LSST:UK Newsletter 23 (June 2022)

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Introduction

It's conference season and, as @ George Beckett notes below, there are a number of LSST:UK-related meetings in the next few months.

The first of those is the National Astronomy Meeting at Warwick, which includes parallel sessions on Preparing for the Rubin Observatory's Legacy Survey of Space and Time on the Monday afternoon and Tuesday morning, plus a talk on LSST:UK computing in the Discovery in Astronomy and Space Physics enabled by large-scale Digital Research Infrastructures (ASTROCOMP) session on the Monday morning.

Registration is also open (and will close on **July 22nd**) for both in-person and remote attendance of the 2022 Project and Community Workshop taking place in Tucson on August 8-12.

Finally, pre-registration is 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.

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

Commissioning update

We have now received formal confirmation that the LSST:UK contributions to Rubin commissioning have been accepted by the System Integration Test and Commissioning (SITCom) team. SITCom are the recipient group for our contributions within the International In-kind programme. We will be working with SITCom leadership to on-board UK team members and define the details of our contributions in the coming months. This will lead to us working within a fully integrated and enlarged SITCom team spanning existing SITCom members plus new members from the International In-kind and US/Chile communities. LSST:UK SITCom members are as follows: Manda Banerji (Southampton), Chris Collins (LJMU), Gavin Dalton (Oxford/RALSpace), Anais Gonneau (CASU), Carlos Gonzalez-Fernandez (CASU), Sugata Kaviraj (Hertfordshire), Jon Loveday (Sussex), Richard McMahon (IoA), Tim Naylor (Exeter), Dan Ryczanowski (Birmingham), Raphael Shirley (Southampton), Graham Smith (Birmingham), Leigh Smith (CASU), Will Sutherland (QMUL), Nic Walton (CASU), Aaron Watkins (Hertfordshire), Tom Wilson (Exeter). All going well, our contributions will mainly occur during 2023 as ComCam and LSSTCam get on sky for the first time. During this time I aim to keep the LSST:UK community updated via the monthly newsletter, and colleagues are always welcome to email me (gps@star.sr.bham.ac.uk) with specific questions.

@ Graham Smith, LSST:UK Commissioning Scientist.

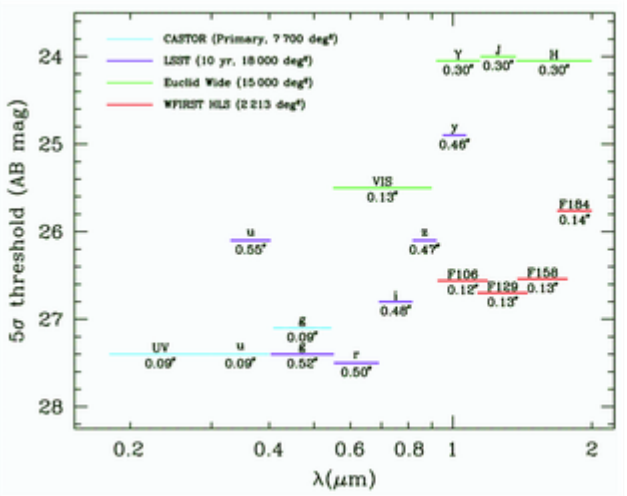
UK participation in CASTOR, and synergies with Rubin

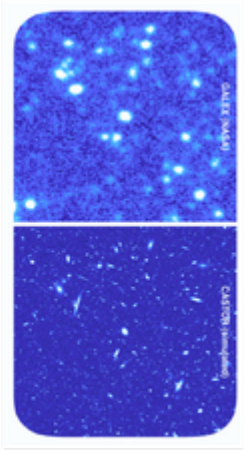
CASTOR is a Canadian-led concept for a 1m space telescope that will provide panoramic, near-diffraction-limited imaging and spectroscopy in the ultraviolet (UV) and blue-optical (150-550 nm). The main capabilities and observing modes are summarised in Fig. 1. With a planned launch in the early 2030s, there is worldwide consensus that such a mission is necessary to bridge the gap in UV astronomy between Hubble and the next generation UV/O/IR observatory, while also having enormous synergies with Rubin and Euclid. With a nominal lifetime of 5 yr (10 yr goal) CASTOR's Primary Survey will provide deep UV/u/g imaging (see Fig. 2) of the overlap region (~7700 deg^2) between Rubin-WFD and Euclid-Wide, including the Roman HSL. Additionally, 30% of the observing time is expected to be allocated to GO programmes.

Wide-field Imaging	
Field of View	0.44° x 0.56° = 0.25 deg²
Image Quality	FWHM = 0.15" in all channels
Photometric Channels	UV (150-300 nm), u (300-400 nm), g (400-550 nm)
Spacecraft Orientation	Telescope always points > 90° from sun. Ideal for long duration, continuous observing in the anti-sun direction.
Data Volumes	~200 GB/day with 10-min exposures in survey mode. High-speed optical downlink (~10 Gbps)

Spectroscopy and Precision Photometry	
Multi-slit spectroscopy	DMD UV spectroscopy in parallel field (150-300 nm). FoV = 207"x117", R = 1500.
Slit-less spectroscopy	Full spatial coverage (0.25 deg²) in UV and u, simultaneously. R = 300 (UV) and 420 (u)
Precision photometry	High-speed photometric monitoring (10 ppm) in the UV-, u- and g-bands using dedicated CMOS detectors.

An 18-month Phase 0 study started in 2022, and will cover scientific, technological, and programmatic aspects. UK researchers are currently involved in the scientific definition of the mission through participation in the different Science Working Groups, namely Time domain astrophysics, Cosmology, AGN physics, Galaxies and cosmic star formation, Near-field cosmology, Stellar astrophysics, Extrasolar planets and Solar System science.





The recent announcement that the UK Space Agency will soon be introducing a new programme for bilateral collaborations outside of ESA represents a real opportunity for the UK to join the mission. Given the strong synergies with Rubin, we are looking for LSST:UK scientists interested in identifying key scientific questions that would strongly benefit from the combination of the two datasets, as well as opportunities to contribute analysis and simulation tools to advance the science readiness of the mission.

Please email me (ruben.sanchez-janssen@stfc.ac.uk) if you're interested in contributing to this exciting opportunity or would like more details.

@ Ruben Sanchez-Janssen

Recent LSST:UK Science Centre outputs

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

Title	Author	Description

D3.3.3 TiDES Target selection from broker	C. Frohmaier, M. Sullivan	The Legacy Survey of Space and Time (LSST) and the 4m multi-object spectroscopic telescope (4MOST) commence survey operations in late 2023 and early 2024 respectively. The Time-Domain Extragalactic Survey (TiDES) on 4MOST will follow-up LSST discovered transients to obtain spectroscopic measurements for tens-of-thousands of supernovae, galaxies, active-galactic nuclei (AGN), and strongly-lensed systems. For the transients and their hosts, this data will allow us to map the astrophysical diversity of cosmic explosions and measure the equation of state parameter for dark energy to unprecedented precision. TiDES forms the basis of LSST:UK's WP3.3: Spectroscopic classification of transients. A key aspect of performing a reliable and efficient follow-up of transients is to create a discovery infrastructure within the LSST alerts stream. Access to this stream is served by several community brokers, allowing users to create custom filters and use value-added data products to fine-tune a selection algorithm to flag transients suitable for their science programme. This is exactly the use-case for TiDES and forms the core of this deliverable. Given that the start of LSST survey operations is expected late 2023/ early 2024, we are developing our selection algorithms on the Lasair-processed ZTF alerts stream. However, we have had to change the scope of our deliverable as ZTF suffered a prolonged outage during a key phase of the development cycle. As a result, this deliverable will not include the Lasair Kafka stream of ZTF alerts or our real-time Lasair filter to pre-select candidates. Instead, we present software that applies a customisable light curve-based selection function on any ZTF object from the archive of historical observations. This mimics a real-time feed, stepping through the observations and assessing each object against the user-defined selection criteria. The planned integration of this with a real-time feed will instead be presented in a future deliverable and the further down-stream connections with 4MOST will be implemented with deliverable D3.3.4.
D3.5.2 First wide area catalogues from joint HSC+VISTA processing	R. Shirley, M. Banerji	The LSST Phase B work package WP3.5 was begun in July 2020. In the first year we built a prototype version of the software to conduct joint photometry with Visible and Infrared Survey Telescope for Astronomy (VISTA) Visible and InfraRed CAMera (VIRCAM) and Vera C. Rubin Observatory Legacy Survey of Space and Time Camera (LSSTCam) imaging. This involved early prototype runs over the SXDS deep field using VISTA Deep Extragralactic Observations (VIDEO) survey and Hyper Suprime-Cam (HSC) Public Data Release 2 (PDR2) Deep surveys totalling a few square degrees. Over the last year we have continued development that was undertaken in the first year of the project. Here we present the first full runs over the overlapping regions of the VISTA Hemispere Survey (VHS), VISTA KIlo degree Infrared Galaxy survey (VIKING), and VIDEO surveys using the alpha version of the obs_vista code. This first wide area prototype run was conducted using the second generation 'Butler' middleware. This full wide run revealed issues with the pipeline that we discuss here including how they are currently being mitigated. In this document we present the results of this large area run. We will present issues discovered and motivate the work to be completed in the final year of the project. Recent development has concentrated on implementing the major refactoring of the LSST Science Pipelines that has taken place. The prototype run here, with all the issues that are discussed is publicly available in the form of catalogues. This was done partly to test the publishing technologies under development and partly to encourage collaborators to help with early testing prior to the final data set being published. Images and all the intermediate files have been deleted in preparation for upcoming reruns with the generation 3 Butler middleware. The central aim remains to have all software required ready to conduct full overlap runs when early LSST data is available which is currently anticipated in early 2024.

@ Terry Sloan

Forthcoming meetings of interest

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

- 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. Pre-registration is open now and those who wish to attend in-person are encouraged to complete pre-registration as soon as possible.
- 17–22 October 2022 – **DESC Sprint Week**, at University of Michigen, 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.
- 25--29 July 2022 – **Boom! A workshop on explosive transients with LSST** is being hosted at University of Urbana-Chapaign, Urbana, in the week preceding the DESC Collaboration Meeting, to allow people to attend both meetings and reduce their overall travel costs.
- 11–15 July 2022 – **National Astronomy Meeting** is being held at Warwick University. In particular, two parallel sessions may be of interest: Preparing for the Rubin Observatory's Legacy Survey of Space and Time organised by LSST:UK; and Discovery in Astronomy and Space Physics enabled by large-scale Digital Research Infrastructures (ASTROCOMP) organised by the IRIS programme.
- Those involved in the Rubin Data Delegates' Program are reminded that the **first DP0.2 Delegate Assembly.** will be held on Friday 8th July at 9am PT/ 5pm BST. More details have been posted on the Community Forum.

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.