LSST:UK Newsletter 17 (November 2021)

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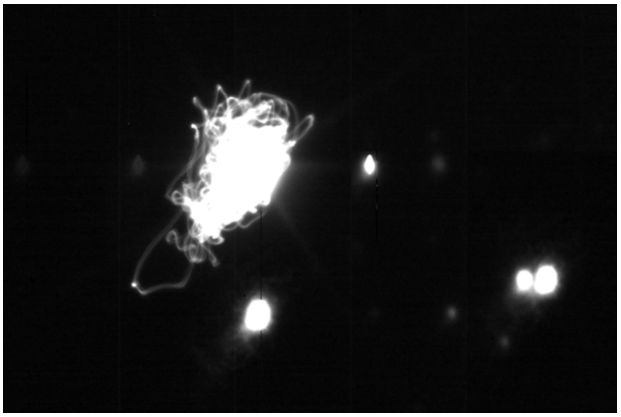
Introduction

Twice a year we produce a Project Assurance Report (PAR) for STFC, summarising progress on the STFC-funded LSST:UK Science Centre (LUSC) programme in the prior six months and providing financial forecasts for the remainder of current grant period (i.e., Phase B, at the moment). Many members of the LSST:UK Science Centre team - most notably the Project Managers, @ Terry Sloan and @ George Beckett - have recently been preparing the PAR covering the period from April to September 2021, and Terry has shared below some of the information it contained, namely per-WP highlights and the ever-impressive list of LSST leadership positions held by members of the LSST:UK Consortium. As Terry notes, that list is difficult to keep up-to-date, so please let him know if you have a leadership role that is not currently included on the list.

Recent news from the Rubin Observatory includes:

- the release of the v2.0 survey simulations, which implement the Phase 1 recommendations from Survey Cadence Optimization Committee;
- an extension in the deadline for nominations and self-nominations for membership of the Rubin Users Committee to **December 5th**; and
- the release of the image shown on the right, which shows the effect of a recent 5.7-magnitude earthquake (centred north of Santiago) on stellar images taken during a recent Auxiliary Telescope (AuxTel) observing run. The caption provided with the image includes the reassuring statement that earthquakes “*are common in Chile, and many design strategies and procedures have been employed to protect Rubin summit facilities and equipment (and staff, of course!) from effects caused by earthquakes*”.



Credit: Rubin Obs/NSF/AURA

Those with ideas for future newsletter items should contact the LSST:UK Project Managers (@ George Beckett and @ Terry Sloan lusc_pm @mlist.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

Call for Phase C DEV Work Packages

As forewarned in the October Newsletter, the call for bids for Phase C DEV Work Packages has opened, with a submission deadline of 20 January 2022. As detailed in the call, bids should be developed in conjunction with an appropriate Recipient Group, so that they will qualify as one of the UK’s in-kind contributions to Rubin operations, and, in the first instance, contact with a likely Recipient Group should be made through the relevant person named in Appendix A of the Manual for In-kind Contributors and Recipients.

We are currently finalising with STFC the timeline for the passage of the Phase C proposal through the PPRP process and any further updates will be announced via emails to the *lusc-announce* list and amendments to the call wiki page.

@ Bob Mann and @ Stephen Smartt

“The Rubin Data Products, Abridged”

Melissa Graham, who leads the Rubin Community Engagement Team, has recently released a video and slide set providing a very clear summary of the planned LSST data products. The formal reference for that material remains the Data Products Definition Document, which

goes into much more detail - e.g., listing columns to appear in data release catalogue tables - but this presentation provides a very clear explanation of what the Observatory will deliver and what kinds of derived data products are being left for the community to generate. It provides, therefore, a very useful introduction to the topic, answering many questions itself and providing valuable preparation for those who do need to dive into the DPDD.

@ Bob Mann

Annotations: a new capability for Lasair

The Lasair transient broker is not built for the Lasair team to extract science from LSST alerts, but rather as a platform for a wide community of astronomers to extract science. Lasair is not built around an existing classification system, but rather invites those who have such algorithms to collaborate with Lasair to publish and amplify in near-real-time. Already astronomers can use Lasair to build a custom SQL query, then convert it to a filter on the alert stream, and publish the resulting stream so that others can use the results. An example might be "Alerts associated with a galaxy within 200 Mpc".

The new capability of the Lasair transient broker allows a classification engine to create “annotations” that go into the Lasair database. These can in turn be part of queries, filters, and streams. In particular, if a classification engine decides that an alert is exciting, its conclusion can be streamed out to interested parties within minutes of the original alert from LSST.

Some annotators take a Lasair stream and filter it further, based on the lightcurve. The code doesn't need to run in the real-time pipeline, rather it can run anywhere on the internet. This outsourcing of classification is being done by several Lasair collaborators now: the FastFinder kilonova classifier, Zooniverse citizen science, and a new collaboration with TiDES/4MOST. Other annotators push an external stream into Lasair; we are in the process of "re-publishing" the classifications made by other LSST alert brokers Fink and Alerce. If you are interested in building a Lasair annotator, please write to lasair-help@lists.roe.ac.uk, and we will get you started.

@ Roy Williams

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 April-September 2021.

Work Package	Highlights
WP 1.4 Coordination of LSST:UK Contributions to Commissioning	A session on early science and commissioning opportunities with Rubin was held at NAM2021, coinciding with the publication of a call for proposals for UK commissioning contributions. The proposals submitted in response to that call were reviewed by the Exec on behalf of the Board in October, and forwarded to the Rubin Commissioning team in November.
WP1.5: External Liaison	The 2021 LSST:UK All Hands Meeting attracted more than 150 registrants for its three half-days of events on 11-13 May 2021. Attendees heard a range of talks, including updates on the Rubin Observatory status and schedule, LSST: UK plans and a series of contributed talks from members of the LSST:UK community. Monthly LSST:UK Newsletters were produced each month during the reporting period and circulated via the lusc-announce email list, in addition to being posted on the LSST:UK wiki. Newsletter items keep LSST:UK Consortium members apprised of progress with Rubin construction and negotiations regarding the UK in-kind package, as well as disseminating news from the LUSC programme to the wider UK LSST community.
WP1.7: International Program Coordinator.	The revised programme of in-kind contributions was delivered. The Manual for in-kind contributors and recipients was developed, as well as the contribution profile explorer system. Contributions were made to the in-kind session at the Project and Community Workshop and the Rubin session at NAM2021. The work plan system for the in-kind program was delivered, and advice provided to contributors and recipients to support execution of the Fall 2021 contribution review period.
WP 2.1 DAC Management	The UK DAC Roadmap was revised in the light of the updated schedule for the LSST Data Previews; this will drive the planning for WP2.2, 2.4 and 2.5 for the remainder of Phase B. A selection round was run for Junior Associates, and discussions were held with Rubin Observatory staff over the mechanisms for updating the UK data rights list in future.
WP2.2 Data Ingestion and Publication	An updated instance of the qserv database system was installed on DAC resources in Edinburgh and loaded with the Data Preview 0.1 dataset. A collaboration was launched with French colleagues working with qserv at CC-IN2P3 in Lyon, with the intention of sharing experience of deploying qserv on different types of infrastructure (in France, the US and the UK) and of benchmarking its performance on these different systems
WP2.3/3.2 Lasair	Lasair selected as a Community Broker, see https://www.lsst.ac.uk/news/2021/lasair-selected-community-broker-21-07-28.

WP2.4 Provision of the DAC Platform	The latest version of the Rubin Science Platform has been installed on UK DAC resources and the Rubin SQuaRE team have recognised this IRIS-based deployment, undertaking to ensure that future updates to the RSP codebase will be consistent with it.
WP2.5 Science Support	DAC staff collaborated with WP3.11 team to complete a first data challenge, exercising DAC resources to create cross-match catalogues for a subset of Gaia and WISE, with outcomes documented in an updated DAC-DEV interface requirements document. DAC staff working with WP3.5 team to plan and resource the data-fusion pipeline, in operations, augmenting Rubin data with additional insight from VISTA (or other near-IR surveys).
WP3.3: Spectroscopic classification of transients	Delivery of software package to process any new LSST cadence strategy (opsim) and automatically produce metrics for TiDES SN and TiDES host galaxies survey performance. Presentations to the DESC time-domain working group and to the 4MOST All-Hands Meeting. Began development work on the interface between the Lasair broker and 4MOST.
WP3.5 LSST and near-infrared data fusion	Completion of a full run of the pipeline in the overlap region between HSC PDR2 and VISTA. First test multi-wavelength catalogues currently being used to produce photometric redshifts and for spectral energy distribution modelling, which will aid in their validation. Work has begun on the generation 3 version of the pipeline, which involves a completely restructured ‘Butler’ database.
WP3.7 Low-surface-brightness science using LSST	Our work on quantifying the accuracy of the sky-subtraction in the current LSST pipeline has been gaining attention throughout the LSST landscape. Since the outputs of this work package will determine LSST's ability to access the low-surface-brightness regime, it will affect the discovery space of all science collaborations. Aaron Watkins has given several invited talks on the work e.g. at Symposium 12 at the EAS meeting, the low-surface-brightness session at the Rubin PCW, two sessions at the UK NAM, the Synthetic Source Injection Workshop organised by the DM team and a science talk at a Galaxies Science Collaboration meeting. His work was featured and discussed in the DM team's presentation (by Lee Kelvin) at the Rubin PCW on the properties of the LSST pipeline. Our focus now is to develop new sky-subtraction algorithms with a view to inserting them into the pipeline further down the line. Aaron's current work is developing an idea that was first proposed by Robert Lupton (DM team lead) to perform sky subtraction that preserves LSB flux at scale for the LSST. Initial tests on small deep fields have shown promise. A paper describing these new algorithms, tested on deep fields from a wide variety of telescopes (including the Hyper Suprime-Cam) is expected be published in the summer of 2022 (the co-authors will comprise the members of WP 3.7 and the DM team).
WP3.9 LSST Point Spread Function, sensor characterisation and modelling	Initial resistivity measurement technique on CCDs performed (part of WP 3.9.2). Sentaurus model of CCD250 pixel started (part of WP3.9.2). New design for the interferometrically aligned PSF projector completed (preliminary work for WP3.9.3).
WP3.10 UK Contributions to DESC Operations	The paper on tomography was published: https://astro.theoj.org/article/29530-the-lsst-desc-3x2pt-tomography-optimization-challenge . The team is now assisting with the STAR project within DESC, the Static Analysis Round Table, which will collect together everything needed for a lensing + clustering analysis. Joe Zuntz started new role as Deputy Computing Manager for DESC. James Perry completed his contribution to GalSim to improve how pixel boundaries are handled, making it ready for LSST's camera behaviour. James has improved the serial run-time of GalSim by a factor of 5.
WP3.11 Cross matching and astrometry at LSST depths	The WP3.11 team have continued to build links with the wider community. One result was their being asked by the Rubin SMWLV (Stars, Milky Way, and Local Volume) Science Collaboration to present the work of this collaboration at the LSST:UK all-hands meeting. Within this reporting period the deliverable D3.11.3 was also completed. This extends the options available in the cross-matches to include two important aspects for the matching of LSST to ancillary datasets, mostly infrared catalogues such as WISE. WP3.11 now have a robust and accurate cross-match tool, and will be able to provide LSST:UK users with robust matches between LSST and other photometric catalogues. The WP3.11 team have also undertaken scaling and efficiency tests in preparation for executing their cross-matching software on DAC hardware. Finally, an initial version of a DAC-DEV Interface Definition has been successfully validated by a data challenge to cross-match two precursor surveys – namely, Wise and Gaia. Lessons learned from the data challenge will feed into a revised Interface Definition in the coming period of work.

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, member of the LSST DESC Membership Committee, DESC Liaison with Simons Observatory.
- C. Alves: member of the LSST DESC Collaboration Council.

- 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. Bannister: LSST Solar System Science Collaboration Outer Solar System Working Group lead, member of the of the Rubin Contribution Evaluation Committee
- M.G.Beckett: member of the LSST DESC High-performance computing resources committee;
- 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.
- 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. Kaviraj: co-chair of the LSST Galaxies Science Collaboration; co-chair of the Low Surface Brightness Coordination Group (This is the first community driven Community Group).
- 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.
- C. Lintott: leads the LSST EPO development of Zooniverse as a citizen science platform.
- J. Mullaney: Chair of the Active Galactic Nuclei WG in the LSST Galaxies 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).
- 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-convener of the DESC Time Domain Working Group, member of DESC Speakers Bureau Policy Committee, DESC Liaison with 4MOST/TiDES.
- A. Verma: 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 (from Jan 2021).
- 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.
- C. Woolford: Member of the LSST DESC International Resources Committee.
- J. Zuntz: DESC Deputy computing and simulations coordinator.

@ Terry Sloan

Recent LSST:UK Science Centre outputs

The LSST:UK Science Centre has recently produced the following technical reports.

Title	Author	Description
D3.7.3 Software to Output Metrics That Keep Track of Improvements to the Pipeline Sky Subtraction	Aaron Watkins, Chris Collins, Sugata Kavira	Low surface brightness science contains much of the potential discovery space for LSST, in galaxies, solar system, and Milky Way research. Unfortunately, the authors (i.e. LSST:UK work package WP3. 7) have previously demonstrated that the current LSST data reduction pipeline's sky subtraction routine over-subtracts flux in the outskirts of extended objects, making low surface brightness science with LSST a potentially very difficult enterprise. Changes to the pipeline are thus required to ensure that LSST's scope is not limited in this way. As WP3. 7 develop an alternative sky-subtraction routine to resolve this issue, it is necessary to track improvements using quantitative metrics. This in turn requires software that can measure and output these metrics alongside regular runs of the pipeline. This report details the current state of such software, which WP3.7 are now making available to the LSST:UK community. The authors also describe future plans for the software, to address its current slow speed and to more easily integrate some version of it into the LSST pipeline itself for use by the data management team.

@ Terry Sloan

Forthcoming meetings of interest

Several meetings of potential interest have been scheduled for the coming months.

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

- 9-13 January 2022. The 239th meeting of the AAS (including a Rubin “Open House” on 11 January).
- 21-25 February 2022. DESC (virtual) consortium meeting.

@ 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.