

Minisurvey and Deep Drilling Field proposals

Rosaria (Sara) Bonito

INAF – Osservatorio Astronomico di Palermo (Italy)

LSST:

Transients and Variable Stars Science Collaboration
(Primary contact of the
Non-degenerate Eruptive Variables subgroup)
Stars, Milky Way & Local Volume
Science Collaboration

LSST

Main Survey/Special programs

- Impressive new instrument (Wide Fast Deep main survey; Federica's talk)
- Some transients and variable objects will need different cadence, set of filters, exposure, field (e.g. GP)
- Therefore:
Special programs: *MS* & *DDF* (multiple pointings/single pointing)

LSST DDf & MS

- Call in June
- Template to be distributed after the call
- Same policy as for the main survey
- Deadline: after the call (Colin Slater); late October or November 2018
- Some WP already submitted since 2011/2012

LSST MS & DDF: WP 2011/2012

- 4 blank fields: multi-band
- Important for a complete characterization of objects

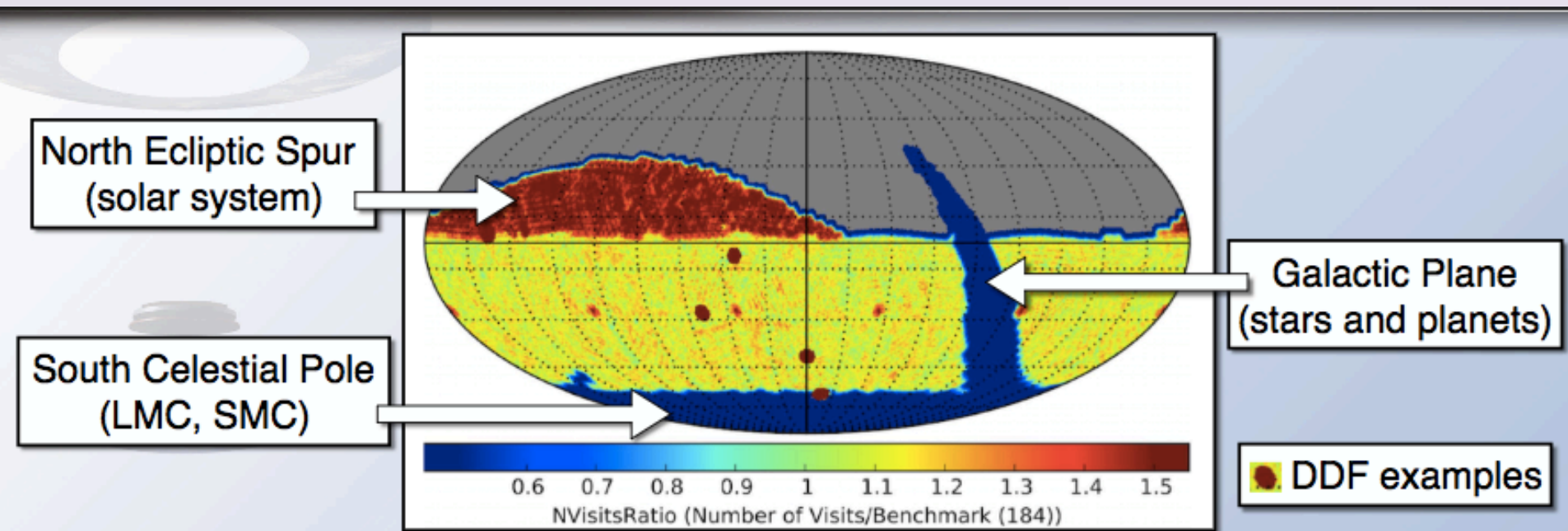
LSST MS & DDF: WP 2011/2012

	ELAIS S1	XMM-LSS	Extended Chandra Deep Field-South	COSMOS
RA 2000	00 37 48	02 22 50	03 32 30	10 00 24
DEC 2000	-44 00 00	-04 45 00	-28 06 00	+02 10 55
Galactic l	311.30	171.20	224.07	236.83
Galactic b	-72.90	-58.77	-54.47	42.09
Ecliptic l	345.97	31.04	40.29	150.70
Ecliptic b	-43.18	-17.90	-45.47	-9.39

- The location have been chosen, but the observational details (cadence, filters, total time): to be determined (Brandt, LSST E-News 2012)
- Repropose to demonstrate that the fields proposed several years ago are still scientifically interesting

LSST MS & DDF: WP 2011/2012

- Special Surveys in the Observing Strategy WP, Chapter 10



LSST MS & DDF: WP 2011/2012

- 8 WPs: these proposals cover several topics
- MS & DDF should serve a wide community

LSST MS & DDF: WP 2011/2012

Distant Extragalactic

LSST Deep Drilling for Galaxies

Authors: H. C. Ferguson,

Contact Information for Lead Author/Authors: Henry C. Ferguson, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218 ferguson@stsci.edu (410) 338-5098

Ultra-deep *ugrizy* Imaging to Reduce Main Survey Photo-*z* Systematics and to Probe Faint Galaxy Clustering, AGN, and Strong Lenses

Authors: Eric Gawiser, Jeff Newman, Hu Zhan, David Ballantyne, Niel Brandt, Andy Connolly, Jack Hughes, Philip Marshall, Sam Schmidt, Ohad Shemmer, and Tony Tyson

Using LSST Deep Drilling Fields to Improve Weak Lensing Measurements

Authors: Zhaoming Ma (BNL), Jeffrey Newman (Pittsburgh), Ian Dell'Antonio (Brown), Mike Jarvis (UPenn), Gary Bernstein (UPenn), David Wittman (UC Davis), Tony Tyson (UC Davis), Ryan Seranton (UC Davis), Erin Sheldon (BNL), Rachel Mandelbaum (Princeton), Bhuvnesh Jain (UPenn), Morgan May (BNL/Columbia)

Supernova Light Curves (March 20, 2011)

Authors: Richard Kessler (U.Chicago), Pierre Astier (U.Paris VI& VII), David Cinabro (Wayne State), Joshua Frieman (U.Chicago,FNAL), Saurabh Jha (U.Rutgers), Maryam Modjaz (Columbia U), Dovi Poznanski (U.C. Berkeley), Masao Sako (U.Penn), Michael Wood-Vasey (U.Pitt)

Standard Candle Relations and Photo-diversity of Type Ia Supernovae
Arin Crots

Galactic and Local Group

Mapping the Milky Way's Ultracool Dwarfs, Subdwarfs, and White Dwarfs

S. Dhital (Vanderbilt), P. Thorman (UC-Davis), J. J. Bochanski (Penn State), P. Boeshaar (UC-Davis), A. J. Burgasser (UC-San Diego), P. A. Cargile (Vanderbilt), K. R. Covey (Cornell), J. H. A. Davenport (Washington), L. Hebb (Vanderbilt), T. J. Henry (Georgia State), E. J. Hilton (Washington), Z. Ivezić (Washington), J. S. Kalirai (STSci), S. Lépine (AMNH), J. Pepper (Vanderbilt), S. J. Schmidt (Washington), K. G. Stassun (Vanderbilt), L. M. Walkowicz (UC-Berkeley), A. A. West (Boston Univ)

High Cadence Observations of the Magellanic Clouds and Select Galactic Cluster Fields

Authors: P. Szalay (U Washington), K. S. Long (STScI), R. DiStefano (CIA), A. Ibanda (AAVSO), J. Kalirai (STScI), V. Kishiyap (CIA), M. Kashiwa (Cal Tech), J. A. Smith (APSU), K. Stassun (Vanderbilt)

Solar System

Opportunities for Solar System Science

Authors: A.C. Becker (U. Washington), C.A. Trujillo (Gemini Observatory), R.L. Jones (U. Washington), N.A. Kalb (CITA), D. Ragozzine (SAO), S.T. Ridgway (NOAO), and the LSST Solar System Science Working Group

(Brandt's talk LSST 2016)

LSST MS & DDF: WP 2011/2012

Distant Extragalactic

LSST Deep Drilling for Galaxies

Authors: H. C. Ferguson,

Contact Information for Lead Author/Authors: Henry C. Ferguson, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218 ferguson@stsci.edu (410) 338-5098

Ultra-deep *ugrizy* Imaging to Reduce Main Survey Photo-*z* Systematics and to Probe Faint Galaxy Clustering, AGN, and Strong Lenses

Authors: Eric Gawiser, Jeff Newman, Hu Zhan, David Ballantyne, Niel Brandt, Andy Connolly, Jack Hughes, Philip Marshall, Sam Schmidt, Ohad Shemmer, and Tony Tyson

Using LSST Deep Drilling Fields to Improve Weak Lensing Measurements

Authors: Zhaoming Ma (BNL), Jeffrey Newman (Pittsburgh), Ian Dell'Antonio (Brown), Mike Jarvis (UPenn), Gary Bernstein (UPenn), David Wittman (UC Davis), Tony Tyson (UC Davis), Ryan Seranton (UC Davis), Erin Sheldon (BNL), Rachel Mandelbaum (Princeton), Bhuvnesh Jain (UPenn), Morgan May (BNL/Columbia)

Supernova Light Curves (March 20, 2011)

Authors: Richard Kessler (U.Chicago), Pierre Astier (U.Paris VI& VII), David Cinabro (Wayne State), Joshua Frieman (U.Chicago,FNAL), Saurabh Jha (U.Rutgers), Maryam Modjaz (Columbia U), Dovi Poznanski (U.C. Berkeley), Masao Sako (U.Penn), Michael Wood-Vasey (U.Pitt)

Standard Candle Relations and Photo-diversity of Type Ia Supernovae
Arin Crots

Galactic and Local Group

Mapping the Milky Way's Ultracool Dwarfs, Subdwarfs, and White Dwarfs

S. Dhital (Vanderbilt), P. Thorman (UC-Davis), J. J. Bochanski (Penn State), P. Boeshaar (UC-Davis), A. J. Burgasser (UC-San Diego), P. A. Cargile (Vanderbilt), K. R. Covey (Cornell), J. H. A. Davenport (Washington), L. Hebb (Vanderbilt), T. J. Henry (Georgia State), E. J. Hilton (Washington), Z. Ivezic (Washington), J. S. Kalirai (STSci), S. Lépine (AMNH), J. Pepper (Vanderbilt), S. J. Schmidt (Washington), K. G. Stassun (Vanderbilt), L. M. Walkowicz (UC-Berkeley), A. A. West (Boston Univ)

High Cadence Observations of the Magellanic Clouds and Select Galactic Cluster Fields

Authors: P. Sakody (U Washington), K. S. Long (STScI), R. DiStefano (CIA), A. Hearden (AAVSO), J. Kalirai (STScI), V. Kishiyap (CIA), M. Kashiwa (Cal Tech), J. A. Smith (APSU), K. Stassun (Vanderbilt)

Solar System

Opportunities for Solar System Science

Authors: A.C. Becker (U. Washington), C.A. Trujillo (Gemini Observatory), R.L. Jones (U. Washington), N.A. Kalb (CITA), D. Ragozzine (SAO), S.T. Ridgway (NOAO), and the LSST Solar System Science Working Group

Collaboration

LSST DDF & MS Task Force

- Important issue for TVS science: a task force (Rachel's talk, Federica's talk)
- Spokesperson: Sara Bonito (please contact me for any information: email, slack, ...)
- Website (in collaboration with Markus Rabus):
https://lsst-tvssc.github.io/MS_DDF_task_force_work_plan.html
- Telecons
- Agenda TVS meeting USA in June, Lehigh University, Pennsylvania (Rachel's talk, Federica's talk): the submitted and new proposals

LSST DDF & MS TF: members

B. Balmaverde

F. Bianco

R. Bonito

M.T. Botticella

M. Carnerero

G. Clementini

F. Cusano

M. Dall'Ora

F. D'Ammando

M. Donachie

M. Drout

R. Egeland

G. Fiorentino

A. Garofalo

M. Graham

K. Hambleton

R. Margutti

I. Moretti

T. Muraveva

I. Musella

M. Rabus

C. Raiteri

C. Righi

R. Street

M. Sullivan

R. Szabo

J. Pepper

A. Prsa

LSST DDF & MS TF: members

B. Balmaverde

F. Bianco

R. Bonito

M.T. Botticella

M. Carnerero

G. Clementini

F. Cusano

M. Dall'Ora

F. D'Ammando

M. Donachie

M. Drout

R. Egeland

G. Fiorentino

A. Garofalo

M. Graham

K. Hambleton

R. Margutti

I. Moretti

T. Muraveva

I. Musella

M. Rabus

C. Raiteri

C. Righi

R. Street

M. Sullivan

R. Szabo

J. Pepper

A. Prsa

LSST MS & DDF TF: Science Cases

- 1) LSST special project for Milky Way and microlensing science:** Street, Clarkson, Rattenbury, Donachie, Dawson, Lund, Ciardi, Hundertmark, Tsapras, Di Stefano, Szkody, Rabus
- 2) Supernovae Demography and Rates based:** Botticella, Greggio, Cappellaro, Cavuoti
- 3) Blazars (variability and census):** Raiteri, Balmaverde, Carnerero, D'Ammando, Righi
- 4) The Gaia-LSST Synergy: from pulsating stars and star formation history to WD planets:** Clementini, Cignoni, Cusano, Garofalo, Muraveva, Ripepi, Silvotti
- 5) RR Lyrae, Cepheids and Luminous Blue Variables to constrain theory using LSST observations:** Musella, Moretti, Marconi, Limongi, Chieffi
- 6) RR Lyrae stars and Cepheids (variability and census):** Szabo'
- 7) RR Lyrae stars in the inner bulge: where the eagles dare:** Bono, Dall'Ora, Fabrizio, Fiorentino, Magurno, Marinoni, Marrese, Inno, Lemasle, Zoccali, Walker
- 8) Young stars with variability:** Bonito, Damiani, Prisinzano, Giannini, Sacco, Antonucci

LSST MS & DDF TF: Science Cases (Details)

- Yesterday's talks by INAF groups
- 6/8: from LSST - INAF (Giuseppe Bono's talk)
- Milestones: by definition different for different projects proposed

An example:

Identify collaborators (synergy of different groups)

Investigate feasibility (optimize the cadence)

Characterization using previous survey data

Identify fields and targets

Participate to meetings (Naples, Pennsylvania, Palermo)

LSST MS & DDF TF: Science Cases

- Some overlap: important to coordinate for possible collaboration/competition (strategy to be discussed also here: starting point)
- Compare with TVS Roadmap (Federica's talk)

Roadmap: DDF Science Cases

Extrinsic transients and variables:

- 1) Eclipsing binary stars (Prsa)

Intrinsic Galactic and Local Universe transients and variables:

- 1) Pulsating stars (Hambleton, Dall'Ora, Musella, Moretti, ..., Szabo')
- 2) Variability in Ultra-cool dwarfs/BDs (Rabus)
- 3) Compact binaries (E. Mason)
- 4) ILOTS (A. Pastorello, E. Mason)

Intrinsic Extragalactic Transients

- 1) Blazars (Cernerero, Raiteri, D'Ammado, ..., Righi)

Extrinsic transients and variables:

MS

- 1) Eclipsing binary stars (Prsa)
- 2) Microlensing: search for black holes (Moniez)
- 3) Interstellar scintillation towards LMC, SMC (Moniez)

Intrinsic Galactic and Local Universe transients and variables:

- 1) Pulsating stars (Hambleton, Dall'Ora, Musella, Moretti, ..., Szabo')
- 2) Variability in Ultra-cool dwarfs/BDs (Rabus)
- 3) Variables in LMC, SMC (Szkody)
- 4) Compact binaries (E. Mason)
- 5) ILOTS (A. Pastorello, E. Mason)

Intrinsic Extragalactic Transients

- 1) Blazars (Cernerero, Raiteri, D'Ammado, ..., Righi)

LSST MS & DDF: Constraints

- Filter changes: [Melissa Graham's talk, LSST 2017](#)
lower than once every 10 minutes;
maximum total number: 18 per
night
- Exposure times:
minimum 1 sec;
maximum not restricted, but
saturation & CR rejection untested
for long exposures

LSST MS & DDF: Constraints

- “Level 3”: proper for special programs
- LSST DM will not give special tools for special programs, but 10% computing resources (L. Guy’s talk)