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The Stars, Milky Way, and Local Volume (SMWLV) Science Collaboration

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Collaboration Numbers

DESC: >1000 (or >250)

TVS: >250

Galaxies: ~200

Stars, Milky Way, and Local Volume: ~180

Solar system: ~120

AGN: ~80

Strong Lensing: >70

Informatics + Statistics: >70

Key Science Areas

- Probing dark energy and dark matter.
- Taking an inventory of the solar system.
- Exploring the transient optical sky.
- **Mapping the Milky Way.**

"The Stars, Milky Way and Local Volume Collaboration has the overarching goals of understanding the accretion history and structure of the Milky Way and the Local Volume, and the fundamental properties of stars within 300 pc of the Sun."

Key Science Areas - SC Connections

DESC: constrain black hole dark matter with microlensing searches towards the Bulge and Magellanic Clouds

- Probing dark energy and dark matter.
- Taking an inventory of the solar system.
- Exploring the transient optical sky.
- **Mapping the Milky Way.**

Solar System: well, it *is* in the Milky Way...
(PSF photometry, time-series photometry overlap)

TVS: Explore variable stars in the Galaxy, accretion/outflow indicators, RR Lyrae et al. as Galactic structure probes, ...

"The Stars, Milky Way and Local Volume Collaboration has the overarching goals of understanding the accretion history and structure of the Milky Way and the Local Volume, and the fundamental properties of stars within 300 pc of the Sun."

SMWLV Working Groups

- The Solar Neighbourhood (Synergy with SSSC)
- Star Clusters
- Variable Stars (Overlap with TVSSC)
- Galactic Bulge
- Galactic Structure and ISM
- Magellanic Clouds
- Near Field Cosmology (Probing similar science to DESC)

Collaboration Priorities

- **Crowded field photometry and astrometry**

(e.g., using DECam studies of the Bulge to probe LSST source densities)

- **Star-galaxy separation**

(*HST* archival images as reference; SMASH Magellanic Cloud survey to benchmark unresolved galaxy impact)

- **Photometric metallicities**

(Use e.g. SDSS/PanSTARRS to explore the accuracy and precision of LSST metallicities)

- **Cadence optimisation and planning**

(Build and test Milky Way specific observing strategies)

- **Stellar variability classification**

(Light curve classifiers, work with precursor data such as the DECam Bulge survey)

- **Simulation predictions for LSST**

(Generic actionable item to build testable predictors from which the on-sky performance of LSST can be tested and verified)

On-going and Recent Activity

Commissioning requirements for the SMWLV SC:

- Astrometric calibration (parallaxes, positions, *Gaia* calibration)
- Astrometric calibration (Differential Chromatic Refraction)
- Crowded field photometry and astrometry
- Photometric accuracy probed with various exposure times and cadences
- Effects of saturation on various Galactic fields
- Star-galaxy separation

On-going and Recent Activity

SMWL(-TVS) Cadence and Observing Strategy

- Ensure good coverage of the MW and MCs
- Don't *just* focus on the inner Galactic plane and Bulge
- “Far side” Galactic Bulge is a key science area
- Short exposures to fill in bright end of dynamic range
- Optimisation of which filter combinations to take in a single visit, and which to separate
- Rolling cadence good for time-domain science, but total number of visits most important metric for a lot of things
- Need to determine the limit at which LSST is confusion limited in good seeing

On-going and Recent Activity

Data Preview 0

- Based on LSST DESC's DR2 dataset
- Science areas include probing MW extinction and structure, and variability of Galactic sources
- Currently only for Galactic latitude $>35\text{deg}$, but what stars there are will probe variability
- Future Data Previews will feature more Galactic science!

On-going and Recent Activity

Other, smaller scale projects I've noted:

- Crowded field photometry, completeness vs density
- Bright star saturation and non-linearity
- u-band filter use+optimisation discussions
- Figure of Merit and “Metric Analysis Framework” decision making tools being adopted and used (e.g., in cadence planning)
- “Early Rubin Science” — pretty much universally applies! (with commissioning a testbed)

Future Direction and Focus

What are the needs of the community?

- Cadence work development?
- Updates to the science roadmap? How to identify and resource new priorities?
- Crowded field? Implement a task force
- Using DP0 to find holes in the Rubin Platform and data releases
- Getting ready for commissioning; will LSST actually deliver what is needed for Milky Way science?
- Adaptation of community analysis tools to LSST science

How To Get Involved

<https://milkyway.science.lsst.org>

Apply to be a member of the collaboration! You should look to connect with at least one working group, and apply either as a full or associate member.

If you don't want to apply to membership, please let me, your LSST:UK SMWLVSC points of contact, or the chairs of the collaboration know what you need/want/wish for from LSST for your Galaxy science to be the best it can be!

Check out the SMWLV SC kiosk as well