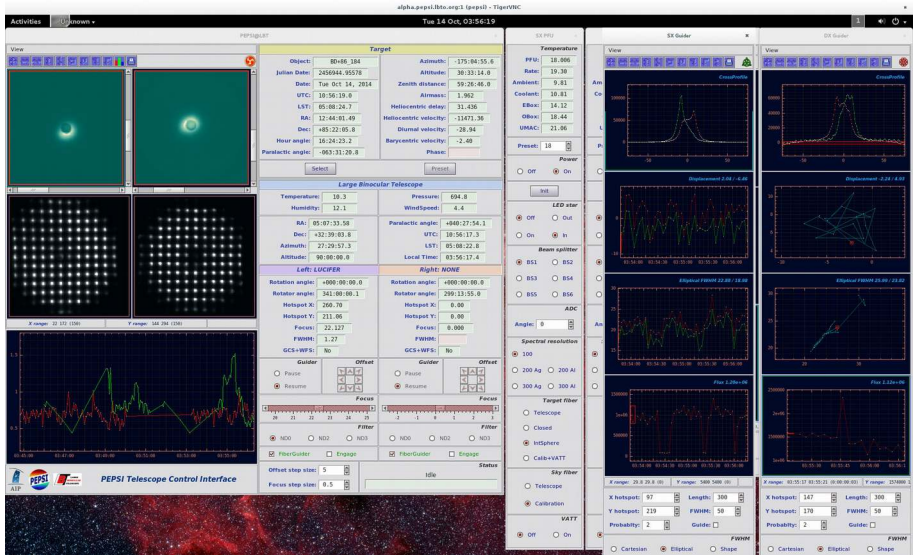
Main Control Interface of PEPSI spectrograph with all subsystems attached.



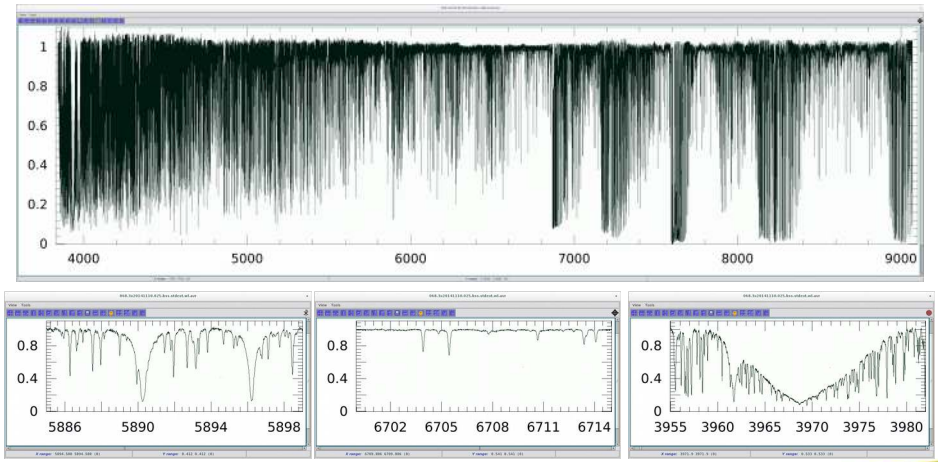
Control interface to Vatican Advanced Telescope from PEPSI with guiding on a target shown



Solar Disk Integration Telescope Control Interface allows to guide of the Sun and make exposures with PEPSI in automatic mode



Guiding with PFU at LBT with both SX and DX focal stations



The first light Solar spectrum at R=270000

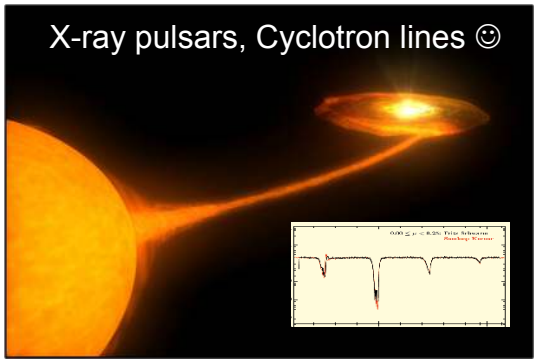
Gabriele Schönherr

Vorstandsreferentin / Galaxies

Projects - my scientific and my non-scientific me

Scientist...

X-ray astronomy group



Bamberg, Tübingen, Madrid

Science Communicator...

AIP → AIP

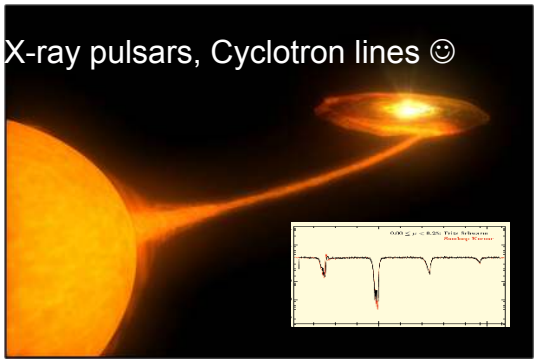
Science Manager...

...many emails...

Projects - my scientific and non scientific me

Scientist...

X-ray astronomy group



Bamberg, Tübingen, Madrid

Science Communicator...

AIP → AIP

Science Manager...

Emails...

February 2015 +

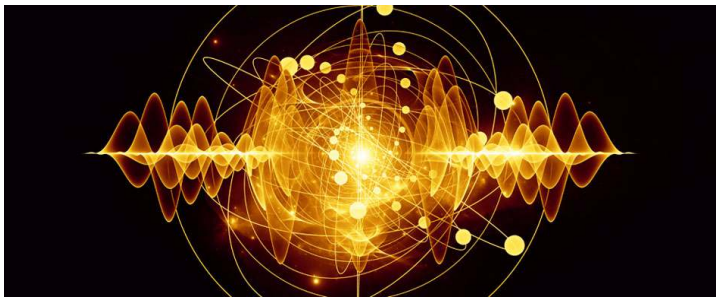
No more SAB/Evaluation E-mails!!!

New Science Communications Office, Berlin

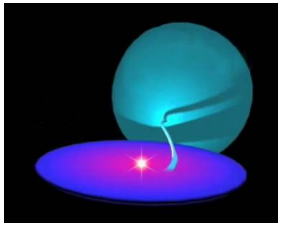
February 2015 +

No more SAB/Evaluation E-mails!!!

Leaving AIP? Only partly. Still around for:



Communication projects: UN Year of Light 2015



Science projects, currently: Hercules X-1, X-ray + optical with STELLA?

New Science Communications Office, Berlin

Happy to discuss more after AIP Evaluation!! ☺