



The DC2* Simulated Sky Survey

Thursday, May 25, 2021

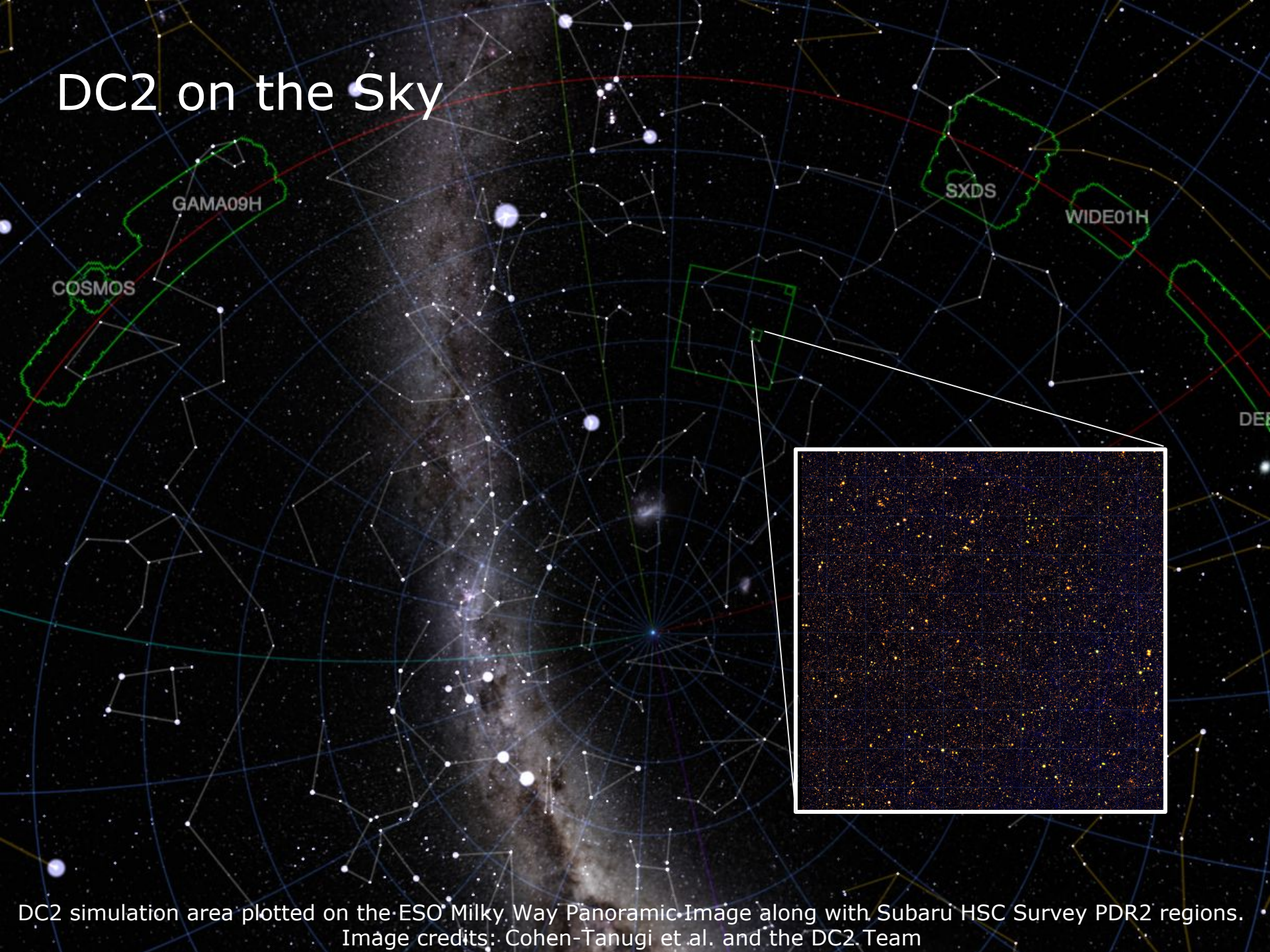
Katrin Heitmann - For the LSST Dark Energy Science Collaboration

IVOA May 26, 2021, Interoperability Meeting



* DC2: Data Challenge 2

DC2 on the Sky



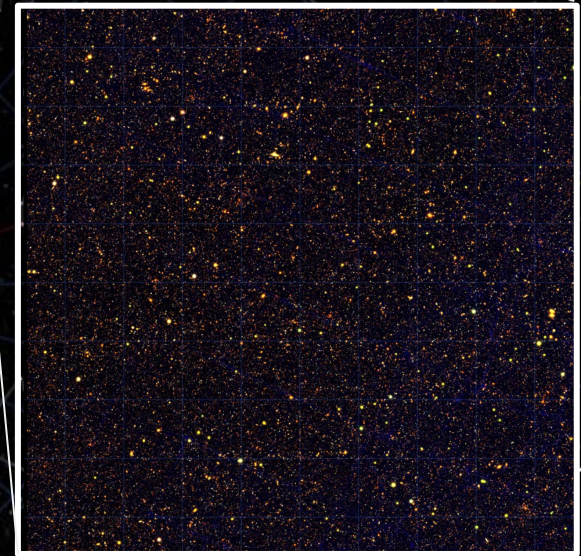
DC2 simulation area plotted on the ESO Milky Way Panoramic Image along with Subaru HSC Survey PDR2 regions.
Image credits: Cohen-Tanugi et al. and the DC2 Team

DC2 on the Sky

LSST-like simulated data in *ugrizy* with both Wide Fast Deep (WFD, 300 deg²) and Deep Drilling Field (DDF, 1 deg²) cadences over five years of LSST. An inspiring modeling and computational challenge!

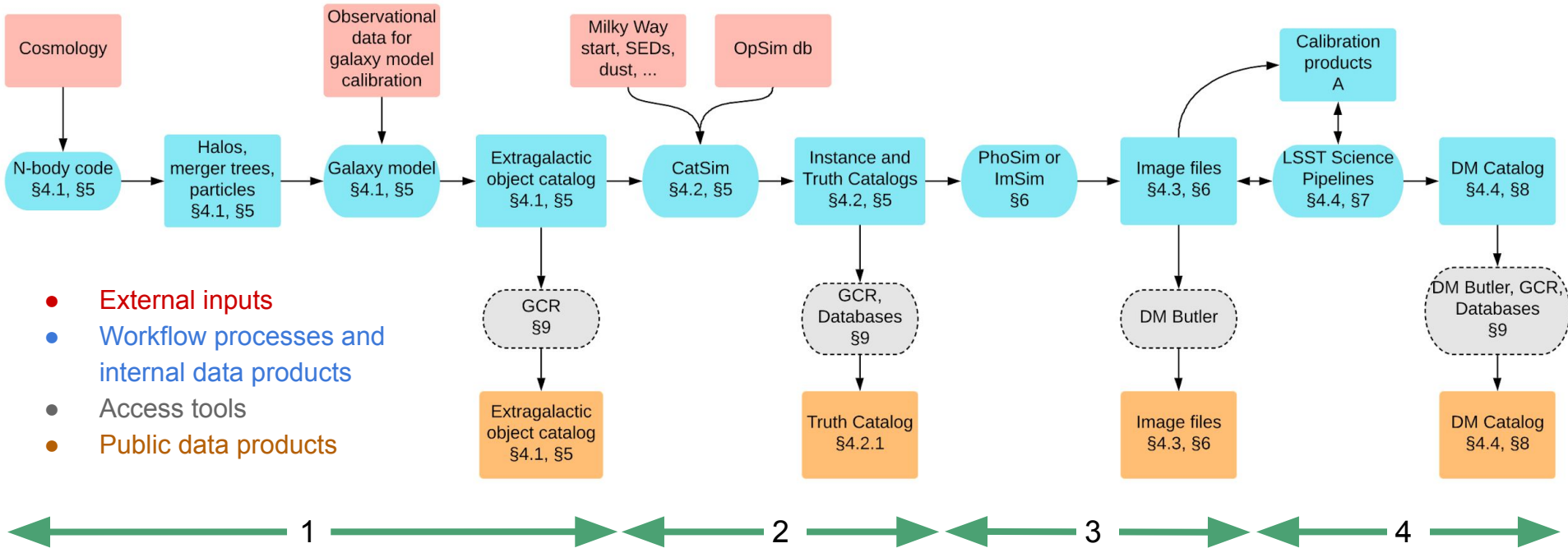
Goals for DC2:

1. Realistic testbed for LSST Science Pipelines
2. Simulated data to aid validation of DESC analysis pipelines
3. Investigation of systematics and how Science Pipelines handle them
4. Exploration of new scientific ideas in static and time-domain cosmology using large N-body simulation (Outer Rim, Heitmann+19) with predicted shear and realistic galaxy models (CosmoDC2, Korytov+19) and image simulations (LSST DESC 21)



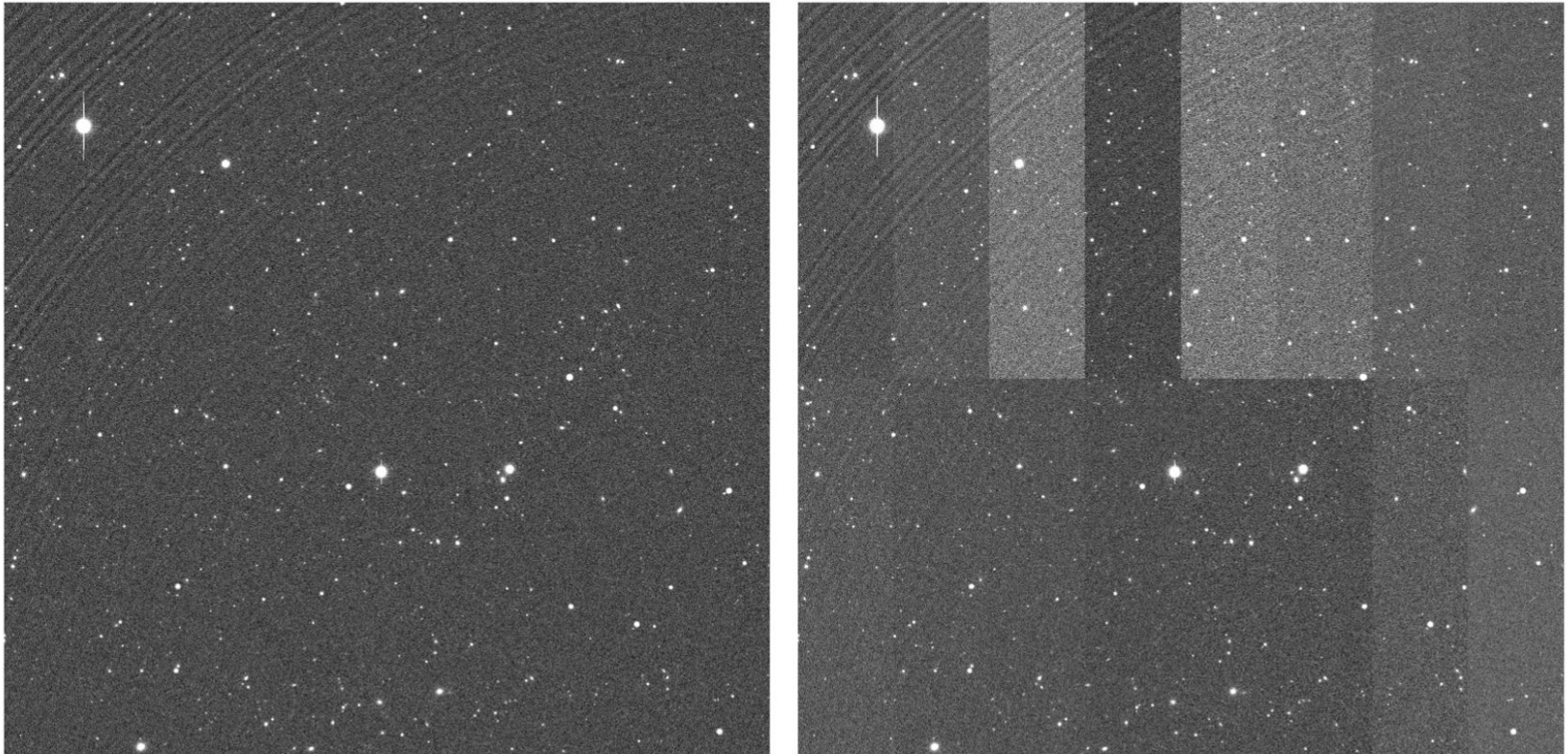


DC2 End-to-End Workflow



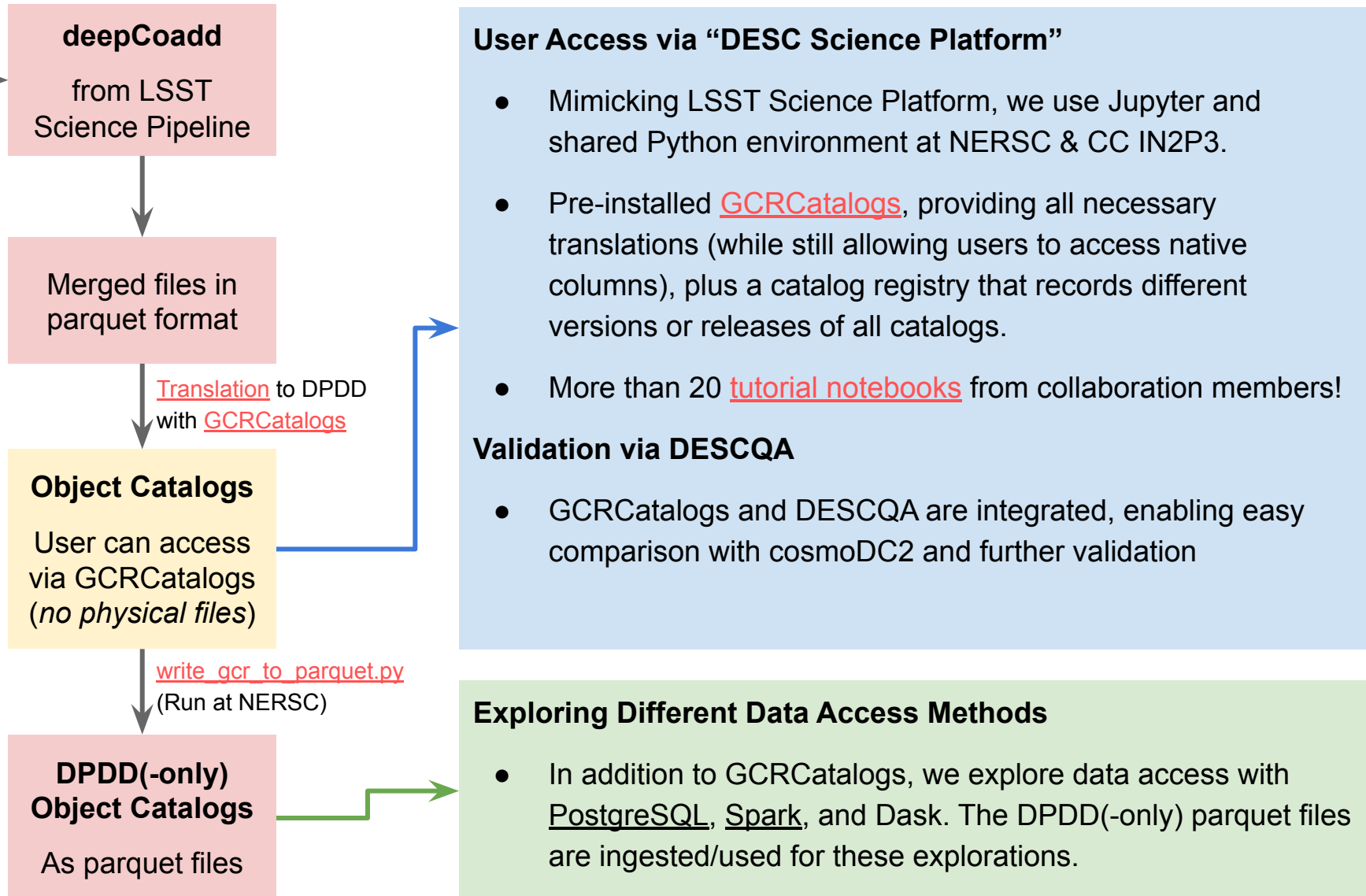
1. Extragalactic Catalog Generation
2. Instance and Truth Catalog Generation
3. Image Simulations
4. Image Processing

Output of the Image Simulation



Left: An "e-image" of a typical DC2 region in i-band for a single CCD on the LSSTCam focal plane. Tree ring sensor effects and saturation bleed trails are clearly visible.
Right: A mosaic of the data after simulating the electronics readout. Different amplifiers are evident because each region has a separate mapping of pixel to grayscale value.

Data Release Data Product & Access



LSSTDESC Data Portal



- Public release of DC2 object catalog and extragalactic catalog via webportal located at NERSC with mirror at Argonne (<https://lsstdesc-portal.nersc.gov/0>)
- Portal allows for easy selection of data and then transfer via Globus
- Extensive documentation, reader (GCR), example jupyter notebooks

LSSTDESC Data Portal

LSST Dark Energy Science Collaboration Public Data Access



Welcome to the [LSSTDESC](#) Data Portal

You have logged into Globus. You may click [Transfer](#) in the top menu to browse and download data.

See the "Getting Started" section below for detailed instructions.

Getting Started

Start by downloading data files from the Portal. Note that the complete

Documentation

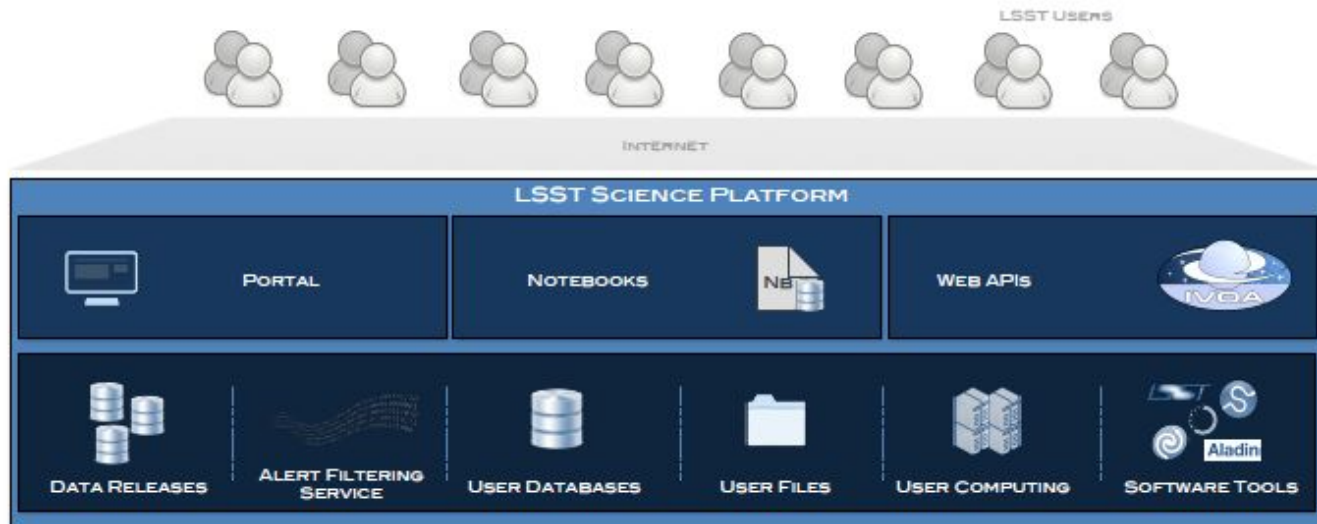
General Instructions

- Download data files

Rubin's Pre-Operations Data Previews

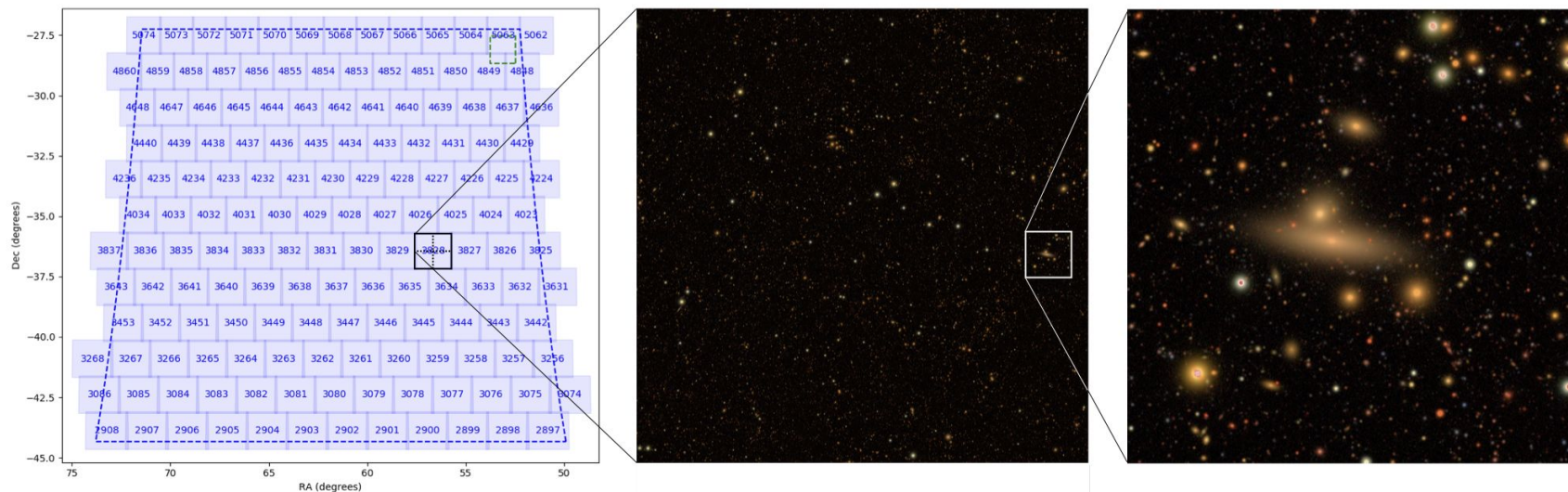


- Rubin will support a series of pre-operations “Data Previews” at their Interim Data Facility (IDF)
 - Early integration tests of their systems
 - Prepare the Rubin team and community to be operations-ready
- Data Preview 0 in 2021 will be based on DC2
- 300 community delegates will perform scientific exercises with the data products and services in the RSP (<https://rtn-004.lsst.io/>)



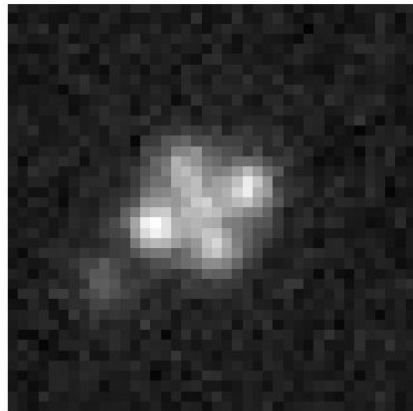
Summary

- Creation of unique dataset involving the work of many DESC members
- Many different data products: extragalactic catalog, image simulations, LSST-like catalog data
- Dataset enables testing of the LSST Science Pipelines and DESC analysis tools
- LSST-like object catalogs have been publicly released via Portal hosted at NERSC and mirrored at Argonne
- Next: Rubin will use DC2 for pre-operations Data Previews

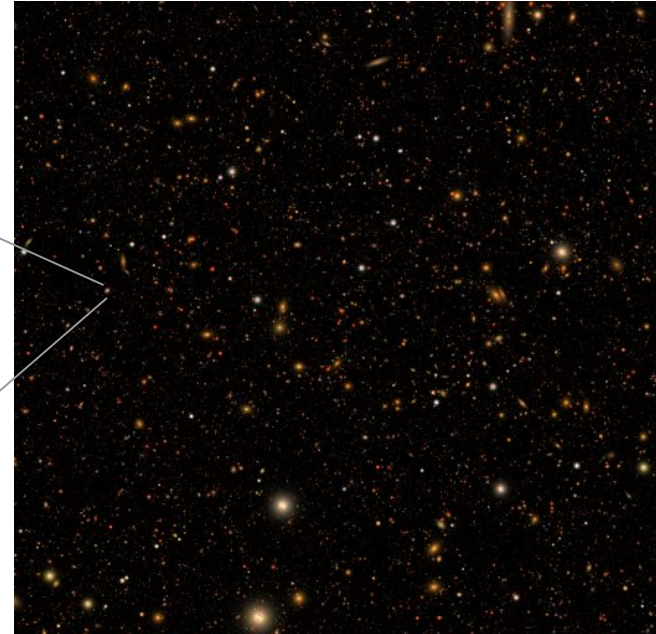


Questions?

- DR3 (Y1+Y2) DDF image processing



A strongly lensed AGN, rendered over 2 years of observations



0.2° × 0.2° DR3 field in *gri* bands

Image credit: J. Chiang

References:

- LSST DESC: "The LSST DESC DC2 Simulated Sky Survey" ApJS 253, 31 (2021)
- LSST DESC: "DESC DC2 Data Release Note", arXiv:2101.04855
- Korytov et al: "CosmoDC2: A Synthetic Sky Catalog for Dark Energy Science with LSST", ApJS 245, 26 (2019)
- Mao et al: "DESCQA: An Automated Validation Framework for Synthetic Sky Catalogs", ApJS 234, 36 (2018)