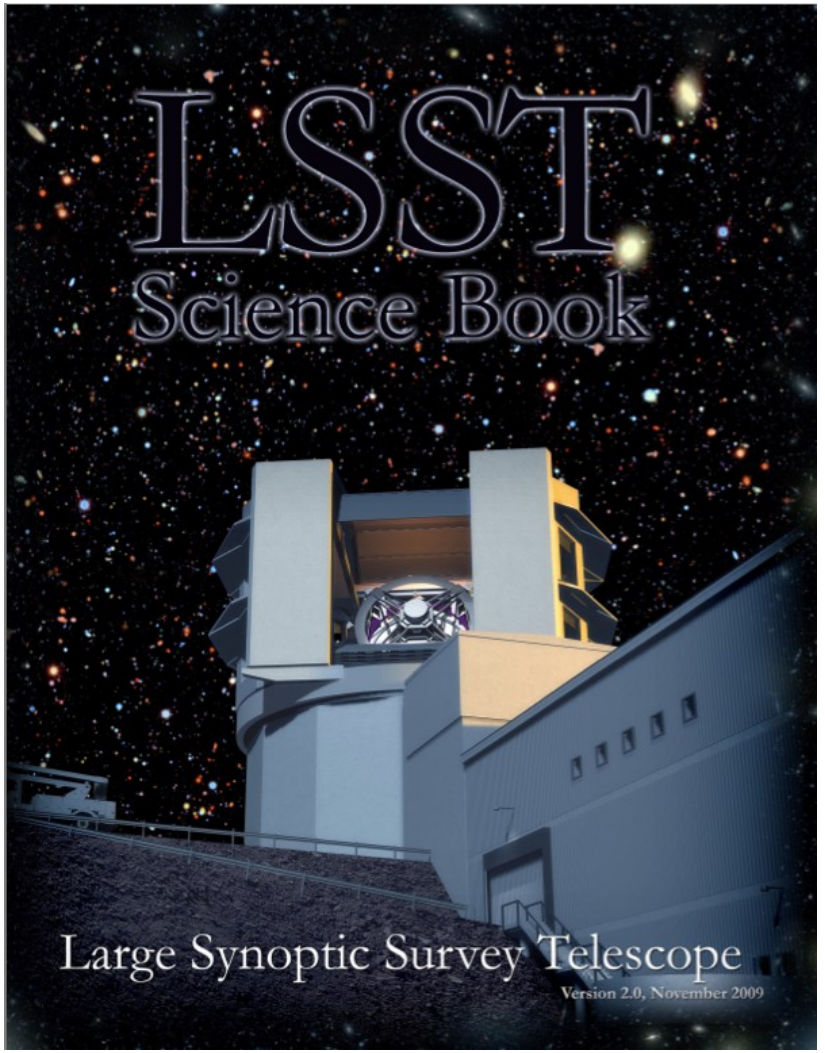
https://confluence.slac.stanford.edu/display/LSSTDESC/Home

The LSST science book

- 4 major themes
  - Dark Energy, Dark matter
  - Mapping Milky Way
  - Transient optical sky
  - Solar system
- 11 science collaborations
  - Weak Lensing
  - BAO
  - Supernovae
  - Strong lensing
  - Galaxies
  - AGN
  - Milky way and the local volume structure
  - Stellar populations
  - Transient/variable stars
  - Solar system
  - Informatics and statistics

LSST DESC Dark Energy Science Collaboration

ArXiv 1211.0310



arXiv:0912.0201

Collaboration Growth

- >420 members, continuing to grow by ~1 member per week
  443 au 1er dec.
  37 chercheurs IN2P3
- 156 full members who have made firm time commitments to the collaboration
  25 « Full members » IN2P3
- Expect influx in the next ~6 months as UK members join.
- DE School helps welcome new members

DESC Membership

- Members :

> **Criterion**
> Applicants who identify work they wish to pursue that is relevant to the DESC will be granted Membership.

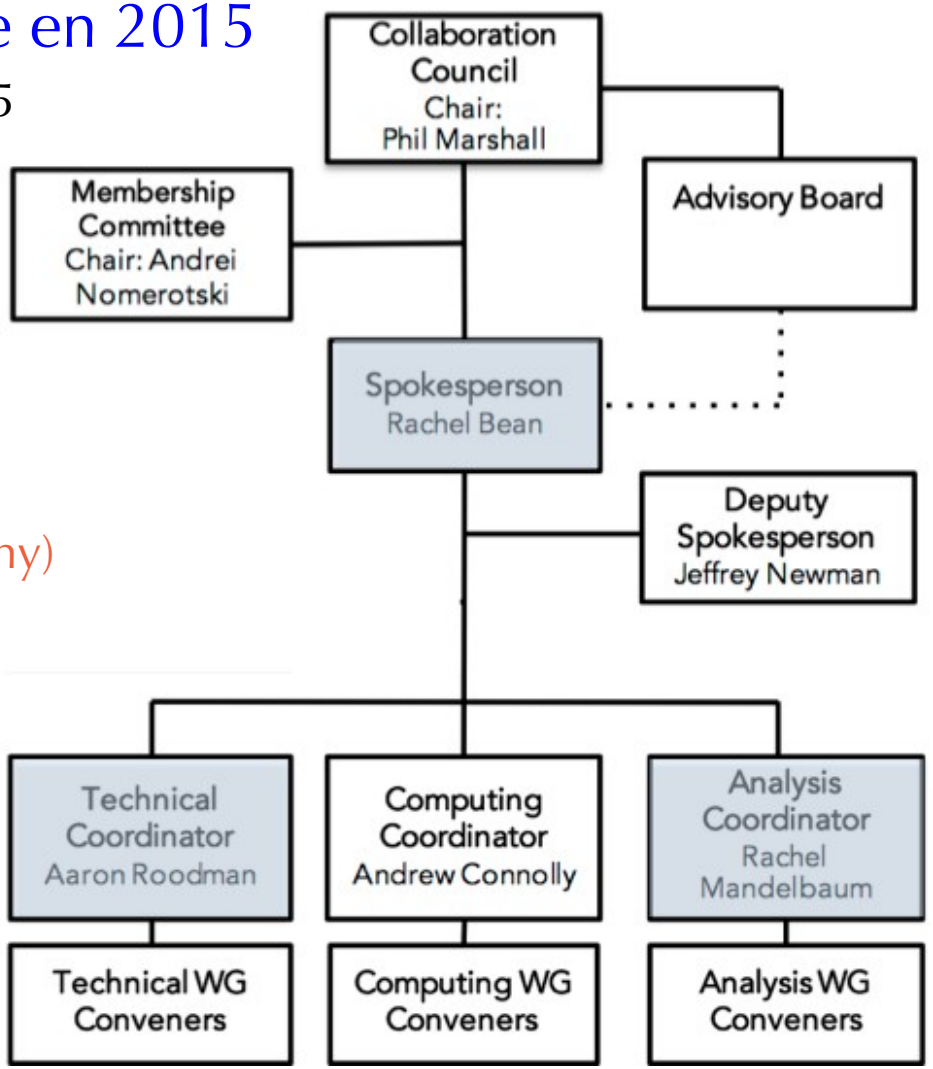
+ Droit d'accès aux données LSST

- Full Members : 3 critères
  - Level of committment relevant to the DESC (« significant fraction of research time »)
  - Demonstrated previous engagement with the DESC
  - Proposed contributions (research-based, LSST-based, management)
  - La plupart des chercheurs IN2P3 ont vocation à devenir « Full Members »

- Liste des chercheurs français sous http://lsst.in2p3.fr/people/
  - **Vérifiez votre statut ;**
  - **Postulez !** (Les jeunes chercheurs sont encouragés à s'inscrire)

Structure de la collaboration

- Changment majeur de gouvernance en 2015
  - **Spokesperson** : prise de fonctions juillet 2015
  - **Collaboration Council** :
    - Organe de décision élu
    - 20 membres (Pierre Antilogus, Dominique Boutigny)
  - **Advisory board** :
    - Rôle consultatif
    - 5 membres nommés (Dominique Boutigny)
  - **Membership committee**
    - Valide le Membership
    - 6 membres nommés (Eric Aubourg)
  - *Publications committee*
    - Propose une politique de publi
    - 7 membres nommés (Nicolas Regnault)
  - *Junior DESC Organisaiton (JuDO)*
    - Non permenents (Job center, mails...)



Changes in Working Group Structure

Analysis Team
Coordinator: Rachel Mandelbaum

Working Group	Conveners
Clusters	Steve Allen Ian Dell'Antonio
Large Scale Structure	Eric Gawiser Anze Slosar
Photometric Redshifts	Ofer Lahav Sam Schmidt
Strong Lensing	Chris Fassnacht Phil Marshall
Supernovae	Saurabh Jha Michael Wood Vasey
Theory/ Joint Probes	Elisabeth Krause Andrew Zentner
Weak Lensing	Joe Zuntz Michael Schneider

Computing and Software Infrastructure Team
Coordinator: Andrew Connolly

Working Group	Conveners
Cosmological Simulations	Katrin Heitman Simon Krughoff
Survey Simulation	John Peterson Chris Walter
Computing Infrastructure	Scott Dodelson Richard Dubois

Technical Team
Coordinator: Aaron Roodman

Working Group	Conveners
Sensor Anomaly	Pierre Astier Andrei Nomerotski
Photometric Calibration	Eli Rykoff Nicolas Regnault

L'IN2P3 est présent dans 5 WG ...et 2 TF

Remarque : la structuration est très réactive / ouverte

Science Road Map (SRM)

https://confluence.slac.stanford.edu/display/LSSTDESC/Science+Roadmap+2015

- Cadre pour les activités DESC
  - Timeline : D'ici au pré-commissionning (2020)
  - But principal : fédérer la collaboration

SRM: Working Group Plans

Key Project:
Significant analysis component

Deliverable :
RQ = requirements
DP = data product
SW = software
VA = validation test
+ delivery timeline

Prereqs: Deliverables needed in advance

Task =~fraction of an FTE activity

DC2 Key Project WL3: Images to shear catalog I

Objective: Develop, in cooperation with LSST DM, a complete pipeline for going from images to a shear catalog, including running a complete suite of null tests on the catalog to check for various systematic errors. This will be used to analyze the PhoSim images and carry out those null tests.

DC2 involves analysis of the DESC-wide **DC2 Mock Lightcone** data set from Key Project **DG5** consisting of roughly 100 deg^2 of PhoSim imaging data with an input galaxy catalog from CatSim. The input catalog will have a limiting depth 2 magnitudes below the LSST Gold …

Deliverable **WL3.1 (01/17) – DC2 RQ:** Set requirements on DC2 simulated datasets

Objective: Refine the area, depth, input catalog, selection of systematic effects, and properties of simulated systematics for the DC2 data set for Key Project DG5. Refinements should be made based on the results of DC1 deliverables in TJPFoRECAST, WLImSim, and WLNull-Test.

Note that these decisions depend in part on which real data set we are working towards. Should we aim only for LSSTComCam data or year 2 or full depth, etc?

Prerequisite Deliverables: WL1.4, WL1.5, SA1.3, SA2.3, **CI6**; overlap with WL2.4, WL2.5, CX5.TJP5, SS2.1

Key Task WL3.1.1 (**01/17**): Determine required size and depth of simulations. This will involve estimating how accurately we will want to be testing the shear null tests, how many galaxies we will need to achieve this level of precision, what kind of tomography is required. These requirements should then be tranlated into size and depth requirements.

Bean & Newman: October 2015 Collaboration Meeting Argonne

Soft L3 en construction !

Approche collaborative encouragée

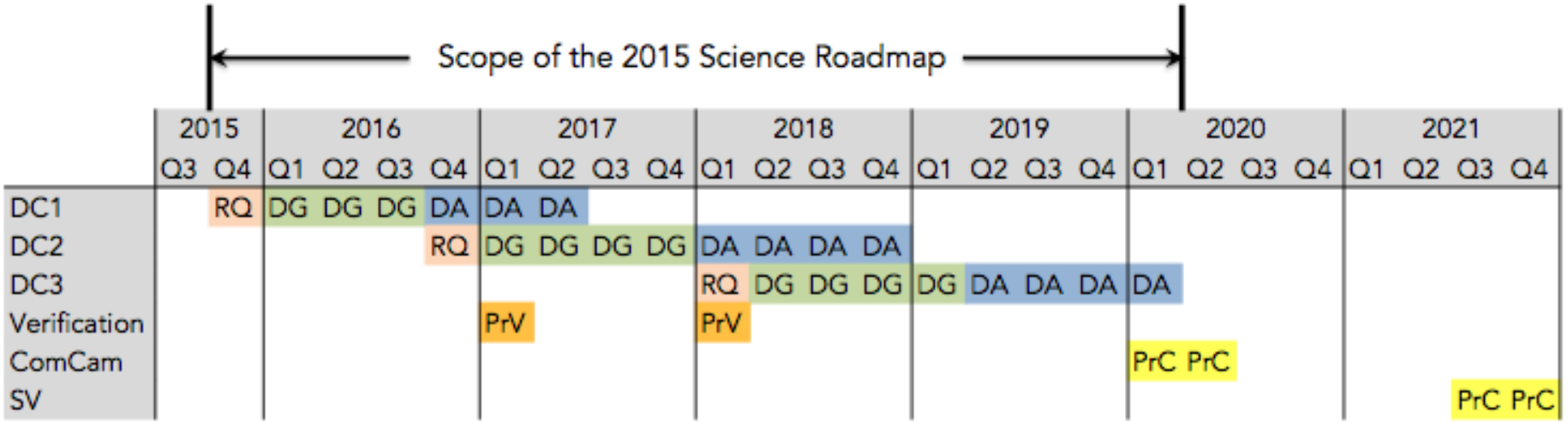
SRM: Pre-Commissioning Data Challenges

- Incremental approach to pipeline creation and validation
- Three successive Data Challenges (DC1, DC2 and DC3)
  - **Simulated datasets** main focus, provide a controlled environment to:
    - assess, study, and validate the required fidelity of survey simulation tools,
    - produce the simulated data sets,
    - utilize the datasets to validate codes and isolate specific systematic effects.

    → *Centré sur l'activité de simulation*
  - **Precursor datasets** will also be utilized:
    - anticipate these will be available on comparable timescales to the DCs.
    - Provide test beds to develop, refine and validate the pipeline tools.
    - Build interface with the Project using their Verification Datasets
    - Determine if the DM Level 2 data products meet DESC needs.

    → *Cadre pour reprocessing CFHT … et projets intermédiaires*
  - **Provide feedback to the Project:**
    - On survey strategy and early operations (Eric Gawiser's talk)
    - User feedback on DM products and tools

SRM: Timeline



RQ	Data Challenge: Simulation Requirements
DG	Data Challenge: Simulated Data Generation
DA	Data Challenge: Data Analysis
PrV	LSST Project Verification Datasets: Anticipated Availability of DM-Processed External Precursor Products
PrC	LSST Project Commissioning Data Products: Anticipated Availability of ComCam & Science Verification (SV) Data

SRM: Common DC Datasets

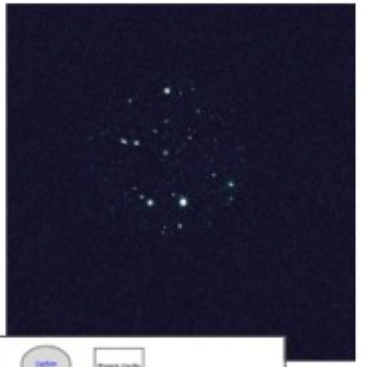
- Aim is to meet needs of multiple WGs with a minimal number of datasets

Table 3.1.1: DC data sets with image data by challenge and working group.

DC	WGs	Name	Input	Catalog area	Cadence[a]	Image Area	Bands	Depth
DC1	CL/LSS	HaloCat	N-body		N/A	N/A	N/A	N/A
DC1	SL/SN	Twinkles 1	CatSim (T)[b]	100 sq arcmin	DDF 10 yr	100 sq arcmin	ri	r=27.0
DC1	LSS/WL	DC1 Phosim Deep	CatSim	80 sq deg	WFD 10 yr	80 sq deg	r	r=28.0
DC2	SL/SN	Twinkles 2	CatSim (T)[b]	100 sq arcmin	DDF 10 yr	100 sq arcmin	ugrizy	i=24.0
DC2	SL/WL/LSS CWG/CL/PZ TJP	DC2 Mock Lightcone	CatSim (N)[c]	300 sq deg	WFD 10 yr	100 sq deg	ugrizy	r=27.5
DC3	WL/LSS CL/PZ/TJP CWG	DC3 Mock Lightcone	CatSim (NN)[c]	18000 sq deg[d]	WFD 10 yr	3000 sq deg	ugrizy	r=27.5
DC3	SL/WL/LSS	DC3 Mock ComCam Survey	CatSim (NN)[c]	1000 sq deg	WFD 6 month	1000 sq deg	ugrizy	r=27.5

Notes: [a] Refers to the observing plan in the OpSim databases. DDF = Deep Drilling Field, WFD = Wide-Fast-Deep. [b] The (T) refers to twinkles modifications to CatSim. Time dependent SEDs and spatially oversampled sources will be made avaliable. [c] (N) refers to a new cosmological model input. (NN) refers to multiple input cosmological models. [d] The size and resolution of the input cosmological simulation will be defined based on the results from DC2 and the catalog will be generated from a set of realizations rather than a single volume to reduce computational costs.

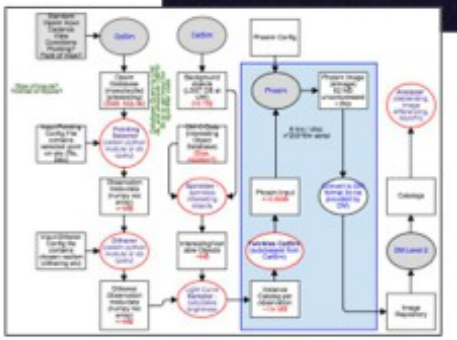
Twinkles



Tiny (~100 sq arcmin) simulated synoptic survey

Realistic observing strategy (*ugrizy*, 10 years)

Field overloaded with SNe and time delay lenses



SN/SL: *Testing ground for DM algorithms*

- light curve extraction
- object detection and initial characterisation

SS/CI: *Pathfinder for large scale DC image simulation*

- CatSim/OpSim/PhoSim then DM Stack + Workflow

People: Dubois, Wood-Vasey, Marshall, Krughoff, Walter,
++ *Dominique Fouchez*

Join in:DESC GitHub: Twinkles/issues

Twinkles vs CFHT Reprocessing

- **Differences :**
  - **data : Simulations (Twinkles) vs "real" data (CFHT)**
  - Light-curve oriented (Twinkles) vs. Multipurpose-oriented (CFHT)
  - **CFHT effort leaded by the french community**

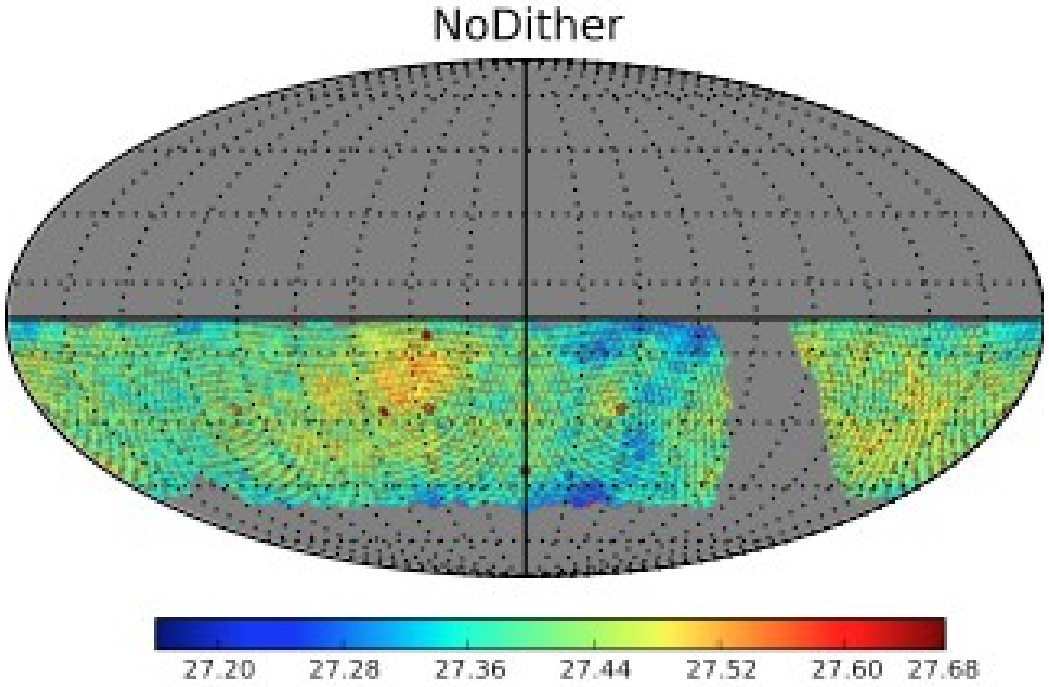
- **Common points :**
  - **same goals :** Be ready for LSST data science analysis
  - **same tools :**
    - **DM stack L2 for image processing (deblending, forced photometry, image subtraction)**
    - **DM stack L3 :** Software built on L2 DM products

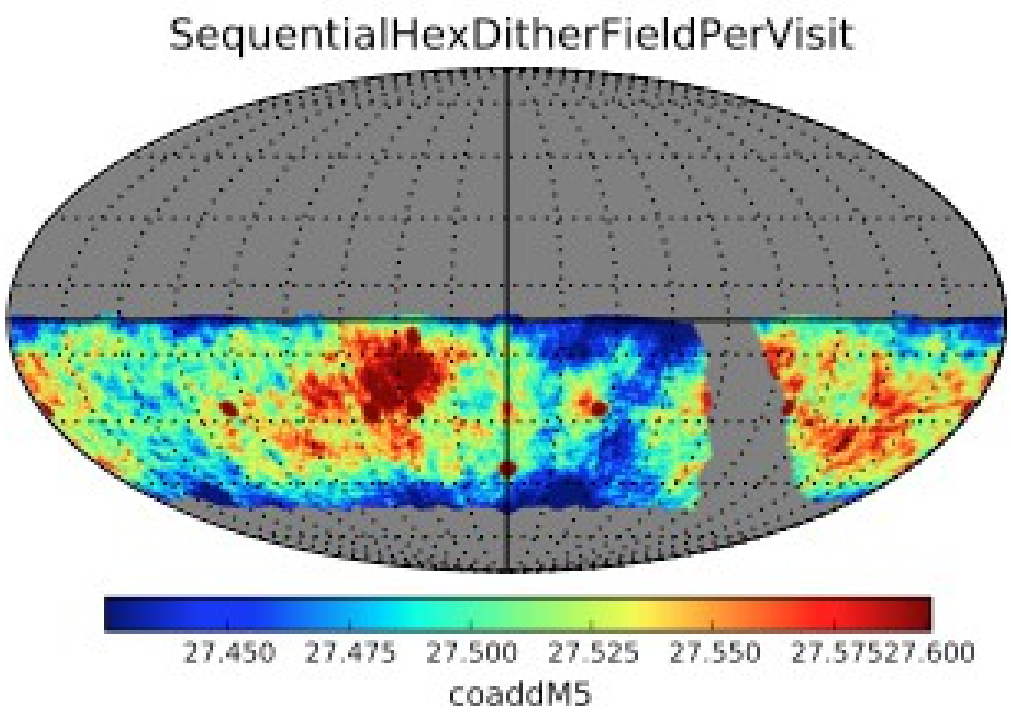
Argonne meeting (27-29 octobre)

- 2 meeting / an
  - Prochains : SLAC 7-11 mars
  - Oxford 18-22 juillet
  - Sur 5 jours :
    - 1er jour DE school
    - 2ème-4ème : meeting
    - 5ème jour : hackaton
- ANL
  - 24 sessions parallèles !
  - 15 français
    - (Photometric calibration, CHFTLS Repro, SAWG, SN, CL, photo-z)

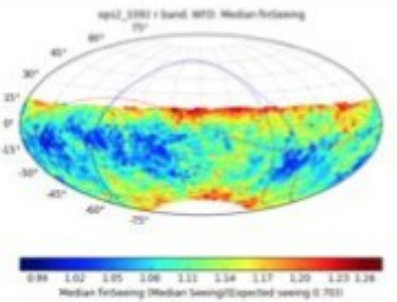
Plenary sessions

- Quelques talks à considérer … (liste tout à fait non exhaustive !)
  - Eric Gawiser : LSST Survey Strategy
    - La stratégie de LSST n'est pas figée
    - Explorer de nouvelles stratégies fait partie des tâches de DESC
      (Cadence pour les SN ; window function pour les BAO)





Survey Strategy



Your probe's accuracy depends on survey strategy: dithering, cadence, filters, depth, ...

The survey strategy is Not Yet Decided.

We can influence the LSST survey strategy, *via quantitative analysis of suitable simulations.*

Cadence diplomacy has begun: we are helping write a community white paper.

Science Driven Optimization of the LSST Observing Strategy

Contact: Eric Gawiser & Phil Marshall

Plenary sessions

- Quelques talks à considérer … (liste tout à fait non exhaustive !)
  - Eric Gawiser : LSST Survey Strategy
  - Andy Conolly, Rachel Mandelbaum, Aaron Rodman :
    Computing, Analysis and Technical group SRM plans
  - Various : Summary of active DESC task forces
    - ~ 1-2 slide / groupe de travail déclinant la roadmap sur 1 à 3 ans

  - Remarque :
    - Les têtes de chapitres et les tâches sont pertinentes
      - fournit un cadre pour joindre l'effort
    - Tout ne sera pas prêt dans 3 ans...

Working groups Roadmap

- Weak Lensing
  - DC1 : Requirements on shear estimates, systematic error framework
  - DC2 : *Deblending*
  - DC3 : Images to catalogs, Catalogs to science, simulations,

    observing strategy
- Large Scale Structure
  - DC2 : *Deblending*
  - DC3 : Power spectrum software, sample definition, cosmology,

    Observing strategy, deep drilling fields
- Galaxy clusters
  - DC1 : Cluster finding
  - DC2 : Mass calibration, *Deblending*
  - DC3 : Cosmology contraint, test on simulated and precursor data,

    Deep drilling fields

Working groups Roadmap

- Strong Lensing
  - DC2 : Strong lens identificaiton, lens environment, *light curve extraction*
  - DC3 : Time delay challenge, end-to-end test
- Supernovae
  - DC1 : SN simulation tools,
  - DC2 : Survey strategy, *light-curve extraction, photometric calibration*
  - DC3 : Distance improvement, cosmology from photometric SN, *instrumental effects*

Working groups Roadmap

- Theory/Joint Probes
  - DC1 : Forcasting framework, *joint probes likelihood software, systematics mitigation*
  - DC2 : *covariances, blinding*
  - DC3 : Physics beyond wCDM, joint analysis of precursor data, synergy with external data, *joint probes integration*
- Photometric redshifts
  - DC2 : Mock data sets, p(z), incompleteness, *Deblending*
  - DC3 : photo-z and cross-correlation infrastructure, spec-z training sets, *Multiwavelength (NIR)*

Cross-Linking section

Cross-Linking Key Projects:

DC1, DC2, & DC3 Key Project **CX1**: Deblending

DC1 Key Project **CX2**: Supernova and Strong Lens Light Curves: Initial Extraction

DC1 & DC2 Key Project **CX3**: Survey masks

DC1 Key Project **CX4**: Concept Study for TJPCosmo

DC1 Key Project **CX5**: Impact and Mitigation of Key Astrophysical Systematics

DC2 Key Project **CX6**: Cosmological Analysis Pipeline for LSST Precursor Data Sets

DC2 Key Project **CX7**: Improved Multi-Probe Data Covariances

DC2 Key Project **CX8**: Blinding Strategy for Cosmology Analysis

DC3 Key Project **CX9**: TJPCosmo: Pipeline Integration

DC2 Key Project **CX10**: Supernova and Strong Lens Light Curves: Final Photometry

DC1, DC2 & DC3 Key Project **CX11**: Systematics Caused by the LSST Observing Strategy

DC2 & DC3 Key Project **CX12**: Using Deep Drilling Fields to Reduce Dark Energy Systematics

DC2 & DC3 Key Project **CX13**: Photometric Calibration Systematics

Computing and Infrastructure (CI)

→ *en construction !*

- Computing model
  - What is needed from our computing resources, where should they be housed, what service level do we need leading through 2nd year of operations (should we be at a lab, the cloud, or a data center)
  - Report back by the end of January (chair: Richard Dubois)
- Software environment
  - How do we write our code (languages, development tools like github, continuous integration, test driven development, teaching these tools)
  - Integrating DM, qserv, workflows, astropy … into a framework
  - Report before next collab meeting (chair: Phil Marshall)
- Start generating software tools and framework
  - Twinkles 1.0 end-to-end simulations and processing (data generation)
  - TJPCosmo framework (CX4) likelihood analysis (derived products analysis)
  - Mask generation (selection functions, integrated tightly with DM)

Computing and Infrastructure (CI)

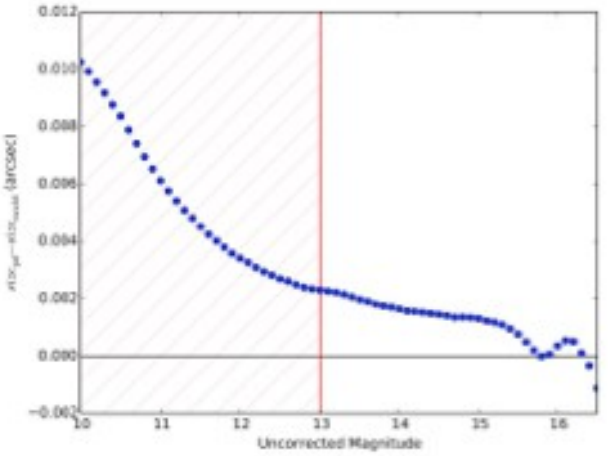
Meeting the Challenge: DESC Operations Support

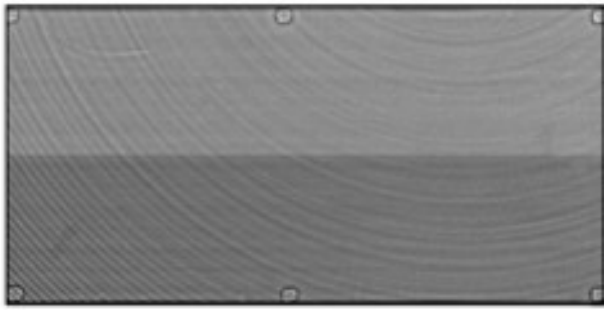
Computing Hardware and Storage	Operations Support Team		Working Groups
	Infrastructure Support	Pipeline Support	
	• **Code development infrastructure** (repository management, package management, automated builds and QA, and code distribution). • **Expertise on High Performance Computing:** support for running efficiently at NERSC, on the grid, and on collaboration clusters. • **Architecture for the DESC analysis framework:** framework design and coordination • **Advanced data product management:** enable optimized queries of databases. • **Provision of DESC community infrastructure:** e.g. wiki, mailing lists, account support, website	• **DESC-Project DM interface:** ensure level 3 codes build effectively on and interface with the LSST Data Management (DM) system. • **"Level 3" code performance:** enable at-scale algorithm, code and data product/catalog development, employing software engineering best practices. • **At-scale pipeline support:** help coordinate and carry out a rigorous simulation and analysis pipeline testing program via the Data Challenges. • **Pipeline Integration:** ensure that DESC pipeline software fit, together using the framework, to form a coherent whole, to fully leveraged the complementary dark energy probes.	

sis)

Sensor Anomaly W.G.

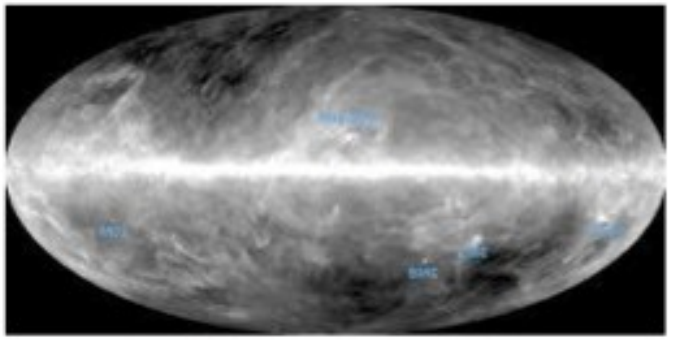
- *Brighter-Fatter*
  - physical sensor model
  - needed fidelity of the model
  - validation of simulations & correction
- Static Sensor Effects
  - characterization
  - needed fidelity
  - validation of simulations & correction
- LSST prototype CCD on sky
  - reduce & apply above corrections
- Study CCD parameter space
  - optimize noise, x-talk, CTE etc..





Photometric Calibration WG

- new WG -
- Photometric precision vs. time, RA+dec, wavelength
  - analytic models for variation
  - bias on probes
  - impact of observing strategy on systematics
- Galactic Extinction
  - required precision
  - study additional multi-wavelength data & compare with stellar locus methods
  - improve modelling



Task Forces

CFHTLS & DLS Reprocessing

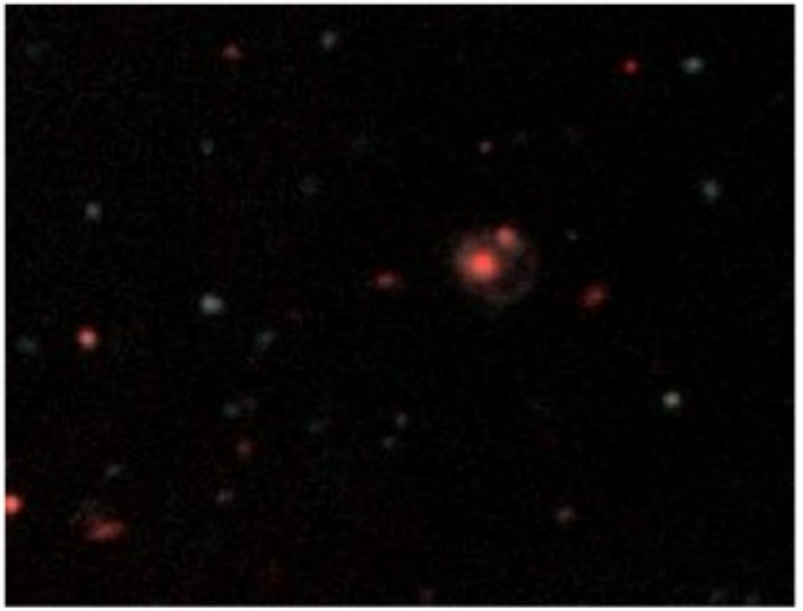
- Provide good quality datasets to WG - SRM KP
  - test-bench for algorithms / pipelines
- Develop synergies between DESC & LSST DM
- Gain expertize on the DM framework
- Understand how to develop L3 code in DM framework
- Wherever possible, re-analyze data and publish improved results

Focus on CFHTLS data first

Include DLS as soon as a camera model is available in DM

→ 1 deep and 1 wide CFHTLS field

Contact : Dominique Boutigny



Impact of the atmospheric absorption on photo-Z

- Use diversity of the atmospheric conditions as a source of spectral info -> Photo-z
- First results: effective Y colour variations of galaxies ~0.1mag, significant up to z~1
- Generate realistic sky situations
  - Can be generalized to any type of instantaneous passband variations (CCD-eff., filter transmission…)
- Strongly connected with PC task

People : M. Moniez, G. Blanc, S. Dagoret-Campagne, K. Gilmore, E. Nuss

Realistic SEDs for photo-z

- Build on top of cosmological galaxy simulations
- Tweak systematics by turning different effects on/off
- Fast generation of realistic galaxy observations/multiple large catalogs -> p(z) testbed

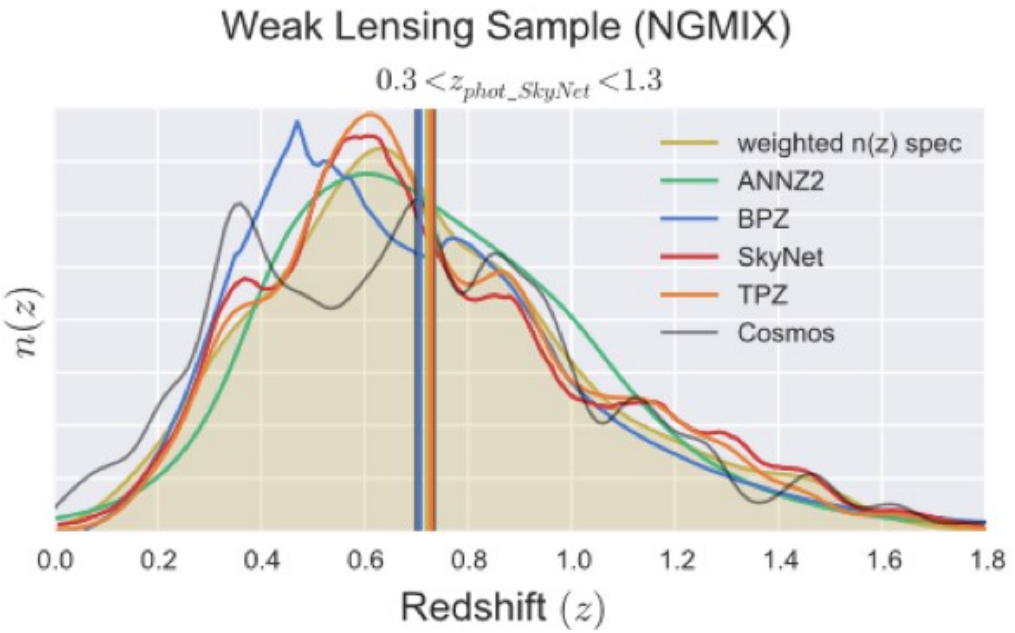
Key Tasks

1. Define a continuous parametrisation of SEDs
2. Design method of mapping SED parameters onto (cosmo-sim) simulated photometry and physical parameters
3. Add (bright) emission lines

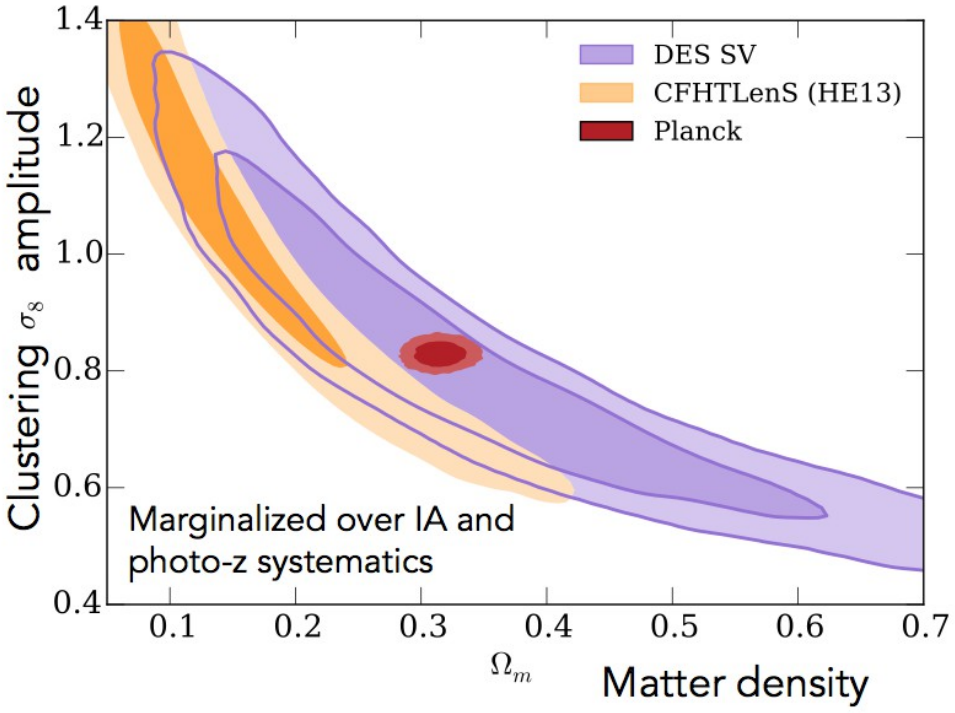
Contact: Abate, Schmidt

Plenary sessions

- Quelques talks à considérer … (liste tout à fait non exhaustive !)
  - Eric Gawiser : LSST Survey Strategy
  - Andy Conolly, Rachel Mandelbaum, Aaron Rodman :
    - Computing, Analysis and Technical group SRM plans
  - Various : Summary of active DESC task forces
    - ~ 1 slide / groupe déclinant la roadmap sur 1 à 3 ans
  - Josh Frieman : DES science verification results, and lessons learned for DESC



Incertitude dz<0.05 sur les photo-bins



Some Lessons Learned

- Early data multiply useful: testbed for DM, for camera +telescope, for analysis pipelines. You won't be ready after the last Data Challenge. Energizes the collaboration.
- Multiple analysis tools (shear pipelines, photo-z, C_l, $w(\theta)$,…) needed to distinguish data systematics from method systematics. How to compare & choose? DOE will want a single DE result.
- Tight coupling of WGs to data is vital: e.g., tree rings, brighter-fatter, calibration, astrometry, masks, star/galaxy separation,…This will be even more important for deeper LSST. Structural impediments to overcome (DES collaboration+project are one).
- Value-added catalogs to turn DM outputs into science require dedicated people within the collaboration.

More Lessons Learned

- Get collaboration eyes on the data early: e.g., DES exposure checker, SV eyeball squad.
- Survey strategy and data quality: will not initially be what's promised but could be close. Strategy will likely evolve, and it will be important to have informed science input to trade decisions.
- Sometimes the weather really sucks (El Nino).
- Photo-z is still not a solved problem and will get harder as go deeper. With luck, it will progress at the rate needed (Cf. SN systematics), but may require additional resources.
- Data management is always harder and takes longer than you think. Again, tight coupling of scientists into DM is needed. What's in vs. outside DM may evolve.

Quelques remarques finales

- **DESC a fait sa « révolution » sur la science**
  - c'est le moment pour se structurer de notre côté
- **Nous sommes très présents sur certains sujets**
  - Mais nous sommes peu nombreux dans la collab.
    - identifier les sujets stratégiques
    - éviter la dispersion ;
- **Utiliser les données précurseur fait sens !**
  - C'est le sens des projets intermédiaires

    … Mais sans oublier notre présence dans les WG de DESC

    - *Objectif de la session science*