

LSST:UK Newsletter 24 (July 2022)

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Introduction

The latest [Rubin News Digest](#) notes that construction work on the submit has been disrupted by a recent winter storm, which dumped up to six feet of snow in some areas around Cerro Pachón; NOIRLab have posted a [video](#) showing the scene after the storm, with Rubin visible near the start, and a site damage assessment is underway. Meanwhile, back at SLAC, the camera team is now operating a pumped coolant chiller, which has been developed as an alternative to the original vapour-compression based refrigeration system, as that has been exhibiting some long-term instabilities during testing.

Due to Covid restrictions, registration for in-person attendance of the [2022 Project and Community Workshop](#) taking place in Tucson on August 8-12 has now closed, but it is still possible to register to attend virtually. The PCW website now also contains a detailed agenda for the workshop, which notes which breakout sessions offer remote participation - in addition to the plenaries, which will all be live-streamed, with remote participants having the opportunity to submit questions via Slack.

Pre-registration remains open for the [LSST@Europe4](#) meeting, which we held in Rome on October 24-28. In-person attendance is limited to 100 people, so those wishing to attend in person should pre-register soon, while the deadline for registering for virtual participation is September 15.

Those with ideas for future newsletter items should contact the LSST:UK Project Managers ([@ George Beckett](#) and [@ Terry Sloan](#) [lusc_pm@mist.is.ed.ac.uk](#)), while everyone is encouraged to subscribe to the [Rubin Observatory Digest](#) for more general news from the US observatory team.

[@ Bob Mann](#)

LSST session at NAM

We had 2 x 90 minute sessions at the RAS National Astronomy meeting at the University of Warwick : <https://nam2022.org/science/parallel-sessions> on the topic of "Preparing for the Rubin Observatory's Legacy Survey of Space and Time". The recordings of the talks are available on the [NAM reattendance site for those that have access through registration](#). With the permission of the speakers, we have linked the talk slides below. For those starting off in the project, the presentations by Federica Bianco and Melissa Graham are particularly use starting points for information. Stephen Smartt (on behalf of Bob Mann) presented the UK's status in the project and Roy Williams presented a overview and introduction on how to get started with accessing the early science data that will come through the alert streams in the UK's Lasair Broker.

There was encouraging attendance at the sessions and we welcomed many early career scientists as they learned about data access and the UK's status in Rubin directly from some of the Rubin Project leadership team, and of the ongoing work being done by postdoctoral level scientists across the UK in a diverse range of topics.

The first session, chaired by our LSST:UK Commissioning Coordinator Graham Smith, was focused particularly on new and potential users aimed at raising interest in data access to the Rubin's survey data.

- Federica Bianco : Deputy Project Scientist for Rubin Construction project. Federica was overall chair off the LSST Science Collaborations, and is co-chair of the Transients and Variable Stars collaboration. "[Status of the Rubin Project and the Science Collaborations](#)".
- Melissa Graham : Lead Community Scientist for the Community Engagement Team and as a Science Analyst for the Data Management team. "[The Rubin Science Platform and data access - early data previews and releases](#)"
- Stephen Smartt and Bob Mann - up to date summary of the UK's role in the Rubin Observatory
- Roy Williams - information on what early data will come from the alert stream, and how to access these data products through the UK's Lasair broker.

The second 90min session was made up of contributed talks from the community, chaired by John Stott of the LSST:UK Executive.

Aaron Watkins - A novel, nearly model-free sky subtraction method for the LSST pipeline. Aaron is employed on the LSST:UK Phase B grant as part of the UK In-kind contribution.

Agata Roek - Application of NoiseChisel to detecting faint small-body activity with the LSST

Daniel Weatherill - Commissioning and Instrument Signature Reduction of the LSST camera

Garreth Martin - Informing low surface-brightness astronomy with the Rubin Observatory using the next generation of cosmological simulations

[Jamie Dumayne - Using 4MOST and the Vera Rubin observatory to measure galaxy properties with smaller uncertainties](#)

[Paul Giles - X-rays in the era of LSST](#)

[Tom J Wilson - Enabling Early Rubin Science with Robust Cross-Matches in the Crowded LSST Sky](#)

@ Stephen Smartt

Work Package highlights from latest STFC Project Assurance Report

As part of the six-monthly Project Assurance Report (PAR) we submit to STFC, we include brief highlights provided by different Work Package teams. Here is the list included in the most recent PAR, which covers the period October 2021 - March 2022.

Work Package	Highlights
WP1.2 Maintenance of Science Requirements Document	With the LSST:UK in-kind proposal being approved in the first instance by the Rubin Management Board, a new version of deliverable D1.2.3 "Science Requirements Document (Mar '22)" has been generated.
WP1.4: Coordinating of LSST:UK Contributions to Commissioning	The proposals submitted to the call for UK commissioning contributions were reviewed by the LSST:UK Executive Committee and forwarded to the Rubin Commissioning Team (SIT-Com) in November. Onboarding of staff from successful proposals started in April 2022.
WP1.7: International Program Coordinator.	Aprajita Verma, joined the Rubin Operations Executive in October'21 as the In-kind Programme (IPC) team lead. Aprajita has also continued to manage the Rubin IPC team, supporting the international in-kind community and managing the Rubin general pool of software development resource. Other highlights over this reporting period are the development of the in-kind contribution viewer and the in-kind program tracking tools.
WP 2.1 DAC Management	The DAC team agreed a new and streamlined process with the Observatory for periodically updating the LSST:UK list of data rights holders. Discussions have also begun with LIneA (Brazil), who are also going to run an IDAC. The aim of these is to identify areas of collaboration and information sharing, and seed a wider cooperation between IDACs. Finally, the DAC team have proposed a Data Facilities transition plan to the two other operational Data Facilities (SLAC, USA and CC-IN2P3, France).
WP2.2 Data Ingestion and Publication	The DAC team have successfully completed a major upgrade of the DAC catalogue service (Qserv). The DAC team have also, in collaboration with colleagues in CC-IN2P3, deployed a 10-node instance with the latest software versions and enough capacity for Data Preview 0.2 and relevant ancillary surveys. On a related note, the DAC team have successfully run the Qserv Ingest workflow to ingest a third-party survey -- specifically, the CatWISE survey, which is a precursor survey for WP3.11.
WP2.3/3.2 Lasair	For the Lasair team the major highlights in this period have concerned the configuration and testing of new IRIS hardware and the subsequent migration of Lasair onto this new platform.
WP2.4 Provision of the DAC Platform	Members of the DAC team have maintained an operational UK-based Rubin Science Platform instance and the collaboration with Rubin (SQuaRE) team about standardising infrastructure support. The team have also completed an upgrade to Somerville (proto-DAC infrastructure) with a mix of IRIS and LSST:UK hardware funding.
WP2.5 Science Support	The DAC team have begun optimisation work on the Macauff cross-match software (produced by WP3.11) to make it production-ready. In addition, the DAC team now have agreement from Rubin Observatory to create a dedicated Lasair channel in the Community Forum, by way of a pilot for UK DAC science support longer term.

WP3.3: Spectroscopic classification of transients	<p>The TIDES survey strategy project/publication was formally approved by DESC and the publication draft was made available to the working group. Chris Frohmaier presented the project at a DESC telecon. The 4MOST project approval for publication is underway with informal approval for a paper from the Strategy and Simulation working group chairs. We successfully created and submitted a catalogue of real-galaxies hosting mock SNe in the GAMA09/eFEDs fields as required by IWG1 in 4MOST. This real-target catalogue was performed by TiDES on a best effort basis to test infrastructure issues such as shared targets and fibre-collision within 4MOST observations. We coordinated with the other surveys in 4MOST in the construction of this catalogue. This effort contributes towards the 4MOST IWG1 WG3's goal of developing a pipeline to identify common targets between the different surveys - Chris Frohmaier is a key member of this WG. We developed a pipeline to create realistic spectra, as observed by 4MOST, following each strategy simulation. This pipeline gives us a clear understanding of the quality of each object's spectrum according to the exposure time variations and weather conditions expected over the survey lifetime. The spectra have been shared with other groups within TiDES to enable secondary projects. We submitted the LSST:UK WP.3.3 deliverable relating to the TiDES target selection algorithm and software to analyse candidate targets from the real-time ZTF stream. We had to adapt the workflow as ZTF suffered a prolonged outage due to hardware issues. We paused development of our software to interface with the Lasair Kafka stream and instead changed to an analysis of historical targets within ZTF. Our pipeline now replicates a nightly flow of observations and analyses individual targets against a user defined and customisable selection function. This software is currently under code-review by LSST:UK and will be publicly released.</p>
WP3.5 LSST and near-infrared data fusion	<p>The WP3.5 team completed the transition of all code to the third generation Butler. All processing is now up to date with the latest version of the LSST Science Pipelines. We implemented a new confidence map into the variance plane within the LSST Science Pipeline such that exposure numbers and bad pixels are properly accounted for. We installed the gen3 workflow code developed for DESC allowing large gen 3 runs to be conducted on SLURM HPC queuing systems. We completed the first trial gen 3 run of the SXDS field and have started to test this latest prototype run "2022.1". We tested the integration of the VISTA-HSC Butler in the UK based RSP allowing access to the full processed imaging and catalogue data sets.</p>
WP3.6 Photometric Redshift Estimation	<p>Work in this WP commenced at the end of January 2022. Thus far a survey of available simulation tools, current data products, and their connectivity and level of realism has been carried out as well as a first study of spatially varying observing conditions and their impact on photometry on existing simulation data. For a simulated 5-year survey, variability was found to be unexpectedly low, the reasons for which are still under investigation.</p>
WP3.7 Low- surface- brightness science using LSST	<p>The LSST Project has made Aaron Watkins a full member of the Rubin Algorithms and Pipeline team which is responsible for delivering the Rubin data products to the worldwide community. Aaron can now access the Algorithms and Pipeline team's code base and development server and much of the work that we will do going forward will use these facilities. Aaron's membership demonstrates the importance that the Algorithms and Pipeline team place on the sky subtraction work that is being performed by WP 3.7 which will be critical for LSST to access its discovery space. The Algorithms and Pipeline team now envisages the WP 3.7 sky subtraction package, when fully developed and tested on LSST data (e.g. from commissioning surveys such as DP2) to be the default sky subtraction algorithm for all LSST data releases. Aaron Watkins will continue to lead this effort, now with the significant resources placed at his disposal by the Project via his membership of the Algorithms and Pipeline team. Aaron Watkins and Sugata Kaviraj (WP 3.7 lead) are in the process of setting up a 'Low-surface-brightness Coordination Group'. This will be the first community-led coordination group within the Rubin eco-system. This coordination group will solicit feedback from all science collaborations (particularly from their UK members) regarding the discovery science that the community wants to perform using LSST. This will ensure that the data products from WP3.7 benefit the largest number of LSST scientists and that our work is guided by what is actually needed from the sky subtraction to enable LSST science. Watkins and Kaviraj continue to give invited talks, both to working groups within science collaborations and also to external communities (e.g. Euclid) to present the sky subtraction work that is being performed within WP3.7 and highlight its significance to the LSST community.</p>
WP3.9 LSST Point Spread Function, sensor characterisation and modelling	<p>We have demonstrated the ability to calibrate our optical interferometer in the OPMD lab to an absolute distance of <200nm between two reflective surfaces. We have begun work on achieving this accuracy in the less reflective surfaces (i.e. CCDs) needed for the final PSF measurements. The measurements needed to calibrate our TCAD models of the CCD pixels were completed, and we can now proceed to begin tuning these models to the experimental measurements.</p>
WP3.10 UK Contributions to DESC Operations	<p>Over this reporting period, the WP3.10 team have: built a draft interface for TXPipe to the RAIL photo-z summarisation tools, which will enable DESC to generate number density distribution of galaxies; created a series of validation tests of TXPipe on CosmoDC2 and Gaussian simulation; built the first TXPipe module to use GPUs at NERSC; kicked off the STAR challenge to test their complete 3x2pt pipeline; completed GalSim pixel boundary code refactoring and optimisation; written a pure C++ GalSim test case for testing and benchmarking GPU port; and, ported the GalSim photon accumulate loop to GPU using OpenMP Target Offload.</p>

WP3.11 Cross matching and astrometry at LSST depths	Over this period, the WP3.11 team have been optimising their code base as well improving and extending their algorithms. The code optimisation improved the efficiency of existing routines and they are working with WP2.5 to enable the code base to exploit multi-node, massive parallelisation. Algorithms have been improved by: the addition of further descriptions of effects on source positions; adding a model for unknown proper motions; and, including external galaxies in the perturbation astrometric model. The algorithms have been extended to include descriptions of transition from photon-dominated to background-dominated AUF algorithms to an all-sky model, allowing for much more robust probabilities of match between sources both in the Galactic plane and outside the galaxy. The team have also been invited to give a seminar talk at the University of Delaware to highlight the work they are doing with LSST:UK in Rubin cross-matching. Finally they have submitted a paper to the RAS Techniques and Instrumentation on their new model for handling the effects of unknown proper motions on the probabilistic cross-matching of photometric catalogues.
WP3.12: Support of EPO software	During this reporting period, the Zooniverse system has been upgraded to allow easy ingest of images and data from observatory systems. In addition there has been development of systems for template projects, allowing observatory scientists to benefit from previous design work and best practice. An agreement has also been reached on data storage for images used in production projects. Finally, the WP3.12 lead, Chris Lintott, has been appointed as LSST: UK EPO Coordinator.

If you are interested in more detail please contact Terry Sloan via lusc_pm@mlist.is.ed.ac.uk in the first instance.

@ Terry Sloan

Leadership positions held by LSST:UK members

Here's the latest list of significant leadership positions held by members of the LSST:UK consortium in the project and international Science Collaborations. This is the list submitted to the STFC in the most recent Project Assurance Report. If you are aware of any corrections or additions please contact the LSST:UK Project Managers (@ George Beckett and @ Terry Sloan: lusc_pm@mlist.is.ed.ac.uk).

- D. Alonso: co-convenor of the DESC External Synergies Working Group, DESC Liaison with Simons Observatory and CMB-S4.
- C. Alves: member of the LSST DESC Collaboration Council.
- A. Amara: member of DESC Speakers Bureau.
- M. Banerji: co-chair of the LSST Galaxies Science Collaboration, member of the Rubin-Euclid DDP Working Group and a member of the Rubin Contribution Evaluation Committee.
- M.G.Beckett: member of the LSST DESC High-performance computing resources committee, UK representative on DESC Data Facilities Committee, UK representative on Rubin Data Production Leadership Committee, Co-chair of the LSST:UK LSST National Group.
- R. Bowler: co-chair of the SED fitting and Photometric Redshifts WG in the LSST Galaxies Science Collaboration.
- P. Bull: member of DESC Publication Board.
- T. Collett: member of the Rubin-Euclid DDP Working Group.
- V. Debattista: Co-lead of the Galactic Bulge WG in the LSST Stars, Milky Way and Local Volume Science Collaboration.
- C. Garcia-Garcia: DESC TJPCov topical team co-lead.
- J. Harnois-Déraps: DESC Higher Order Statistics (HOS) topical team co-lead.
- P. Hatfield: co-chair of the Galaxy Environment WG in the LSST Galaxies Science Collaboration.
- C. Heymans: UK representative on DESC Operations Committee, member of DESC Advisory Board, member of the Rubin-Euclid DDP Working Group.
- S. Hoenig: Co-Chair of the Variability group in the AGN Science Collaboration, In-kind contribution coordinator for the AGN Science Collaboration, Member of the Rubin Contribution Evaluation Committee.
- S. Kaviraj: co-chair of the LSST Galaxies Science Collaboration; co-chair of the Low Surface Brightness Coordination Group.
- O. Lahav: member of DESC Publication Board.
- B Leistedt: co-convenor of the Large Scale Structure (LSS) Working Group; co-chair of the LSST DESC Equality, Diversity & Inclusion Committee.
- D. Leonard: DESC Core Cosmology Library topical team lead, member of the LSST DESC Publication Board and Collaboration Council, Co-lead of the DESC Modelling and Combined Probes Analysis Working Group.
- C. Lintott: leads the LSST EPO development of Zooniverse as a citizen science platform.
- R Mann: Co-chair of the LSST:UK LSST National Group.
- J. Mullaney: Chair of the Active Galactic Nuclei WG in the LSST Galaxies Science Collaboration.
- Q. Ni: Member of Rubin Users Committee.
- C. Opitom: Co-lead Active objects WG in the LSST Solar System Science Collaboration.
- H. Peiris: member of the Rubin Observatory Survey Cadence Optimization Committee (SCOC).
- M. Schwamb: co-chair of Solar System Science Collaboration, member of the Rubin Observatory Survey Cadence Optimization Committee (SCOC), member of the LSST Science Advisory Committee.
- S. Smartt: member of the LSST Science Advisory Committee.
- G. Smith: co-chair of the LSST Strong Lensing Science Collaboration (SLSC) and Commissioning Liaison for the LSST SLSC.
- M. Sullivan: co-chair of the DESC Follow-up Task Force, co-convenor of the DESC Time Domain Working Group, member of DESC Speakers Bureau Policy Committee, DESC Liaison with 4MOST/TiDES.
- T. Tröster: Co-convenor DESC Weak Lensing Working Group
- A. Verma: chair of the Strong Lensing Science Collaboration, chair of the Strong Lensing Working Group in the Galaxies Science Collaboration, member of the Rubin Observatory LSST Contribution Evaluation Committee, chair of the Software Sub-committee and International Program Coordinator in the Rubin Director's Office.

- A. Watkins: co-chair of the low-surface-brightness working group within the LSST Galaxies Science collaboration, co-lead of the LSST LSB challenge 1: "How do LSST algorithms do at detecting LSB sources; co-chair of the Low Surface Brightness Coordination Group.
- G. Madden: Member of the LSST DESC International Resources Committee.
- J. Zuntz: DESC Deputy computing and simulations coordinator.

@ Terry Sloan

Forthcoming meetings of interest

Meetings of potential interest for the coming months include:

- 25–29 October 2022 -- [Rubin Observatory LSST@Europe4](#), at Accademia dei Lincei, Rome, Italy. The will be a hybrid meeting with a limited number of in-person spaces. [Registration](#) for virtual participation is open until 15th September..
- 17–22 October 2022 – **DESC Sprint Week**, at University of Michigan, Ann Arbor. Details to be published on [DESC members website](#) (login required).
- 8-12 August 2022 – **2022 Project and Community Workshop**, [Ritz-Carlton Dove Mountain Resort](#), Tucson. This is primarily an in-person event, though some sessions (plenaries and general-interest sessions) will be virtually accessible for those who cannot attend in person.
- 1–5 August 2022 – the next **DESC Collaboration Meeting** will be held during 1st–5th August at the Kavli Institute for Cosmological Physics at the University of Chicago.

Members of the Consortium (not in receipt of travel funding through one of the Science Centre grants) may apply for travel support for meetings of this kind via the the LSST:UK Pool Travel Fund. Details are available at <https://lsst-uk.atlassian.net/wiki/spaces/HOME/pages/25853997/LSST+UK+Pool+Travel+Fund> .

Note that the current list of forthcoming meeting is always available on the [Relevant Meetings](#) page. You may also wish to check information held on the LSST organisation website [LSST-organised events](#) and the [LSST Corporation website](#).

@ George Beckett

Announcements

If you have significant announcements that are directly relevant to LSST:UK and would like to share the announcement in a future newsletter, please contact the [LSST:UK project managers](#).