Publicité et Invitation: Planning Projects in the LSST DESC

LSST@Europe3, Lyon, France

Thursday June 14, 1600 CEST

http://tinyurl.com/DESC-session-LSST-at-Europe3

Meeting (Session) Contact Person: Craig Lage
(as per the DESC Code of Conduct, last slide)

LSST DESC
Dark Energy Science Collaboration

Le Plan

Our goal for this session is to make plans for DESC projects, focusing on improving the connections between groups with Europe as well as between Europe and the rest of the world.

1600 - 1630 CEST	**Les Publicites:** Speakers have 1-3 slides per person, to advertise your project and attract interest from your colleagues. What do you need help with? What opportunities can you offer? Audience: take notes on who you want to talk to!
1630 - 1730 CEST	**Discussion:** Go find the people you might like to work with, ask them about their projects, make some plans. Speakers: fill out your slide at the end of the deck.
1730 - 1800 CEST	**Les Celebrations:** Speakers, or designates, tell the group what your plan for the next 12 months is, using your one slide at the end of the deck.

Les Speakeurs

- Fabrice Feinstein - Millical
- Simon Huber - Time Delay Measurement of SLSNe Ia with LSST
- Mickael Rigault - Astrophysical Bias in SN Cosmology
- Pierre-François Léget - Cosmic Shear and the LSST PSF
- Jonathan Blazek - Projects in the TJP Working Group
- Emille Ishida - PLAsTiCC
- Peter Hatfield - GPz: Machine Learning Photometric Redshifts
- Jim Chiang - Data Release Production for the DESC
- Mariana Penna-Lima - Cluster Mass Estimation
- Cécile Roucelle - Deblending with Deep Learning
- Éric Aubourg - LSST-Euclid Coordination
- Elizabeth Swann - Spectroscopic Follow-up of LSST SN & Host Galaxies
- Fabrice Feinstein - Millical: fitting star mags using GAIA & AuxTel
- Philippe Gris - Cadence optimization for supernovae in LSST
- Joachim Harnois-Deraps: Cosmological Simulations for Weak Lensing+
- Nicolas Regnault : what can we learn about LSST from SNIa Hubble diagram residuals
- Catherine Heymans: Accurate Non-linear power spectra for modified gravity theories

17 gens x 2 mins each = 34 minutes. PRES DE PARFAIT.

Les Publicités

LSST DESC
Dark Energy Science Collaboration

Millical: fitting star mags using GAIA & AuxTel

Fabrice Feinstein

Foreground G & K stars are invaluable references for calibrating fluxes at millimag level, optimal for cosmology with SN Ia

Using GAIA photometry, we can verify our calibration pipeline

Millical: a [catalog simulation - linear fit] pipeline to test that

A “fast” run:

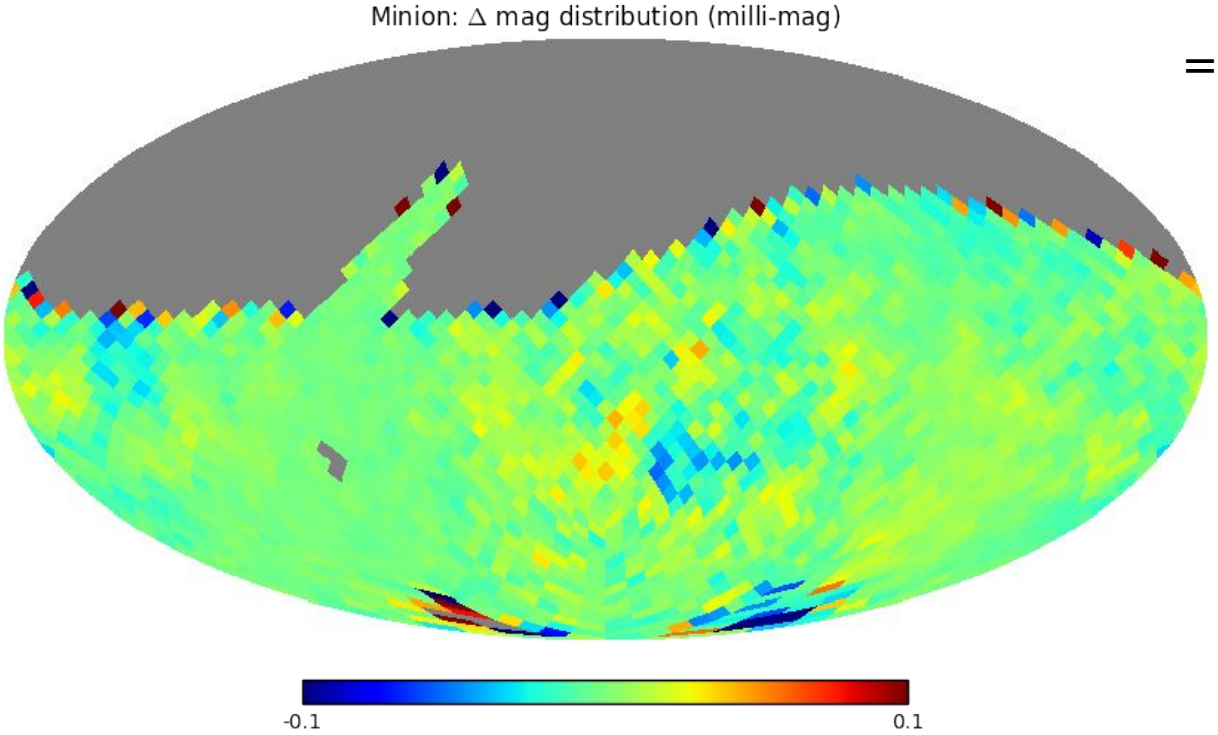
- Simulates 28 M sources in 1 y of OpSim (minion or alt_sched)
- Fits 1.4 M star mags + 100 k atmos/instrument parameters
- Total 45 min. on our HPC machine at CPP Marseille

Results

Each pixel : 13.4 sq. deg.

A SG pole : ~ 2000 ref. stars/ FoV

~ 0.1 mmag RMS

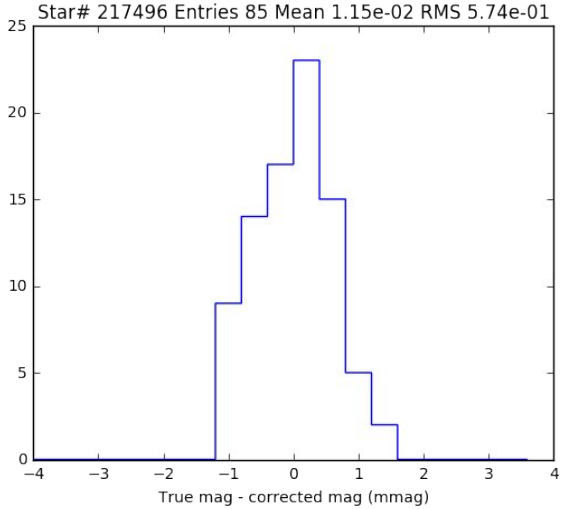


Star observed 85 times

fit results for:

instr Zp & atmos param

=> star repeatability



… and plans
(let’s discuss them in front of our poster)

We need to simulate:

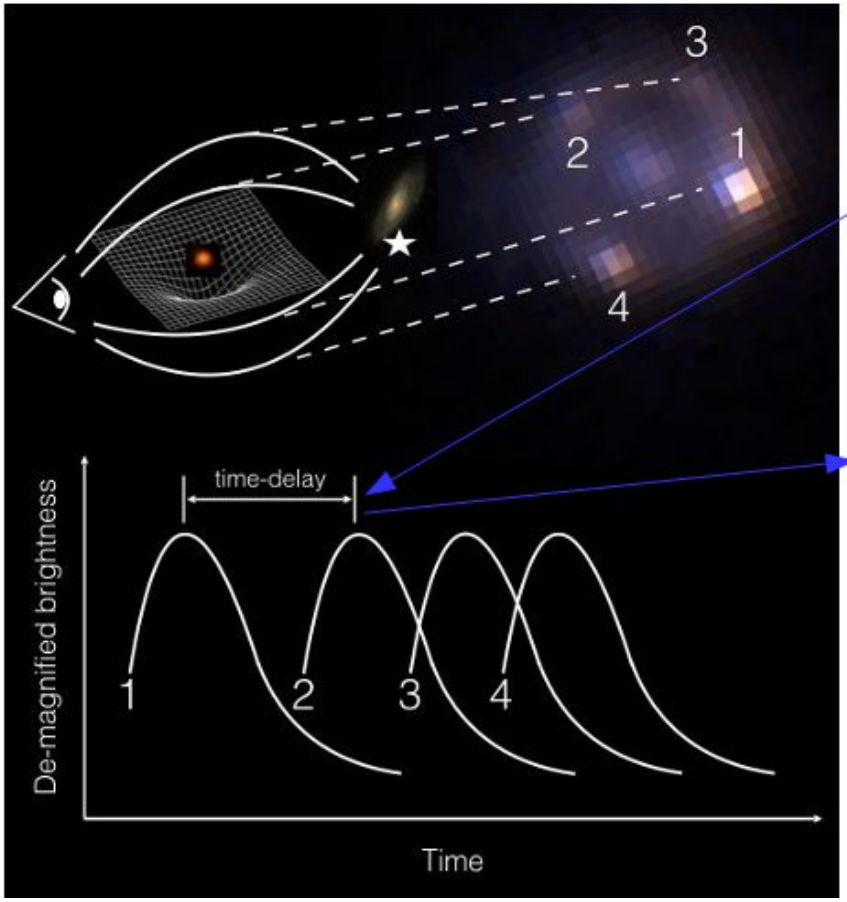
- color effect
  - SED (lambda)
  - Atmosphere att. (lambda)
- use of Aux Tel information
- use of GAIA SED information
- PSF-dependent leakage of neighbouring stars
- Outliers and various errors

Then we should:

- compare with data (DES…)
- Test on DC2

HELP HIGHLY DESIRABLE: from undergrad. to senior

Time Delay Measurement of Strongly Lensed SNe Ia with LSST (Simon Huber, Sherry Suyu)



Measure Hubble constant

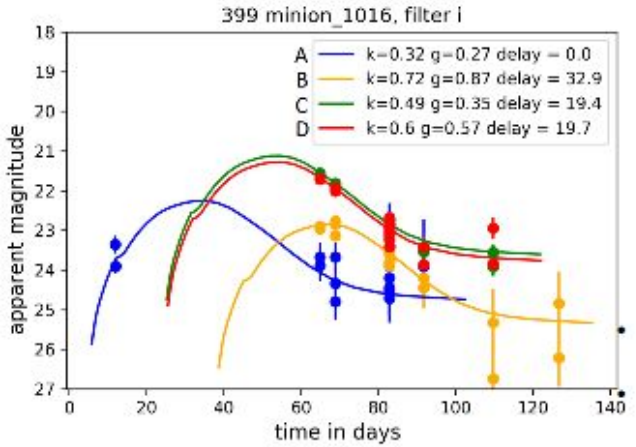
Refsdal 1964

Cadence

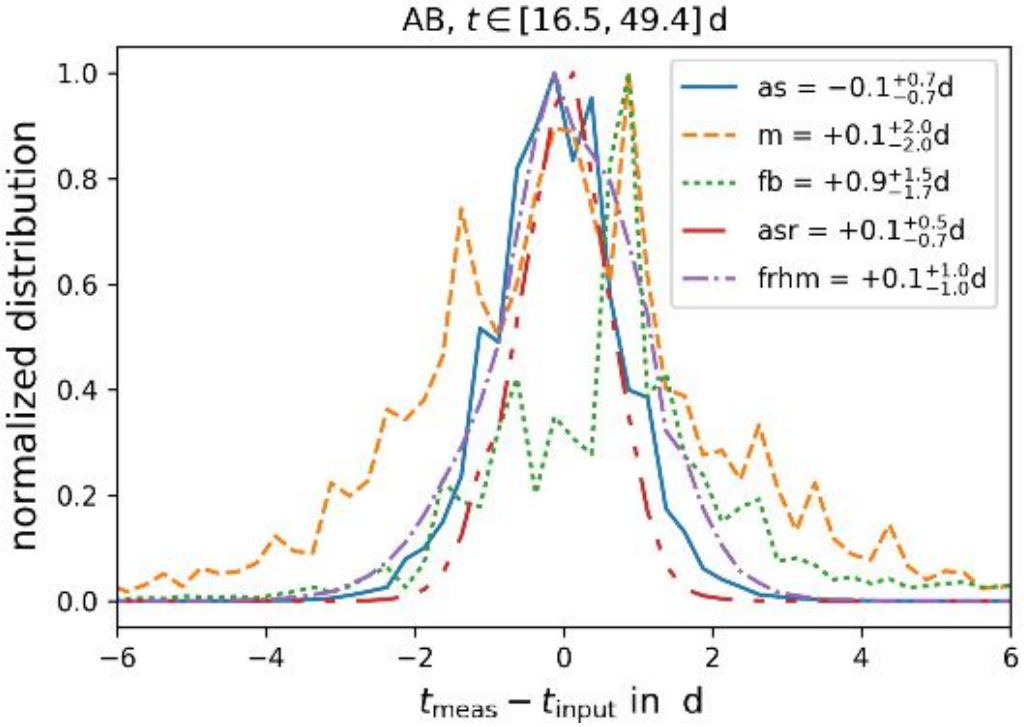
Illustration: Chien-Hsiu Lee/Subaru Telescope

Time Delay Measurement of Strongly Lensed SNe Ia with LSST (Simon Huber, Sherry Suyu)

One spot in the WFD survey
+ One SLSN Ia from OM10 (Oguri & Marshall 2010) mock catalog of strong gravitational lenses
+ Theoretical SNe Ia model



PyCS (Tewes ++2013, Bonvin ++2016)



Time Delay Measurement of Strongly Lensed SNe Ia with LSST (Simon Huber, Sherry Suyu)

- 30 minute revisit in different filters (implemented in alt_sched)
- First cadence investigation: favours alt_sched and alt_sched_rolling
  - → Investigate more spots on sky and more SLSNe Ia from OM10
  - → Investigate fraction of SLSNe Ia which would be useful for time delay measurments
  - → Include microlensing in cadence investigation

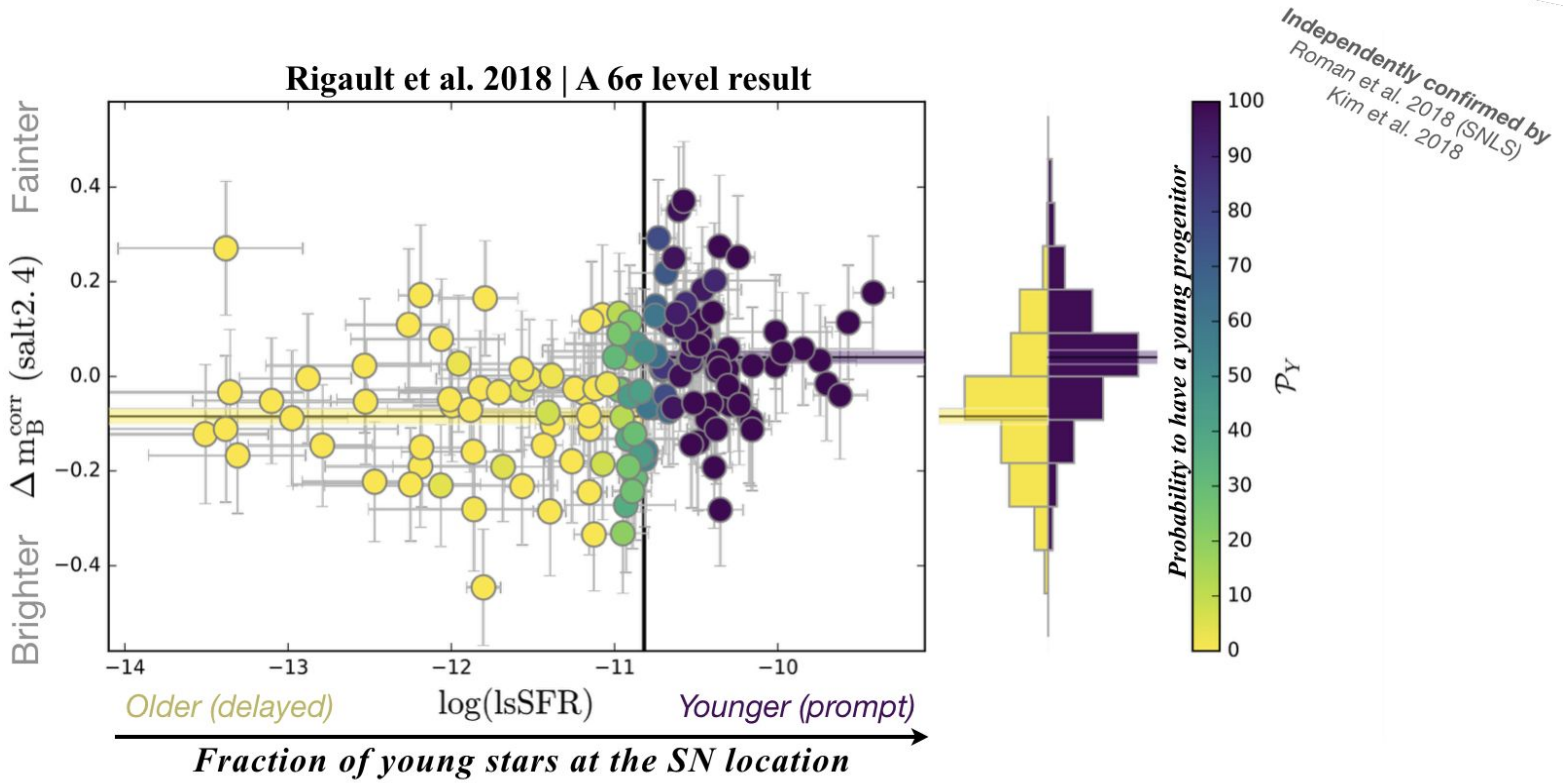
- Interested in supernovae or cadence strategies or have comments on our project?
  Please come and talk to us

Astrophysical bias in SN Cosmology

Observation | *Type Ia Supernovae varie as a function of their environment*

Interpretation | *Progenitor properties influence the SN standardised magnitude*

Consequences | ***Redshift drift and Selection effets significantly affect Cosmology !***



http://arxiv.org/abs/1806.03849

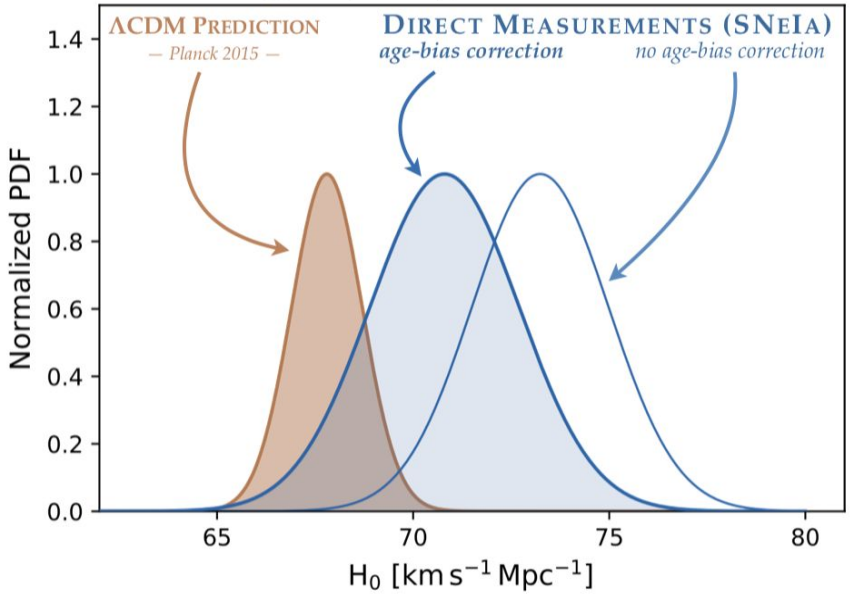
Check the Poster

Astrophysical bias in SN Cosmology

Consequences | ***Redshift drift and Selection effets significantly affect Cosmology !***

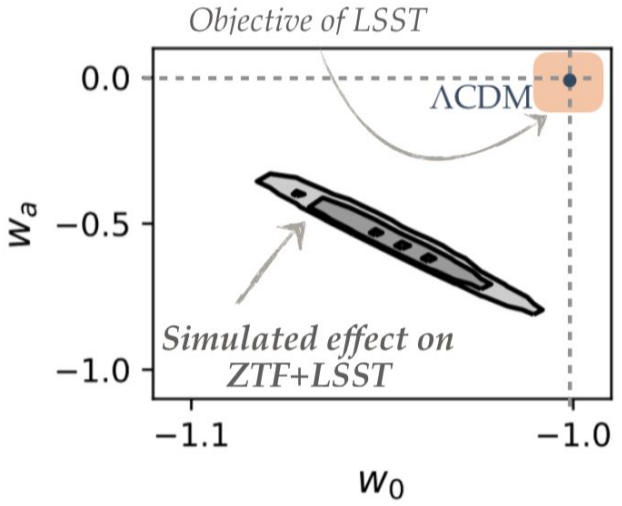
The Hubble Constant	***Properties of Dark Energy***
Test Standard model of Cosmology	*Can we trust w/w_a measurements?*

Selection effets | ***It Explains the H_0 tension !***



Rigault et al. 2015
https://arxiv.org/abs/1412.6501

Redshift Drift | ***Drastically biases FoM !***



Rigault et al. 2018
http://arxiv.org/abs/1806.03849

Check the Poster

Astrophysical bias in SN Cosmology

We can do something about it !

LSST will be able to measure and correct for Local Environmental Bias !

But we must be careful with our SN sample construction:

- Be careful with your cadence
- Be careful with sample selection
- **Be very careful with non-completeness**

DESC Job | Incorporate SN population drift in Cosmological Simulations

Are we able to recover it ? How biased is the resulting cosmology ?

I have idea so let's discuss

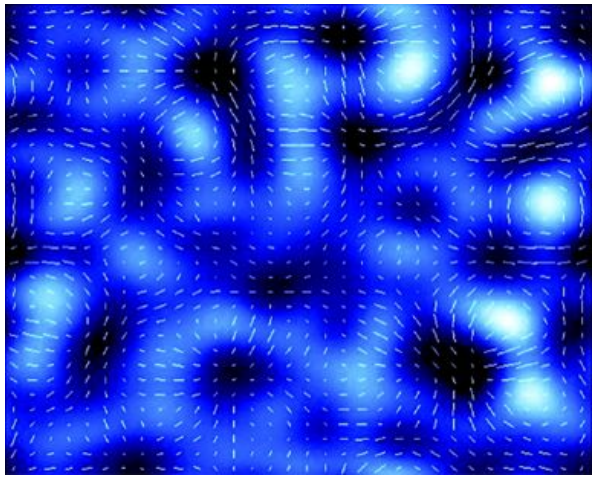
Check the Poster

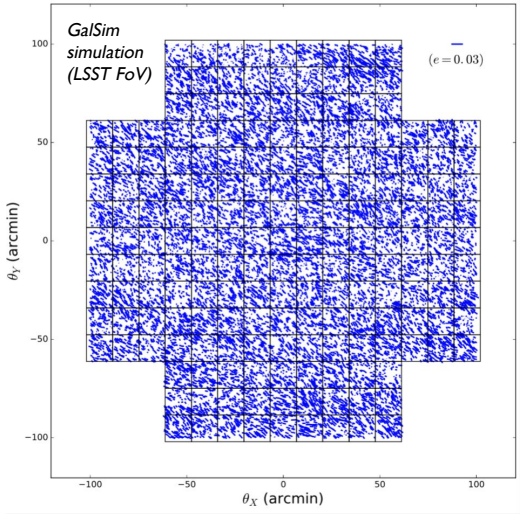
Cosmic shear & spatial variation of the PSF

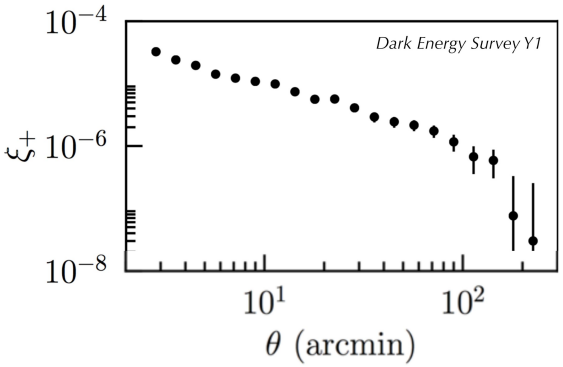
Weak lensing signal

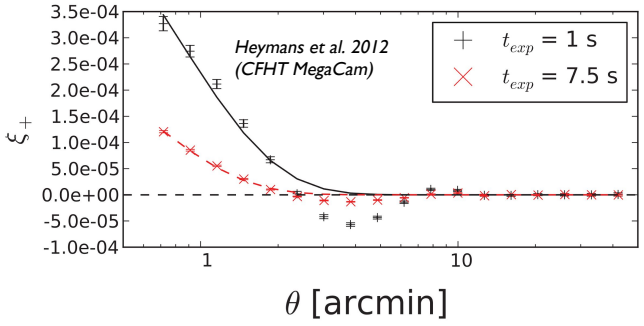
Atmospheric PSF

Ellis 2010 (simulation)









- Weak-lensing needs very accurate (unbiased) shape measurements
- PSF introduces additional ellipticity and is spatially correlated (like sheared galaxy shapes) due to atmosphere and optics
- An accurate (unbiased) model of spatial variation of the PSF is crucial for LSST cosmic shear
- Will benefit all Dark Energy science

Piff: PSFs in the Full Field-of-view

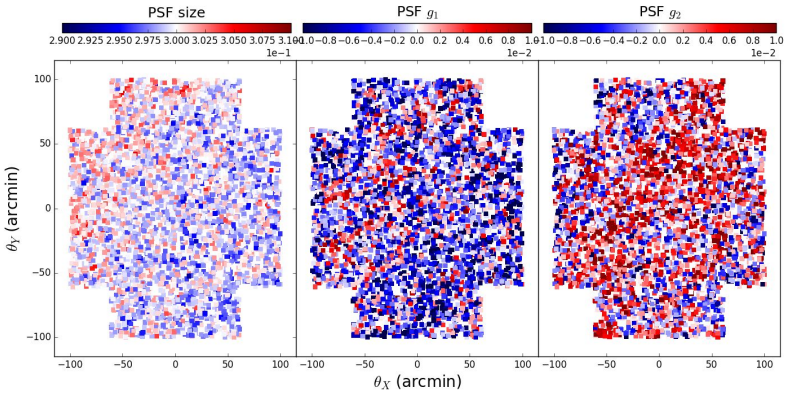
- Existing PSF modeling (e.g. PSFEx) have several shortcomings:
  - PSF model in pixel coordinate: does not allowed inclusion of optical distortion & threerings
  - PSF model per CCD chip: spatial correlations larger than the chip size - due to optics and the atmosphere, for example - are not captured.

- Solution: PSFs in the Full Field-of-view (Piff)
  - Works in sky coordinate instead of pixel coordinate
  - PSF modeling per CCD:
    - e.g.: PixelGrid model + Polynomial interpolation
    - This is what will be use for DES Y3 (Provides better results than PSFEx)
  - PSF modeling on the full FoV:
    - e.g.: Optical model * Kolmogorov profile + Gaussian Processes interpolation of Atmosphere
    - What would be use in the Future
  - Will be include in the stack by DM
  - On GitHub https://github.com/rmjarvis/Piff, Contributors: *M. Jarvis, C. Davis, P.-F. Léget, E. Sheldon, J. Meyers, G. Bernstein, A. Roodman, P. Burchat, D. Gruen, A. Hernandez, A. Navarro, F. Sobreira, R. Wilkinson, J. Zuntz, S. Burnett*

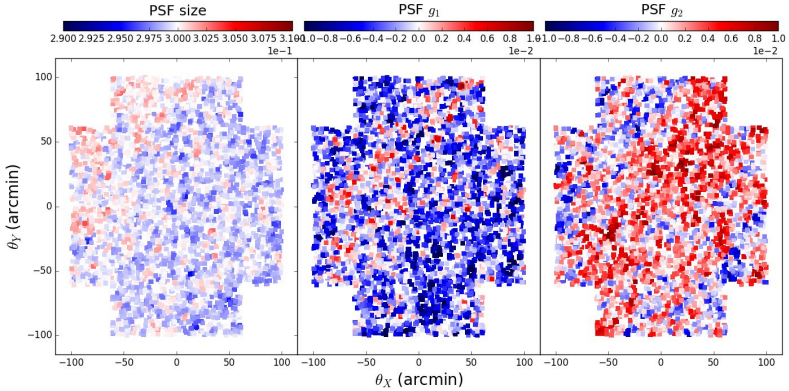
Piff e.g.: Gaussian Process interpolation on Atmospheric PSF

PSF size | PSF ellipticity 1 | PSF ellipticity 11

GalSim simulation of LSST FoV (30 seconde exposure & only Atmospheric PSF)



Gaussian Process Prediction



- Kolmogorov turbulence is a Gaussian random field → Gaussian Process should be optimal interpolation method
- Find GP parameters by fitting two-point correlation function ($O(N^2)$ vs $O(N^3)$ for maximum likelihood)
  - Works for both isotropic and anisotropic correlations (due to preferential wind directions)
- Perform GP interpolation on a single exposure after subtracting optical component (model and/or mean over many exposures)
- Could reduce two-point correlation of residuals (Rowe statistics) by a factor of ~10
- See Poster for more details

Theory and Joint Probes (TJP)

Main activities

- What physics can DESC probe?
  - Beyond wCDM (M. Ishak)
  - Dark matter (A. Drlica-Wagner)
- Modeling observables and systematics (J. Blazek, E. Chisari, T. Eifler)
  - Galaxy bias and IA
  - Baryonic effects
- Methods and software for joint-probe analyses
  - Core Cosmology Library (E. Chisari)
  - TJPCosmo (E. Krause)
  - TJPCov (S. Singh)

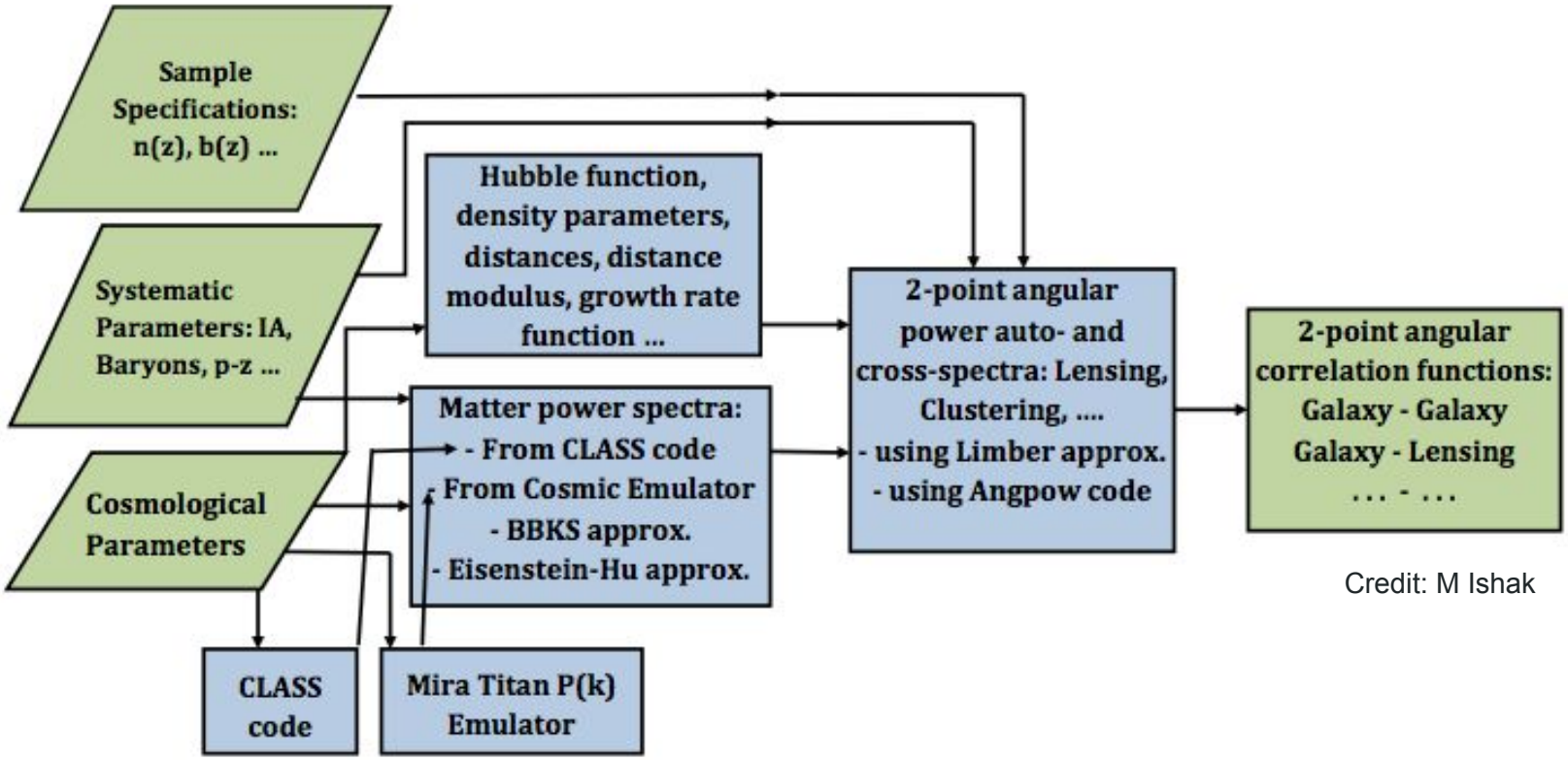
Looking for input and participation in all areas!

Contact: Phil Bull (philbull@gmail.com) and Jonathan Blazek (blazek@berkeley.edu)

Core Cosmology Library (CCL)

E. Chisari (elisa.chisari@physics.ox.ac.uk) and many contributors

https://github.com/LSSTDESC/CCL (public)



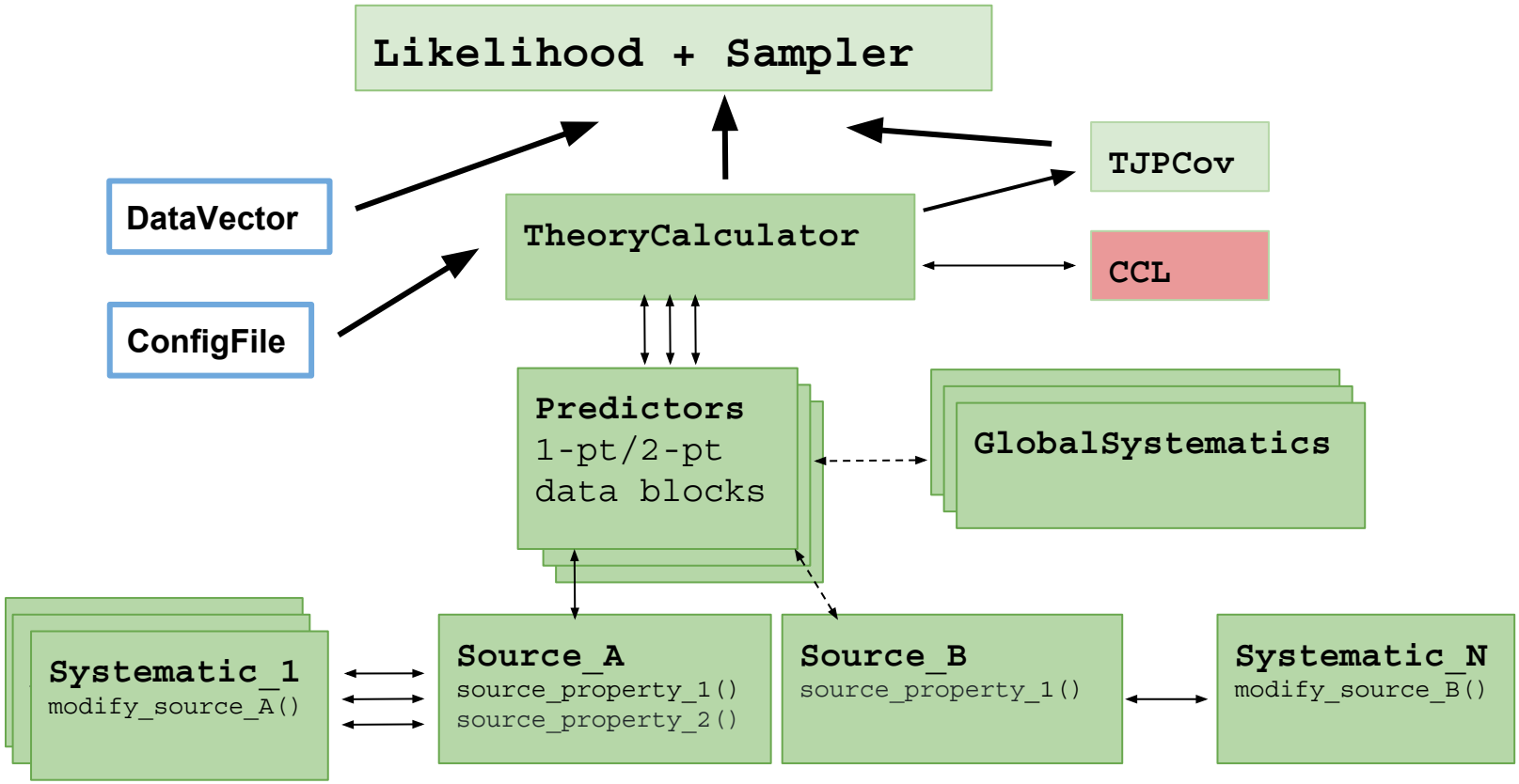
Credit: M Ishak

- Written in C with a python wrapper (pip install; jupyter notebook examples)
- Validated accuracy; will be a core part of DESC analysis pipeline
- Well-documented; paper in internal review
- Developers always wanted! New features (e.g. beyond wCDM, nonlinear bias)
- Incorporate into other DESC and non-DESC projects
- Session at DE school at July CMU meeting (focus on 3x2 cosmology)

TJPCosmo

E. Krause (krausee@email.arizona.edu) and many contributors

https://github.com/LSSTDESC/TJPCosmo (for DESC members)



- Flexible, modular, and consistent analysis framework
- Model data vector (CCL and systematics modules), obtain covariance (from TJPCov), sample likelihood
- Written in python, designed for ease of use by analysis teams (with Docker)
- Basic chains have been run on simulated 3x2 data
- Development of systematics modules, coordinated with TJP and other WGs

PLAsTiCC

Photometric LSST Astronomical Time-series Classification Challenge

A data challenge aimed to prepare a larger community for the LSST data paradigm

2017ClassificationChallenge: an LSST Photometric Classification Challenge

Renée Hložek, Tina Peters, Rick Kessler, Dan Scolnic, Saurabh Jha, Ashish Mahabal, Federica Bianco, Hiranya Peiris, Michelle Lochner, Robert Schumann, Rob Firth, Mark Sullivan, Alex Malz, Lluís Galbany, Emille Ishida, Rahul Biswas, Bob Nichol

Enabling Science Grant

Goals:

1. Up to date view on ML performances on LSST data
2. Engage non-astronomers in the classification task
3. Boost the development of new algorithms
4. **Develop infra-structure for future studies**

PLAsTiCC

Photometric LSST Astronomical Time-series Classification Challenge

A data challenge aimed to prepare a larger community for the LSST data paradigm

Ensuring realistic simulations – **not a SN challenge!!**

Call for notice of intent for transient model inputs for PLAsTiCC: Photometric LSST Astronomical Time-series Classification Challenge

May 1, 2017

Renée Hložek, Rick Kessler, Anita Bahmanyar, Federica Bianco, Rahul Biswas, Mi Dai, Seth Digel, Jason McEwen, Rob Firth, Dominique Fouchez, Lluís Galbany, Philippe Gris, Emille Ishida, Saurabh Jha, Michelle Lochner, Ashish Mahabal, Alex Malz, Bob Nichol, Johanna Pasquet, Tina Peters, Hiranya Peiris, Chad Schafer, Robert Schuhmann, Dan Scolnic, Mark Sullivan, Elizabeth Swann.

PLAsTiCC

Photometric LSST Astronomical Time-series Classification Challenge

LSST DESC Dark Energy Science Collaboration

A data challenge aimed to prepare a larger community for the LSST data paradigm

- PIs: Renee Hlozek and Rick Kessler; talk to: Emille Ishida and Rahul Biswas!
- SNANA simulations → Light curves in observer-frame (no images!)
- 3 years worth of LSST data, ~ 15 GB
- ~ 5 million objects
- A variety of transient models (galactic and extra-galactic, periodic and non-periodic)

Expected release date:

Summer/Fall 2018

- Please respect model-information policy: ``don't ask, don't tell"

- Training sample will be *small and biased*
- Not all models will be present in the training sample
- Challenge will be done in phases: kaggle then RAMP

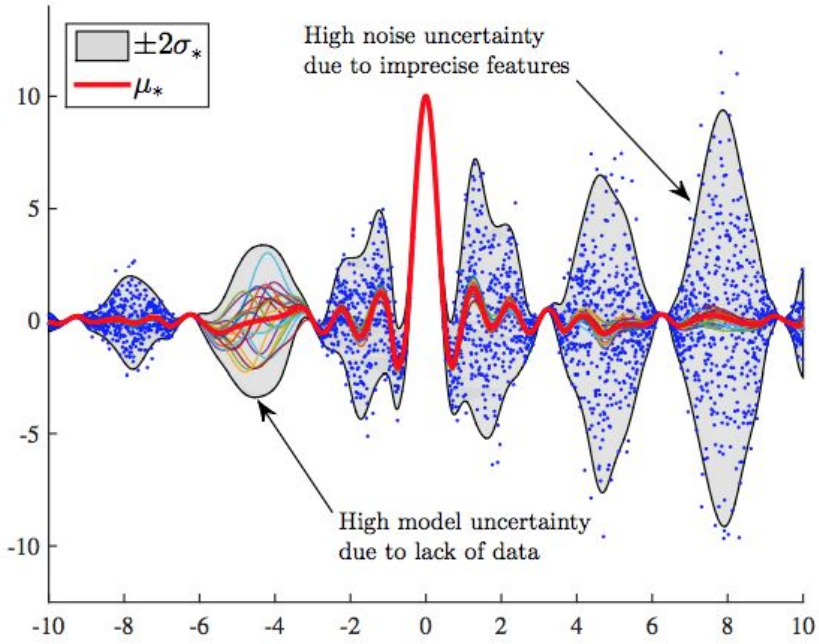
https://plasticcblog.wordpress.com/

GPz: Machine Learning Photometric Redshifts

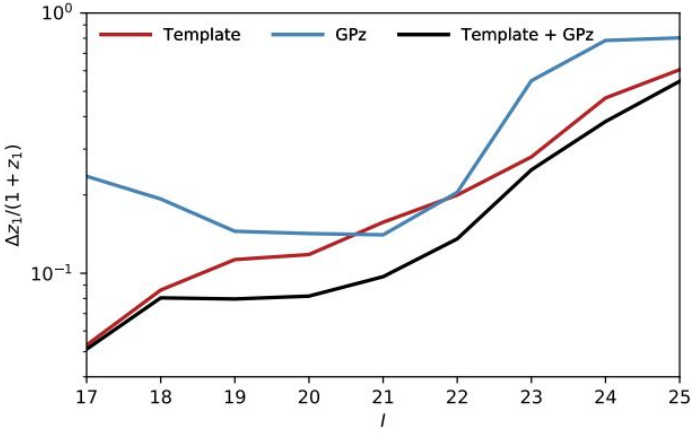
- ➔ Ibrahim Almosallam; Matt Jarvis; **Peter Hatfield**; Stephen Roberts; Zahra Gomes; Kenneth Duncan; Corentin Schreiber (Oxford, Leiden, KACST)
- ➔ Available in python and matlab: https://github.com/OxfordML/GPz
- ➔ Key Papers: Almosallam+ 2016a, 2016b
- ➔ Being used in various data sets, e.g. LSST Testbed, Euclid Data Challenge, VIDEO, SDSS…

Key Features:

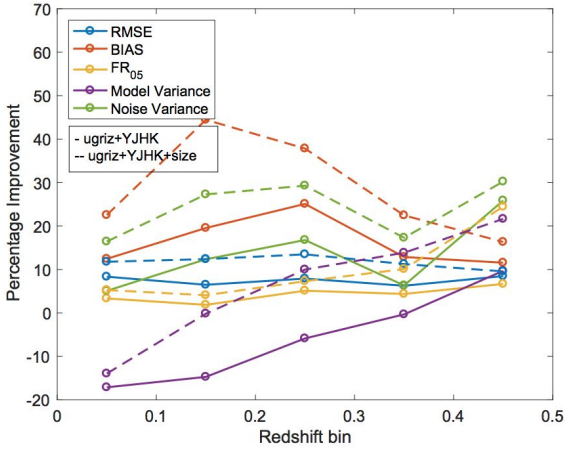
- Easy to use
- Both training and prediction very fast
- Straightforward to interpret
- Breaks down uncertainty into
  - a) error from lack of data
  - b) error from imprecise features
  - c) error on photometry
- Gives realistic error bars
- Highly tunable for different science goals e.g. cosmology versus galaxy physics



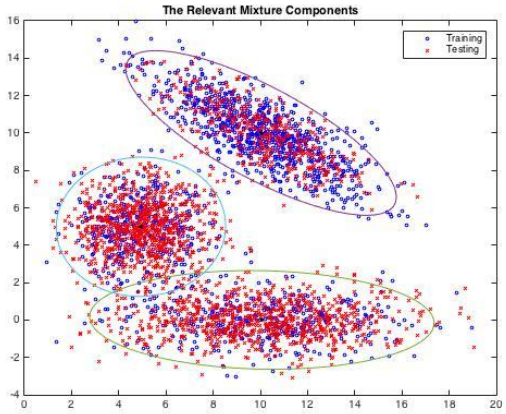
GPz: Machine Learning Photometric Redshifts



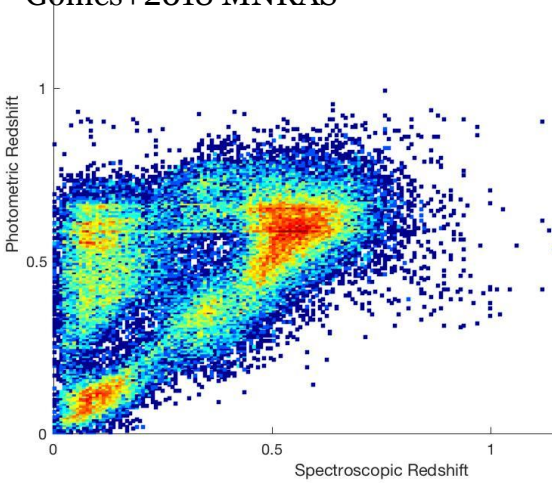
Combining with template fitting
Duncan+2018 MNRAS



Incorporating size information and post-processing
Gomes+2018 MNRAS



Accounting for training/test data colour differences
Multi-modal pdfs from identifying populations
Hatfield+ in prep.



Coping with missing bands
Almosallam+ in prep.

Being actively developed for LSST+Euclid - please download and start using/get in contact if interested in being involved, or using in other physics applications!

Data Release Production for DESC

DESC plans to do its own DRP-level reprocessing during observations, and DESC needs realistic LSST-like datasets to develop and test its science pipelines. Hence, DC2:

Table 3. Cadence and Survey options

Main Survey:	
Image area	300 sq deg
Campaign length	10 years
Cadence	`minion_1016` WFD proposal visits
Number of Visits	$(ugrizy) = (56, 80, 184, 184, 160, 160) \times 30$ fields $\sim 27,000$ total
Input	See Table 1 and 2, plus (stretch goal): natural density of core-collapse SNe, lensed AGN and lensed SNe
Field Location	Offset but just including the Extended Chandra Deep Field South Deep Drilling Field
Dithering	Realistic large dithers and rotations
Ultra-DDF:	
Image area	$\sim$ 1.25 sq deg (3 rafts, 27 sensors, 4600 sq arcmin, 15% of a full FoV), embedded in one corner of the main survey region
Campaign length	10 years
Cadence	`minion_1016` DDF proposal visits (re-arranged from year to year to emulate enhanced cadences), including visits labeled WFD from the `minion_1016` WFD proposal
Number of Visits	$\sim 20,000$ total
Input	See Table 1 and 2, plus: over-abundance of lensed AGN ($\gtrsim$ 1000, 0.2/sq arcmin) and lensed SNe ($\gtrsim$ 1000, 0.2/sq arcmin), and: $\sim 6\times$ over-abundance of SNe Ia (25000, 5/sq arcmin), core-collapse SNe (similar)
Field Location	Extended Chandra Deep Field South Deep Drilling Field
Dithering	WFD visits dithered and rotated (since these are also main survey visits). DDF visits to have small (chip-scale) dithers, and realistic rotations (same as for WFD).

Sky Model Inputs:

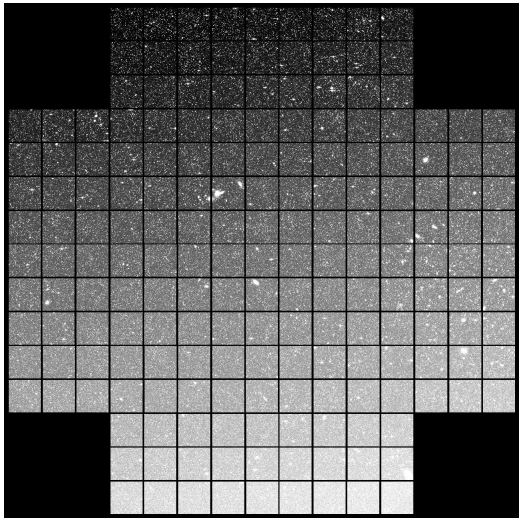
Extragalactic catalog based on Outer Rim simulations with Galacticus+MC resampling to populate halos with galaxies. Effects/features include disk/bulge galaxy components, cosmological redshifts, WL, star formation, accreting SMBHs, etc..

Stars and Milky Way properties from CatSim.

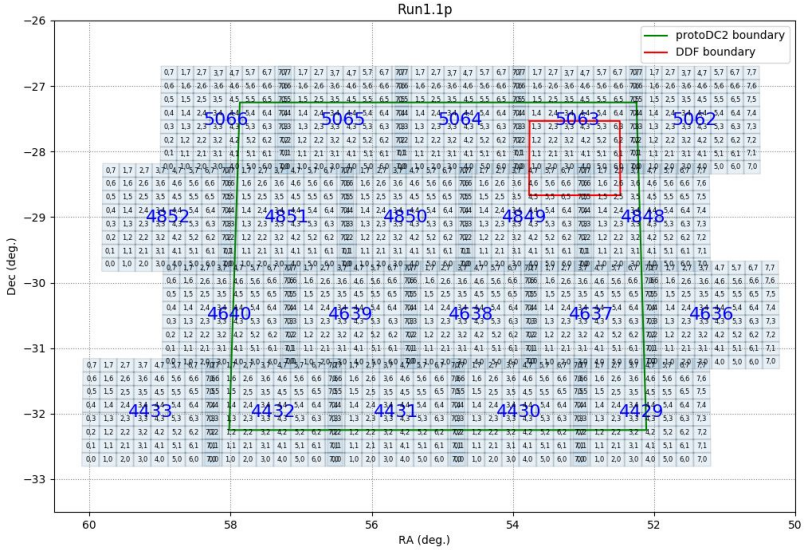
In the uDDF, over-abundance of transient objects is "sprinkled" into region to enable time domain science.

Data Release Production for DESC

We are using PhoSim and imSim/GalSim to simulate the pixel data:



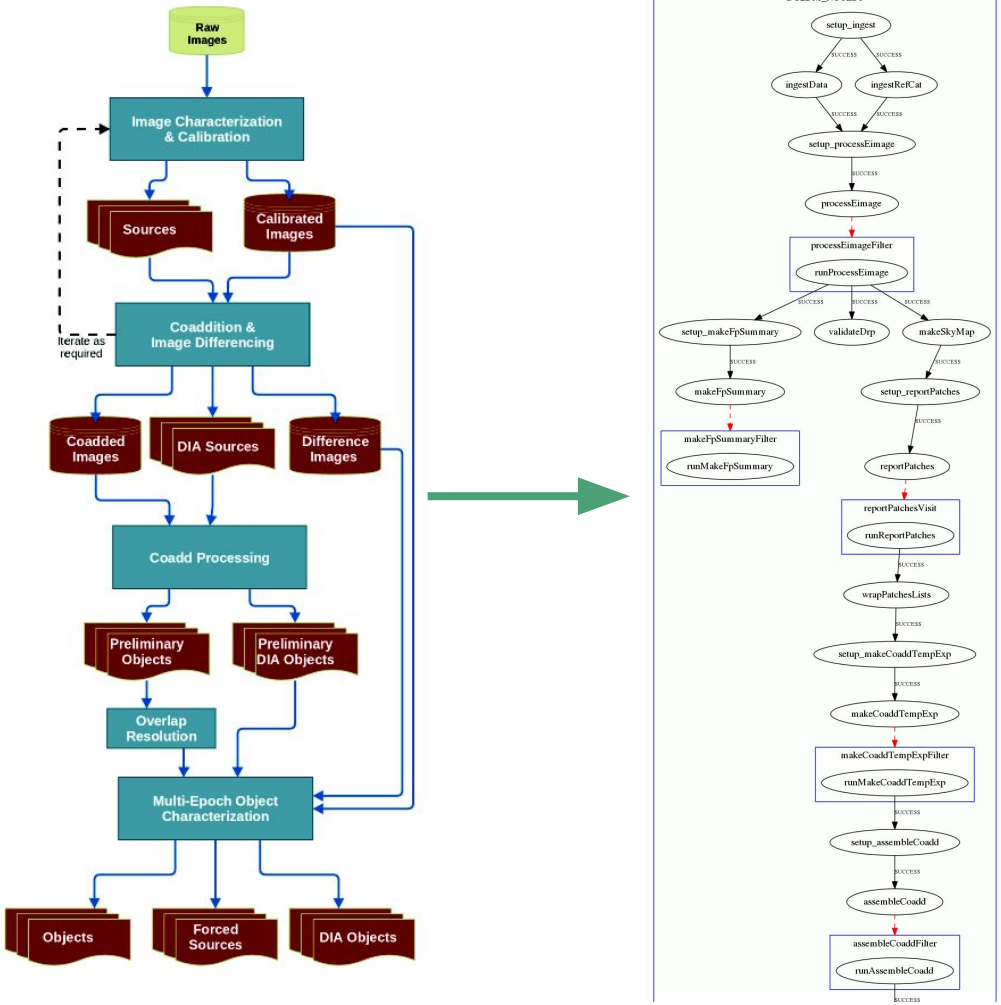
and the LSST Stack to process the images:



Data Release Production for DESC

DESC needs help implementing the DRP pipeline:

From LDM-151:



Our current implementation (using the SLAC SRS Workflow engine) is based on DESC's CFHT reprocessing effort and DC1-era work, but the Stack pipeline tasks have evolved since then. In particular, we'd like to benefit from the experience gained from the HSC PDR1 Reprocessing work done by Hsin-Fang Chiang et al., especially regarding

- Handling calibration products.
- Balancing memory vs disk I/O for coadd tasks.
- Recommendations on granularity of tasks in the pipeline implementation.
- Migrating obs_subaru/HSC configs to obs_lsstSim.

The DESC DM DC2 Task Force is on confluence and Slack, with code in https://github.com/LSSTDESC/ImageProcessingPipelines

DESC DRP : Focusing on Time Domain processing : SuperNova(SN)/Strong Lensing (SL)

DM Alert Processing/DIAObject of DRP not yet in a state to be ‘released’

Need close follow up of development with DM + developing ‘own’ DESC task : evolution toward more collaborative work with DM developers ?

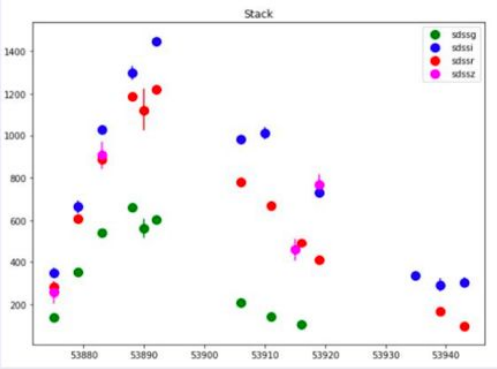
Supernova science has requirements beyond LSST ones, then specific needs

- Scene modeling photometry (vs forcephot on diasources)
- precise detection efficiency (artifact in center of bright galaxies)
- Control of systematics : color/calibrations
- Follow up
- …

DESC DRP : Focusing on SN/SL processing

Status :

First attempt: build 'DM' lightcurve from CFHT (SNLS) images



Run on DC2 images : work in progress : Hackathon next week

- Remote session : Tuesday June 19 , 18.30 CEST/9.30 PT
- https://confluence.slac.stanford.edu/display/LSSTDESC/SN+pipeline+workshop

DESC DRP : Focusing on SN/SL processing

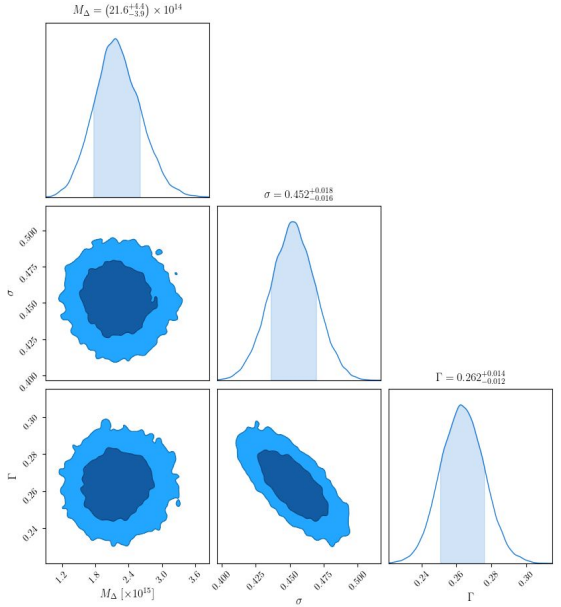
- Short term objectives
  - DC2 1.2p UDDF light curves (from diaobject) + matching with OpSim inputs
- Mid Term
  - DC2 : Lightcurve, study of efficiency and photometry from forcephot in Diasources
- Longer term
  - Scene modeling, detection efficiency 'in' bright galaxies, template generation (coaddition), …

Many studies will benefit from for participations of DESC members + interactions with DM members.

Individual Cluster Mass Estimation

- Obtain weak lensing cluster mass estimates using the full photometric redshift distributions of the lensed galaxies.
- The algorithm is implemented in the Numerical Cosmology library (NumCosmo). https://numcosmo.github.io/
- Current status: tested for simulations (B. Liu); being tested using real data (TheWeighing the Giants catalog- WtG).

- This project is part of the CLMassMod project of the Cluster WG.
- People: Mariana Penna-Lima, Céline Combet and Dominique Boutigny (+new postdoc starting in November).
- Next steps: implement different matter density profiles; include observational / astrophysical effects to compute the surface mass density (e.g., miscentering, 2-halo, no-weak shear terms ...)



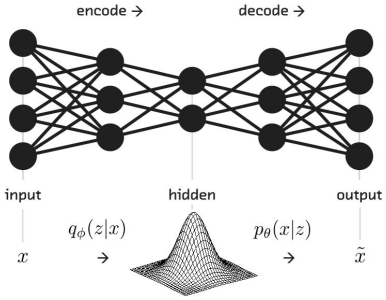
Deblending with deep learning

APC : Bastien Arcelin (PhD), Eric Aubourg, Cyrille Doux, Cécile Roucelle

Use of trained VAE :

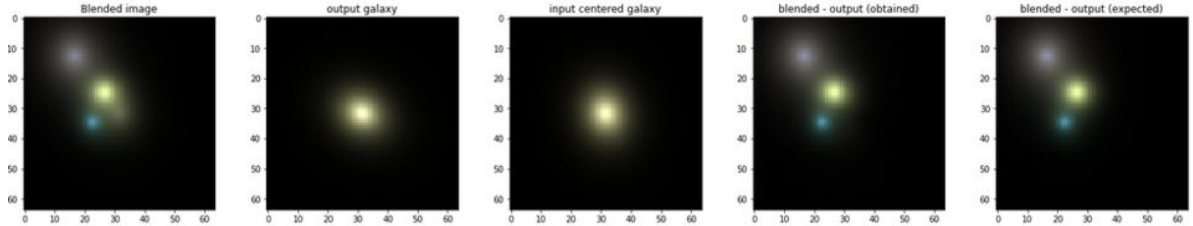
1- Fast generator for simulated galaxies

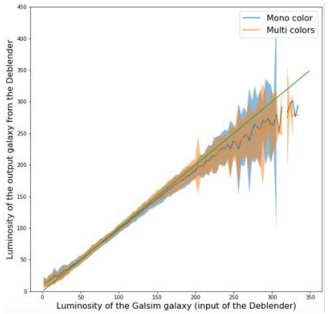
2- Actual deblending

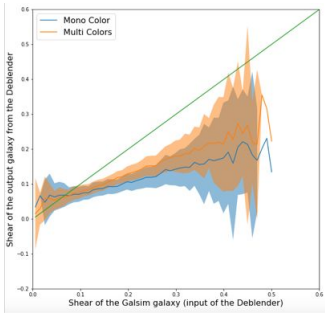


=> First results of deblending using multi band images

with simulated (GalSim) galaxies for deblending





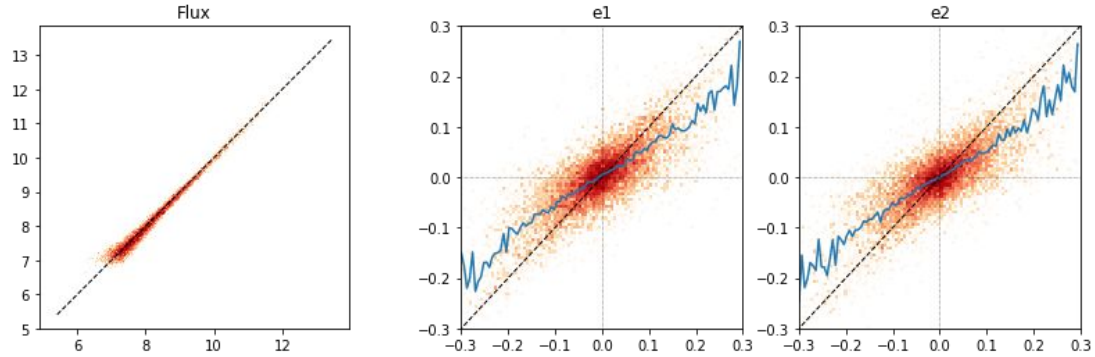


Deblending with deep learning

Work on noisy images

with COSMOS parametrizations + LSST noise (no atmosphere)

(mono band)



Discussion : assess performances and integrate in the collaboration effort

=> Deblending challenge ?

LSST-Euclid coordination

Euclid and LSST will have a large overlap (> 10k sq deg), complementary colors (ugrizy vs VIS+NIR), and similar timing (~Q4 2022 for science survey)

Several papers have explored possible synergies (Jain et al. 2015, Rhodes et al. 2017…). There is a wide range of relevant topics (DESC or beyond).

Thursday @ 2pm: introduction talks and discussion on a few topics

Friday @ 9am : breakout groups to start projects

Contact: Éric Aubourg & Jason Rhodes

LSST-Euclid coordination

Breakout topics (Friday 9am):

Shape measurements: Robert Schuhmann…
Deblending: Robert Lupton, Cyrille Doux, Alexandre Boucaud…
Euclid ground segment: Joe Mohr…
Photo-z/SED : Matt Jarvis…

Joint simulations?
Pipeline adaptations? ugrizy+VIS+NIR multifit?
Clusters? Transients with NISP? Galaxies?
LSST commissioning data? LSST scanning strategy?

Your favorite topic…

Spectroscopic Follow-up Associated with SN

LSST is a photometric survey with large number of SN.
For SN cosmology, we need

- a classification (spectroscopic/photometric)
- a distance measurement (includes light curve fits conventionally with known/spectroscopic redshifts)
- information about environment (eg. host galaxy stellar masses, but possibly more)

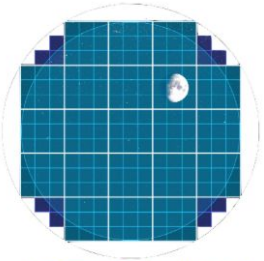
We will need the following to determine sample sizes:

- Spectrum of the **SN Host when identified**
- **Spectrum of the SN** (small unbiased sub-sample) not far from peak

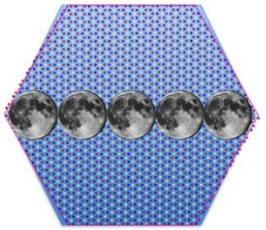
Who could provide spectral resources?
4MOST & TiDES

4MOST Instrument (operation by 2022)

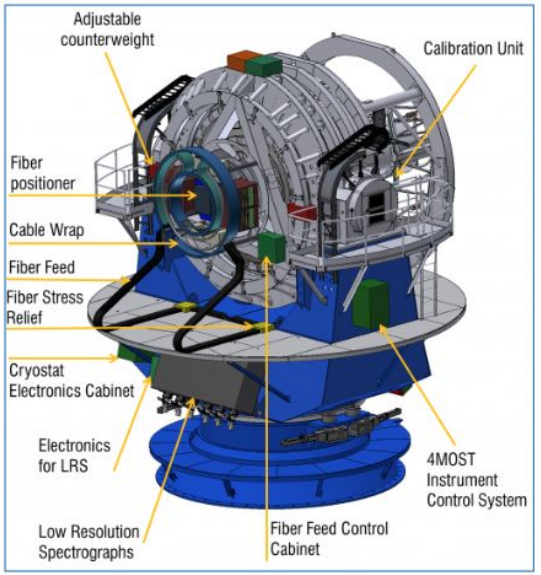
- ~ 2400 fibres (high multiplex capabilities)
- **4MOST well matched to LSST** in terms of:
  - Sensitivity (Galaxy redshifts @~23rd mag)
  - Location (12,000 deg^2 overlap w/LSST)
- The premier **wide spectroscopic facility** in the south (30 deg^2 / night)



LSST 9.6 deg^2 FoV



4MOST 4.1 deg^2 FoV



The Time-Domain Extragalactic Survey (PI: Bob Nichol)

- 250,000 fiber hours **guaranteed** for follow-up of LSST transients (50,000+ spectra)
- Rapid (~3 day) spectroscopic follow-up of live LSST transient discoveries (SNe Ia)
- Spectroscopic redshifts of Type Ia SNe **host galaxies**
- Large AGN reverberation mapping experiment

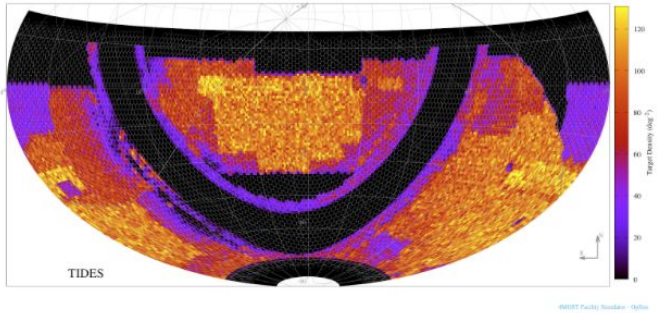
TiDES - A Dynamical Mock Catalogue

A mock catalogue of SNe, host galaxies & spectral templates has been created & passed to the 4MOST simulations team

PRELIMINARY results - number of successful redshifts

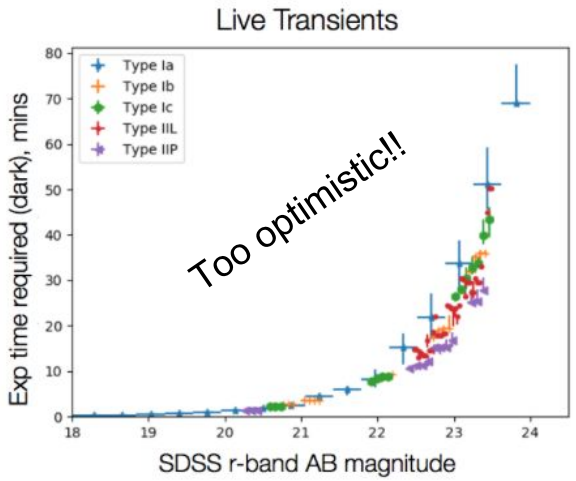
- SN Ia: $5x10^5$
- SN Ia Hosts: $4x10^5$
- Other SN (Ib/Ic/IIL/IIP): $3x10^5$

Density of Completed Targets per deg2 (Hosts + Live Transients)
Approximate key: black=0, purple=30, red=60, orange=90, yellow=120



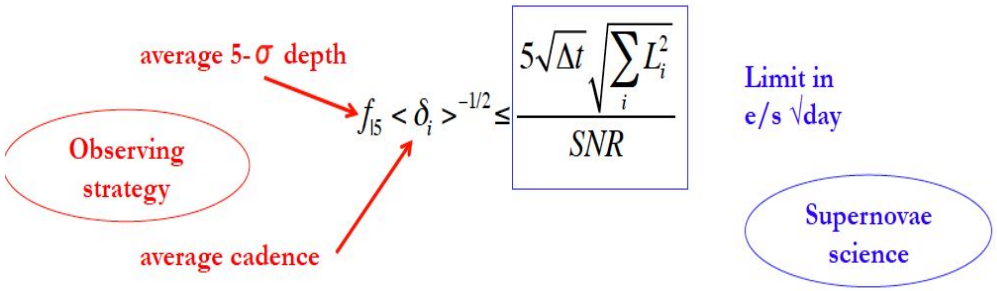
We still have ***many*** improvements to make.
What TiDES would like to know from **you**:

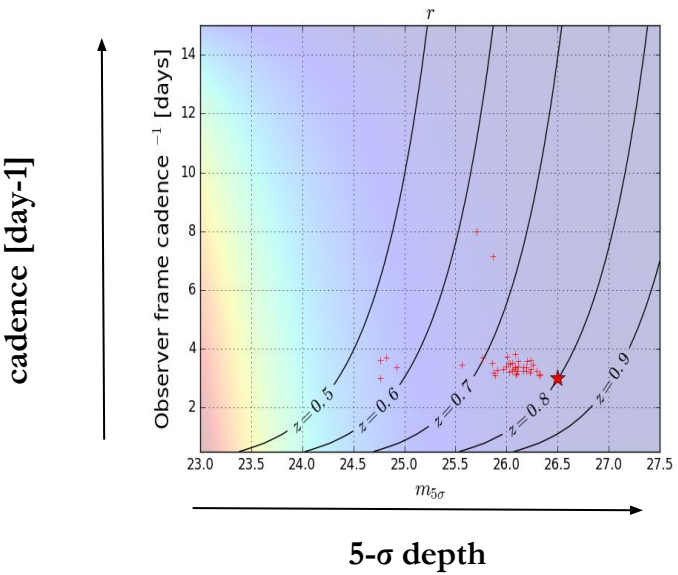
- LSST survey strategy (cadence & area, WFD & DDF)
- What information will come from the brokers and when (data format & frequency)
- Will cosmological samples of SN Ia be created dynamically/every data release/end of 10 years?
- Early commissioning opportunities (AAT?)
- LSST data sharing policy with 4MOST
- Would anyone like to use our mock catalogue/suggest improvements?



Cadence optimization for supernovae in LSST

- Context of the study :
  - Call for white papers on LSST cadence optimization (end of june)
  - Intense effort up to end of november
- What has been done so far:
  - A set of tools has been developed to estimate the impact of the available simulations on supernovae science:



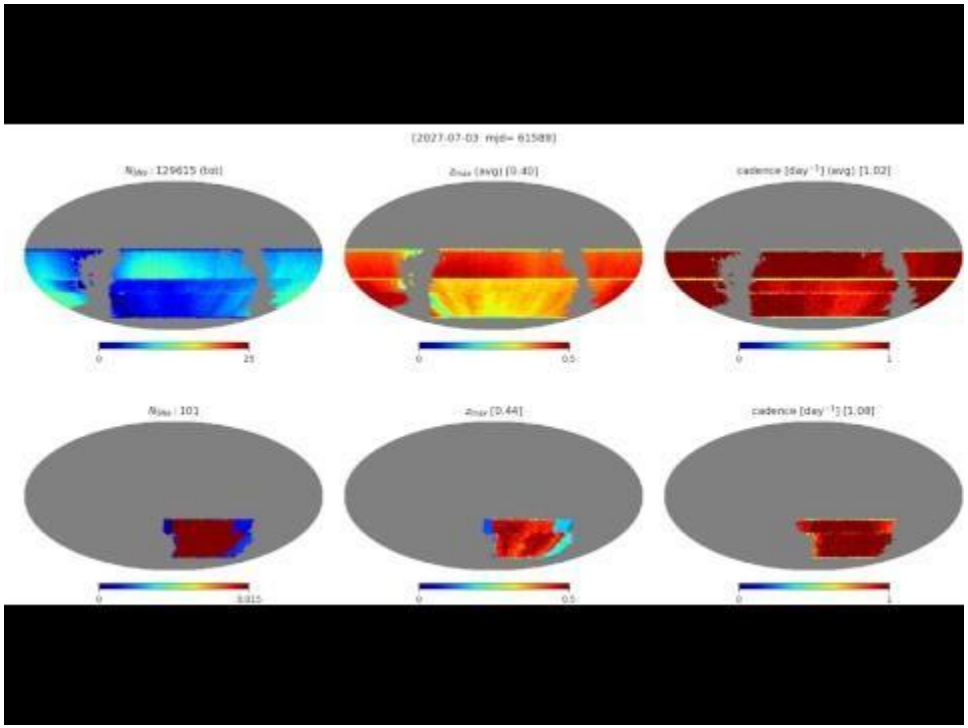


Cadence optimization for supernovae in LSST

- Number of well measured supernovae

WFD - 10 years

altsched_rolling



Courtesy N. Regnault

Cadence optimization for supernovae in LSST

- Where to contribute:
  - ➢ Number of SN, completeness of the surveys
    - Develop fast and reliable tools
  - ➢ Impact of photometric classification
    - Classifier comparisons, efficiency, purity
  - ➢ Cosmology
    - Figure of merit, Hubble fit diagram
  - ➢ Synergy with other experiments
    - Impact of LSST observations (EUCLID, WFIRST)
    - Contribution of spectroscopic measurements (4MOST,...)

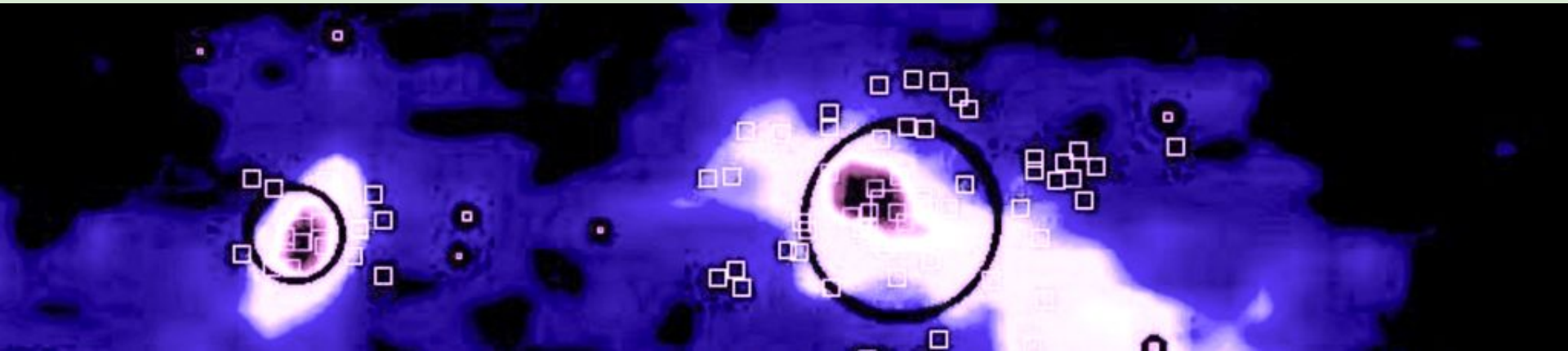
Lots of cadences available

Possibility to define the cadence of your dreams !

Contact: Philippe Gris

Cosmological Simulations for Weak Lensing

- **Goal: extract information beyond 2-pt correlation function**
- Bi-spectrum, peak count, density-split lensing, filaments & walls, shear clipping…
- No analytical predictions for the modelling
- No analytical predictions for covariance matrix
- **Need N-body simulations**



What's available?

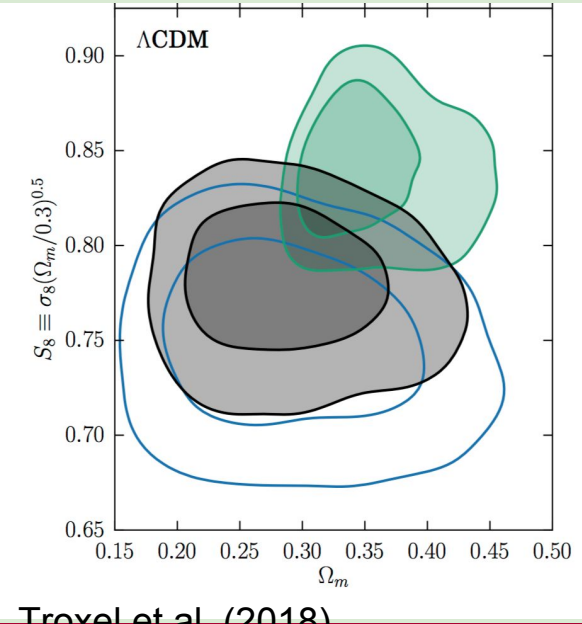
	SLICS	HSC	DH10	CLONE	MICE-GC	Millennium
L_{box} (h^{-1}Mpc)	505	450 ($z \sim 0$) 4950 ($z \sim 3$)	140	231.1 ($z > 2$) 147.0 ($z < 2$)	3072	500
m_p ($h^{-1} M_\odot$)	2.88×10^9	8.2×10^8 ($z \sim 0$) 1.1×10^{12} ($z \sim 3$)	6.51×10^9($\Omega_m = 0.07$) 5.74×10^{10}($\Omega_m = 0.62$)	8.94×10^8 ($z > 2$) 2.30×10^8 ($z < 2$)	2.93×10^{10}	8.6×10^8
N_{cosmo}	3	1	158	1	1	2
N_{sim}	844	108	192	185	1	1
A_{tot} (deg^2)	8.44×10^4	4.45×10^6	6912	1.11×10^4	1.03×10^4	1024

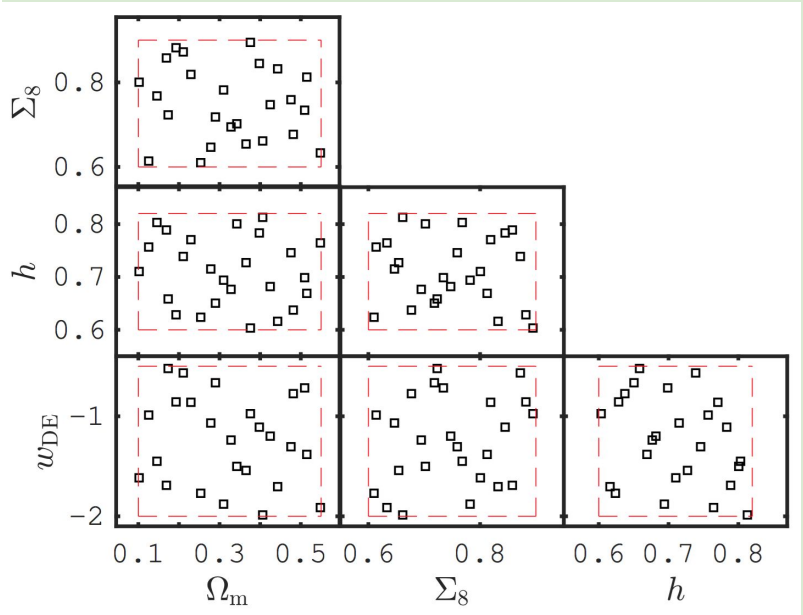
- SLICS suite: 800+ *public* simulations with lensing, CMB lensing and clustering (CMASS, LOWZ, GAMA) catalogues: http://slics.roe.ac.uk
- **Tailored for covariance matrix estimation**
- How about modelling? DH10 is the only option to date

Requirements for modelling lensing:

- Lightcones mass maps (lacks in Aemulus?)
- Wide Cosmology span (lacks in Mira-Titan)

cosmo-SLICS: 25 cosmologies, use machine learning, (i.e. Gaussian Processes) to interpolate in your likelihood analysis

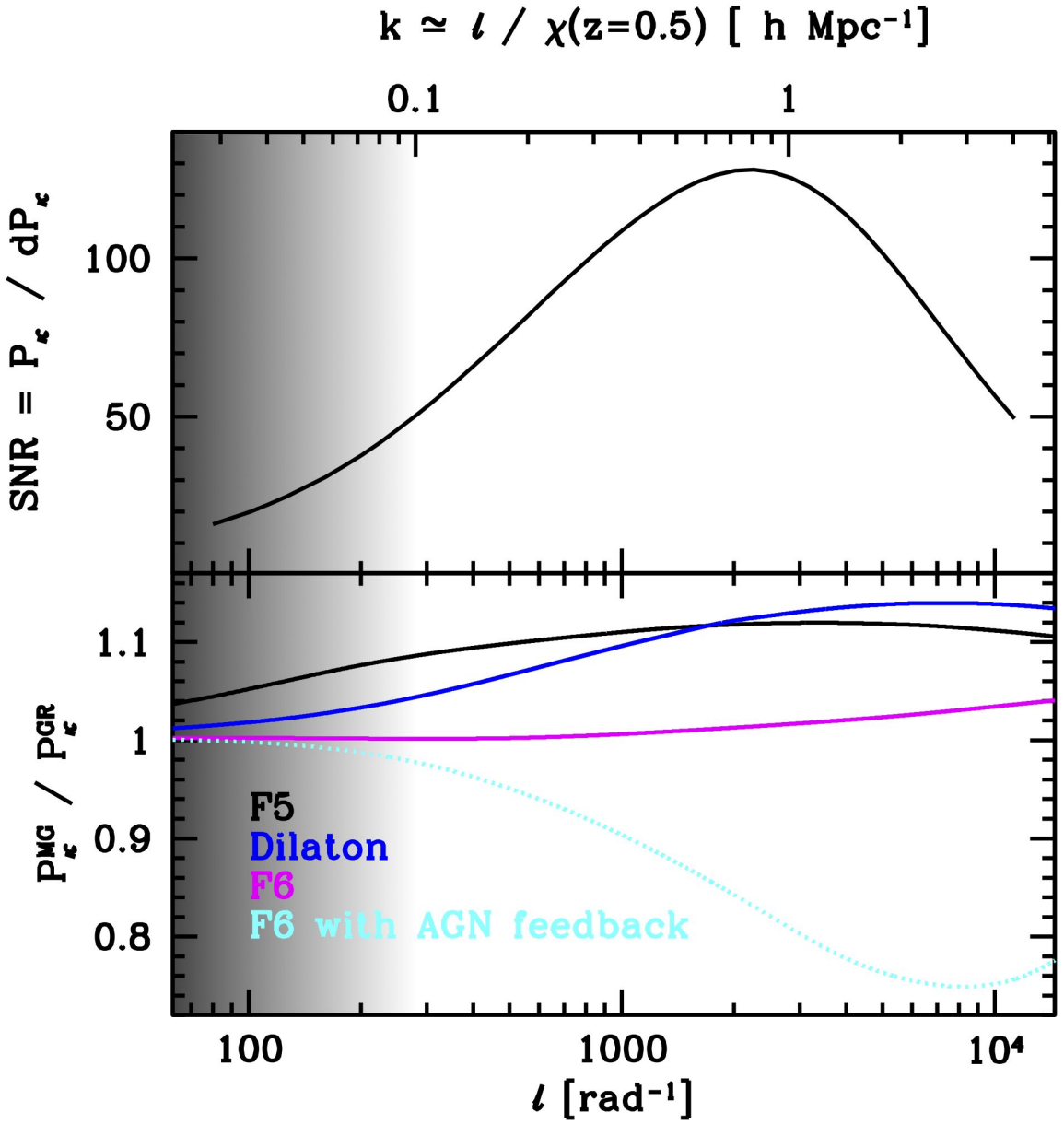




LSST

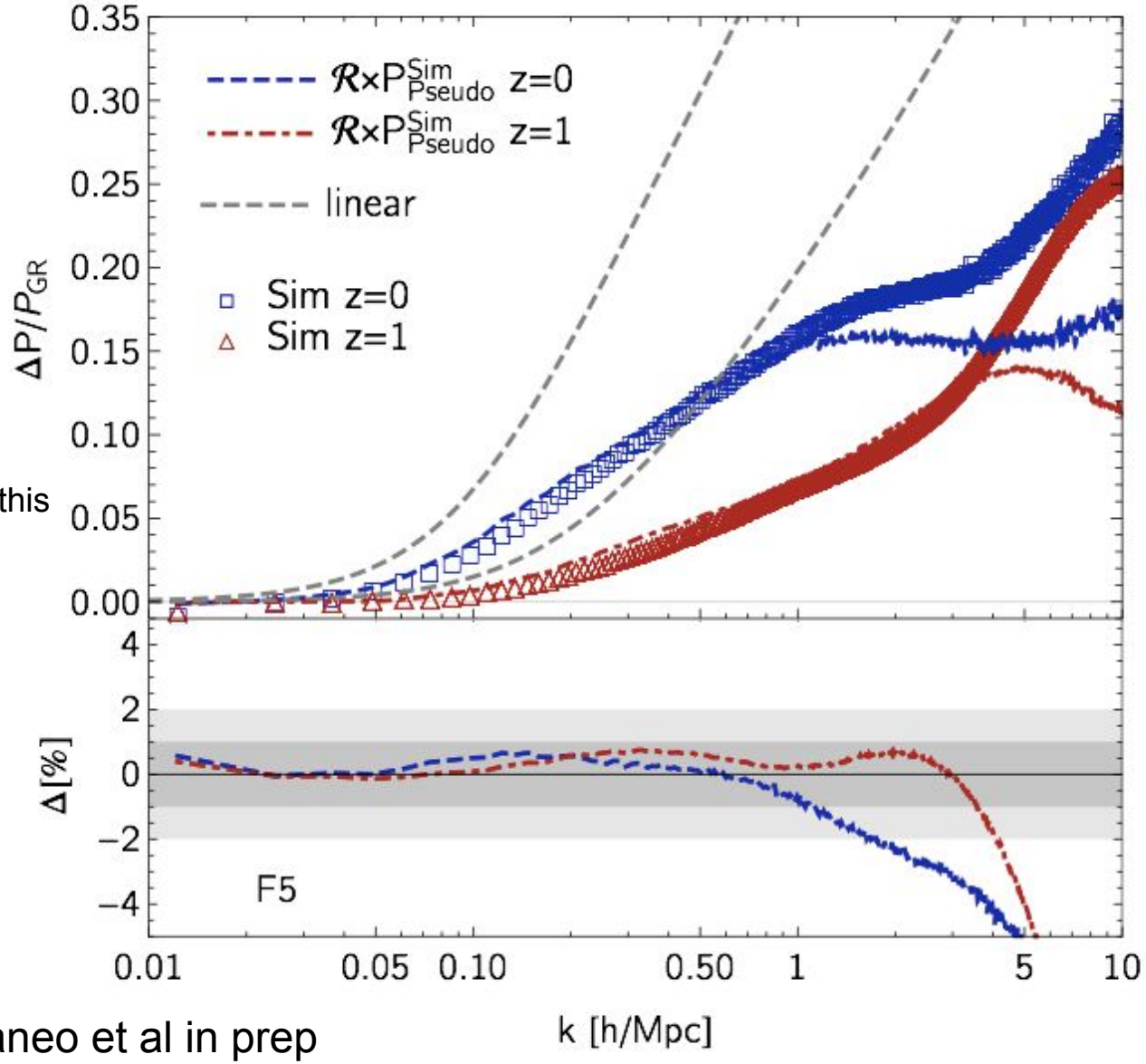
Troxel et al, (2018)

Accurate non-linear power spectra for modified gravity theories



Catherine Heymans

Use the Halo Model to predict the "Response" to a modification in gravity

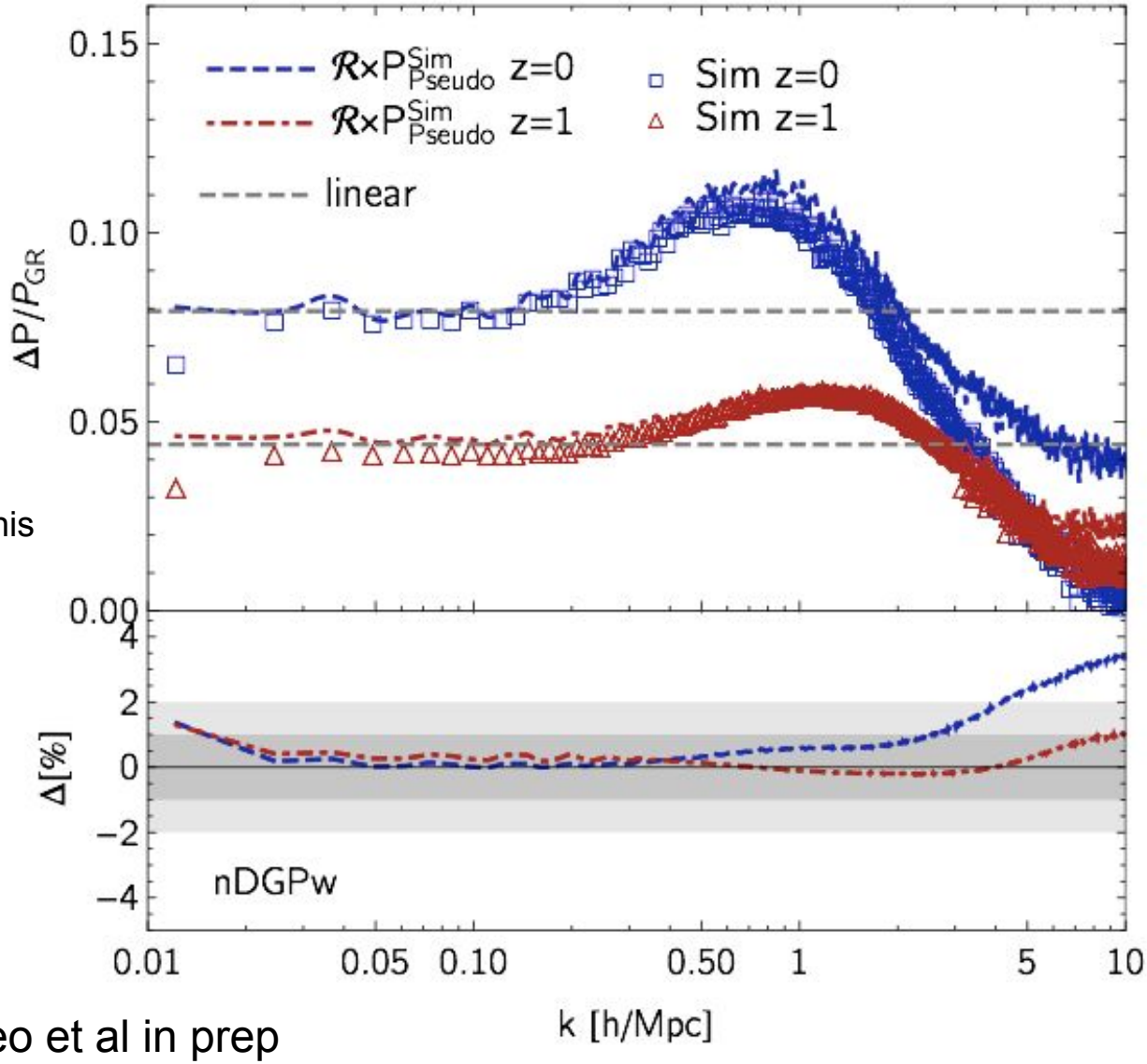


No free parameters - this is not a fit to simulations!

f(R) model (F5)

Cataneo et al in prep

Use the Halo Model to predict the "Response" to a modification in gravity

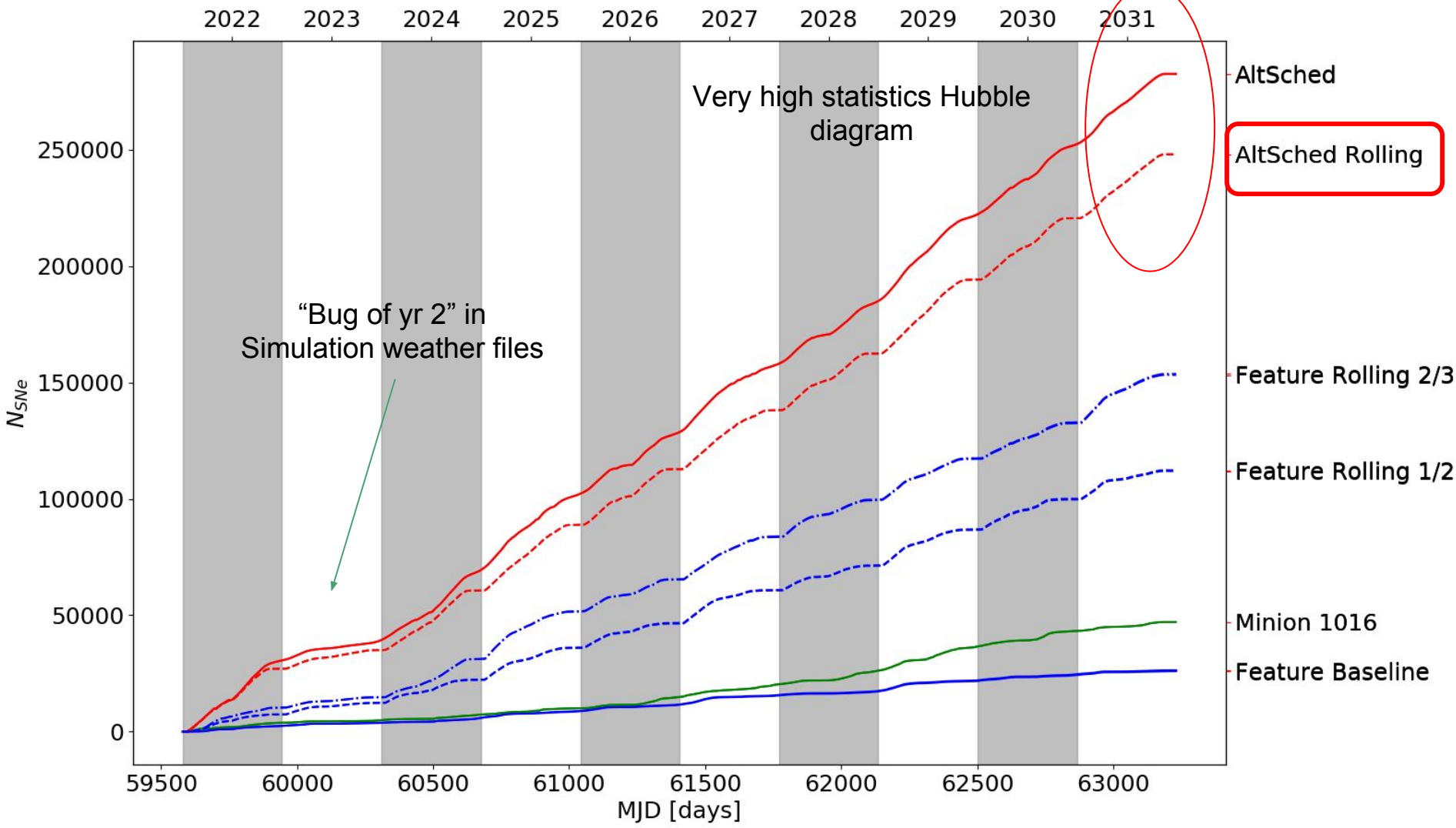


No free parameters - this is not a fit to simulations!

nDGP model with w

Cataneo et al in prep

From SNIa Hubble diagram residuals to LSS

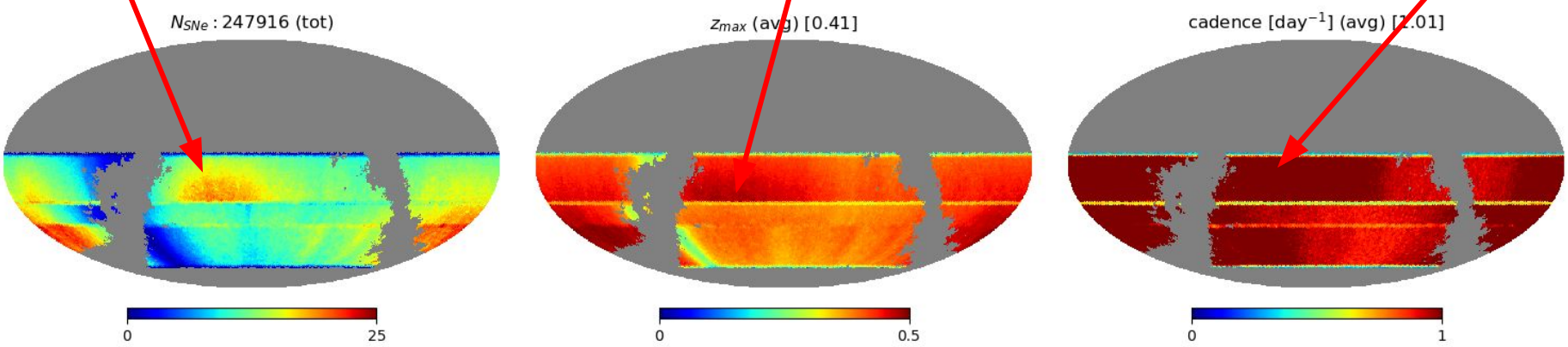


From SNIa Hubble diagram residuals to LSS

> 15 - 25 SNe / deg^2

up to z ~ 0.4-0.5 (WFD)

> 1 visit / day



- High density of SNe Ia on WFD :
  - 15 - 25 SNe / deg^2 (full survey)
- HD residuals are a function of
  - LSS on the line of sight (SN lensing convergence)
  - SN peculiar velocities (w.r.t Hubble flow)

Dominates at high-z

Dominates at low-z

From SNIa Hubble diagram residuals to LSS

- Project: design and forecast paper
  - *Given LSST cadence, how do HD residuals allow us to constrain matter clumpiness and growth of structure ?*
    - with SNe alone
    - in combination with spectroscopic surveys (4MOST ?)
  - *Tweak the cadence to optimize density of high-quality SNe*
  - *Requirements on redshift and distance precision*
  - *High LSST cadence obtained at the price of lower season duration*
    - Follow-up plan to salvage the nearby SNe detected by LSST, but with no LSST follow-up

Les Célébrations

LSST DESC
Dark Energy Science Collaboration

Your Project Title Goes Here

Now that you have discussed your project with your DESC colleagues, what do you plan to work on together in the next 6 months?

- 1 celebration slide per project, please! It doesn't have to be the same speaker as in the publicites - better to spread the load among the team!
- You won't have had time to do much, in the last hour: but any kind of commitment to each other is worth celebrating :-)

… Fabrice's plans (as discussed in front of the poster)

We need to simulate:

- color effect
  - SED (lambda)
  - Atmosphere att. (lambda)
- use of Aux Tel information
- use of GAIA SED information
- PSF-dependent leakage of neighbouring stars
- Outliers and various errors

Then we should:

- compare with data (DES…)
- Test on DC2

HELP HIGHLY DESIRABLE: from undergrad. to senior

Time Delay Measurement of Strongly Lensed SNe Ia with LSST

- *Spectroscopic follow-up*
  - *Coordination between DESC and TIDES, to estimate/optimise the number of fibers to follow-up live LSST SN candidates (see Elisabeth's slide)*
- *New cadence strategies*
  - *SN team (Philippe Gris et al.) plan to optimize cadence specifically for SNe, and share with lensed SNe folks*
  - *Quantify the time delay measurements for lensed SNe (Simon Huber, Sherry Suyu et al.)*

Theory and Joint Probes (TJP) Projects

- *Catherine: put mod grav responses in "Beyond wCDM planning"*
- *Mariana and Cyrille: numCosmo and CCL - cross checks, test TJPCosmo. Avoid duplicating effort*
- *CCL: make speed vs accuracy settings more user-friendly*

Cosmological Simulation for Weak Lensing

Joachim Harnois-Deraps

Discussed with the world experts on N-body (Salman and Katrin)

- *Shared wisdom on Emulators, Gaussian Processors, IC*
- *Many ideas to improve the setup*
- *Combine some results with Mira-Titan*

Discussed with Jonathan Blazek

- *Possibility of using the SLICS with DES as a training for LSST*

PLAsTiCC

Photometric LSST Astronomical Time-series Classification Challenge

Kaggle challenge will be launched in Summer/Autumn 2018

- *Do you or someone you know wish to **prepare** in advance? Start here: https://github.com/ramp-kits/supernovae*
- *Use the opportunity to **engage non-astronomers** in LSST data!*
- *Huge scientific opportunity will come **after** the challenge:*
  - *Infrastructure to test cadences*
  - *Potential for further development of algorithms tailored for LSST (analogous to the 2010 challenge impact)*

"the end of challenge is really the beginning of this project ..." -

Rick Kessler

SN spectroscopic follow-up

TiDES Mock Catalogues:

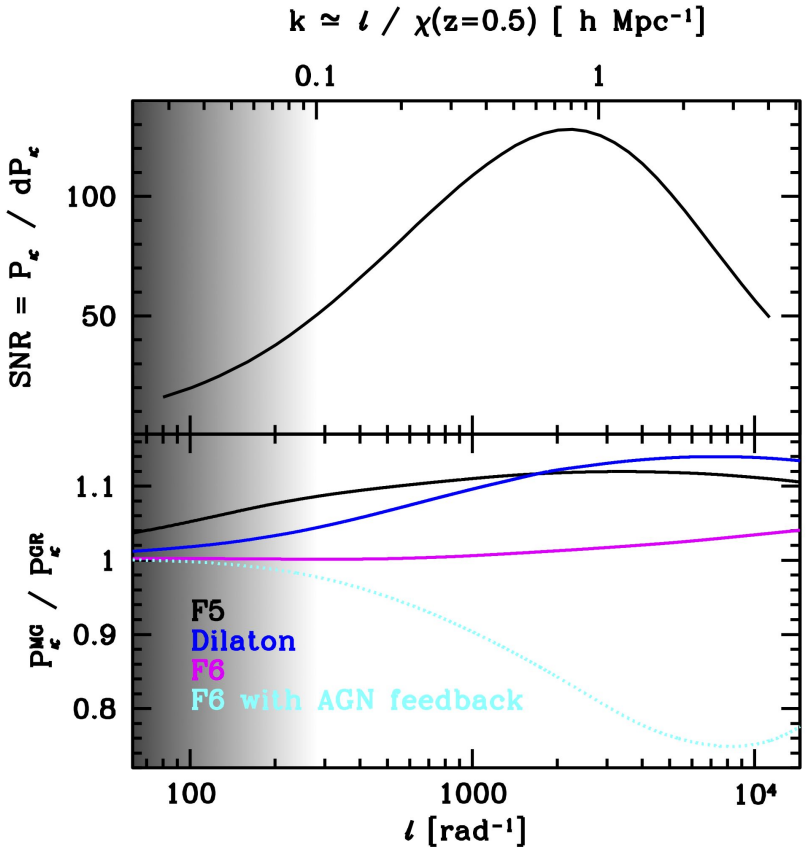
Next phase of upgraded 4MOST simulations: September 2018

Improvements to be made to TiDES mocks: More realistic & varied spectral templates, how do various LSST cadences affect numbers of spectra, better SN selection strategy for follow-up

- Have a European workshop on spectroscopic follow-up w/TiDES?
  - How can we best collaborate with 4MOST
- TiDES members to be part of DESC observing strategy task force
- LSST tests on selection function/cadence etc can inform 4MOST field pointings - make 4MOST follow LSST

Please email me! elizabeth.swann@port.ac.uk
Or Bob Nichol (PI) bob.nichol@port.ac.uk

Accurate non-linear power spectra for modified gravity theories



- 1-2 months: Include Response method in TJP white paper on beyond-Einstein theories?
- 12 months: Build an emulator to give non-linear matter power spectra for modified gravity theories
- 24 months: Include emulator into something like CosmoSIS/TJPCosmo or NumCosmo so we can constrain models

Catherine Heymans

Fin

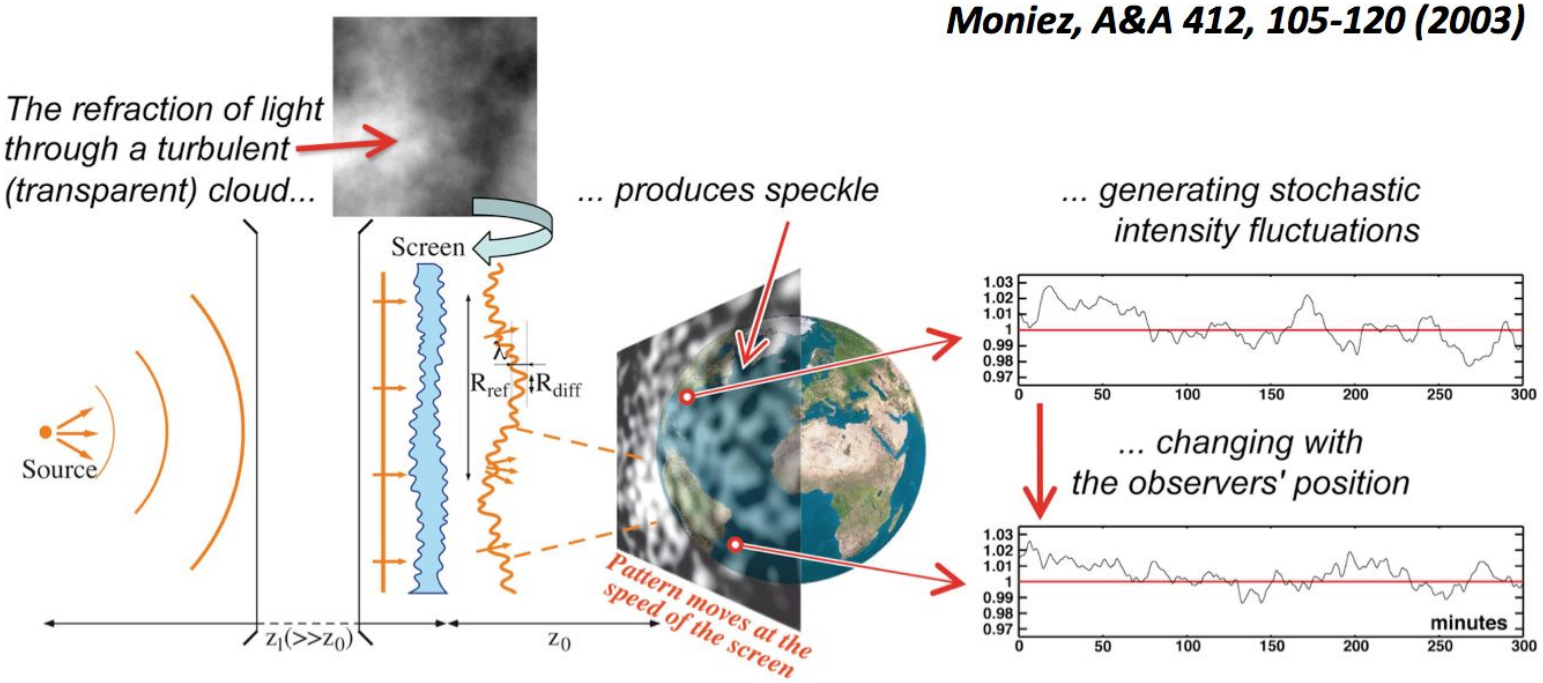
Le Bonus: The Cosmological Problem of the *Missing Matter*

Please see Marc Moniez to discuss more! His three slides make an interesting appendix for DESC scientists to think about.

Search for missing H_2 turbulent galactic gas

through scintillation detection (the OSER project)

Moniez, A&A 412, 105-120 (2003)



Light received by telescope varies with

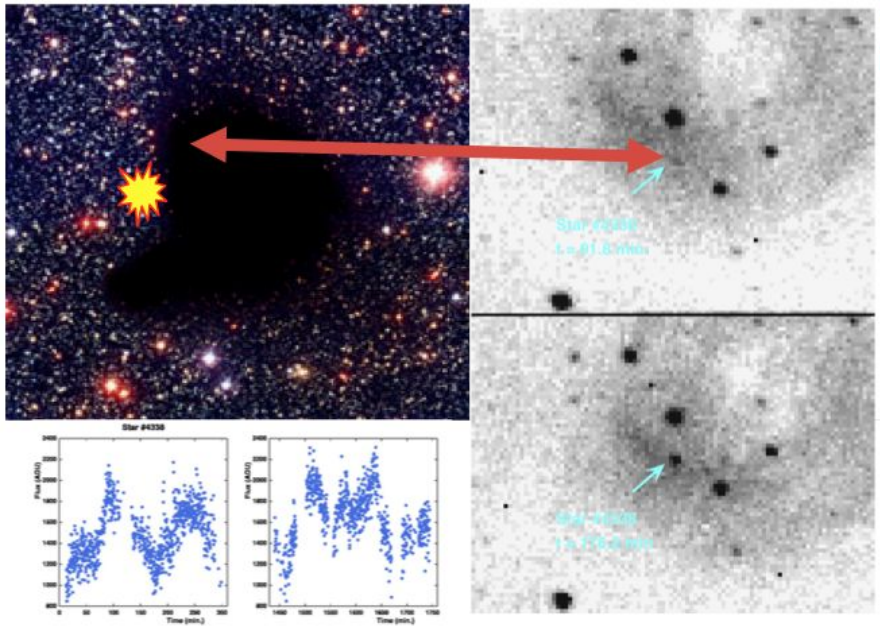
- ***timescale ~10 min*** *(due to the relative velocity of the gas)*
- ***modulation of a few %*** *(depending on distances / turbulence parameters / source extension)*

Results from feasibility studies

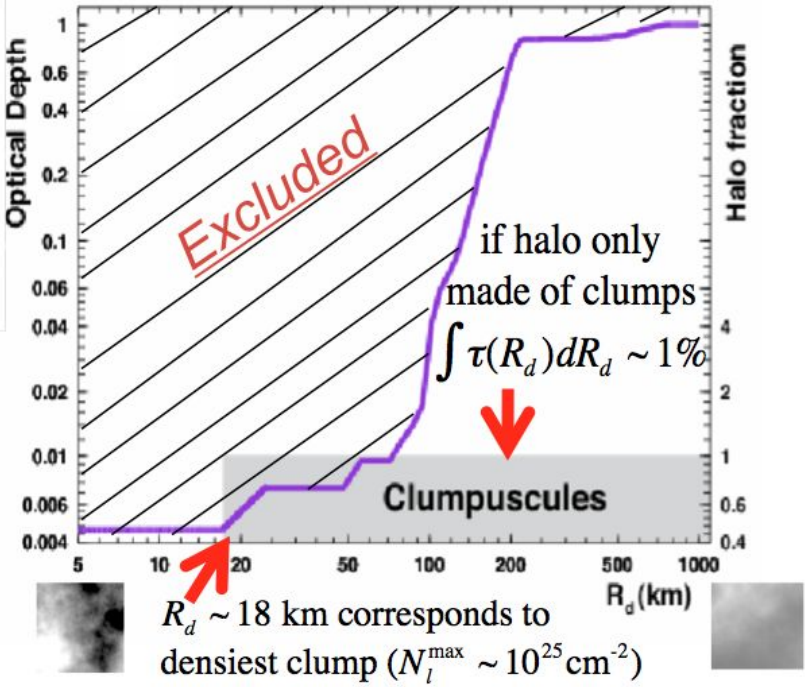
Based on

- Simulation of fractal clouds and the Fresnel diffraction involved
  -> Habibi, Moniez, Ansari, Rahvar, A&A, 552, A93 (2013)
- Test data taken with the 3.6m ESO-NTT telescope
  -> Habibi, Moniez, Ansari, Rahvar, A&A 525, A108 (2011)

A star scintillating through visible gas?



Upper limits on scintillation probability =>
constrain the turbulent gas abundance



A one night movie towards LMC

- **1 night project during commissioning**
- **Take series of 15s of the same field in R for all night in LMC**
- *> Efficient search for interstellar scintillation*
- *> Short time-scale microlensing*
- *> Any short time-scale transient (planetary transits…)*

DESC Meeting Contact Person Policy

For each in-person Large Synoptic Survey Telescope Dark Energy Science Collaboration (DESC) meeting (DESC-sponsored, organized, or funded), two persons are designated as Meeting Contact Persons. Their role is to support compliance with the DESC Meeting Code of Conduct (Meeting CoC) and to take action to resolve harmful situations. In addition, any participant who wishes to discuss a violation of the Meeting CoC can speak in confidence to the Ombudspersons under the DESC Ombudsperson Policy, and/or institute a formal complaint with the DESC Spokesperson or Deputy Spokesperson as outlined in the DESC CoC in the Implementation section. The Meeting Contact Persons are available to meeting participants who are experiencing conflicts or disputes as part of the DESC meeting activities. The Meeting Contact Person will work together with the participants who consult them to identify options for managing and resolving disputes and conflicts. This includes providing advice and support, and taking action as needed to defuse a harmful situation, up to and including requiring the offender to leave the meeting. The Meeting Coordinators will provide nominations for the Meeting Contact Persons to the DESC Collaboration Council at the initiation of the meeting planning. DESC Management and the Collaboration Council will be responsible for ratifying the appointment of the Meeting Contact Persons. The authority to act is afforded to the Meeting Contact Persons by the DESC Management and Collaboration Council and is in place throughout all meeting sessions and activities, including informal gatherings. The Meeting Contact Persons will be full members of DESC who will be present for the duration of the Meeting. They will not be members of DESC Management or the Collaboration Council. They will have a strong understanding of DESC policies, their authority to act as Meeting Contact Persons under these policies, and will report their actions directly to the DESC Spokesperson or Deputy Spokesperson. All Meeting Contact Person decisions are final and not subject to appeal.