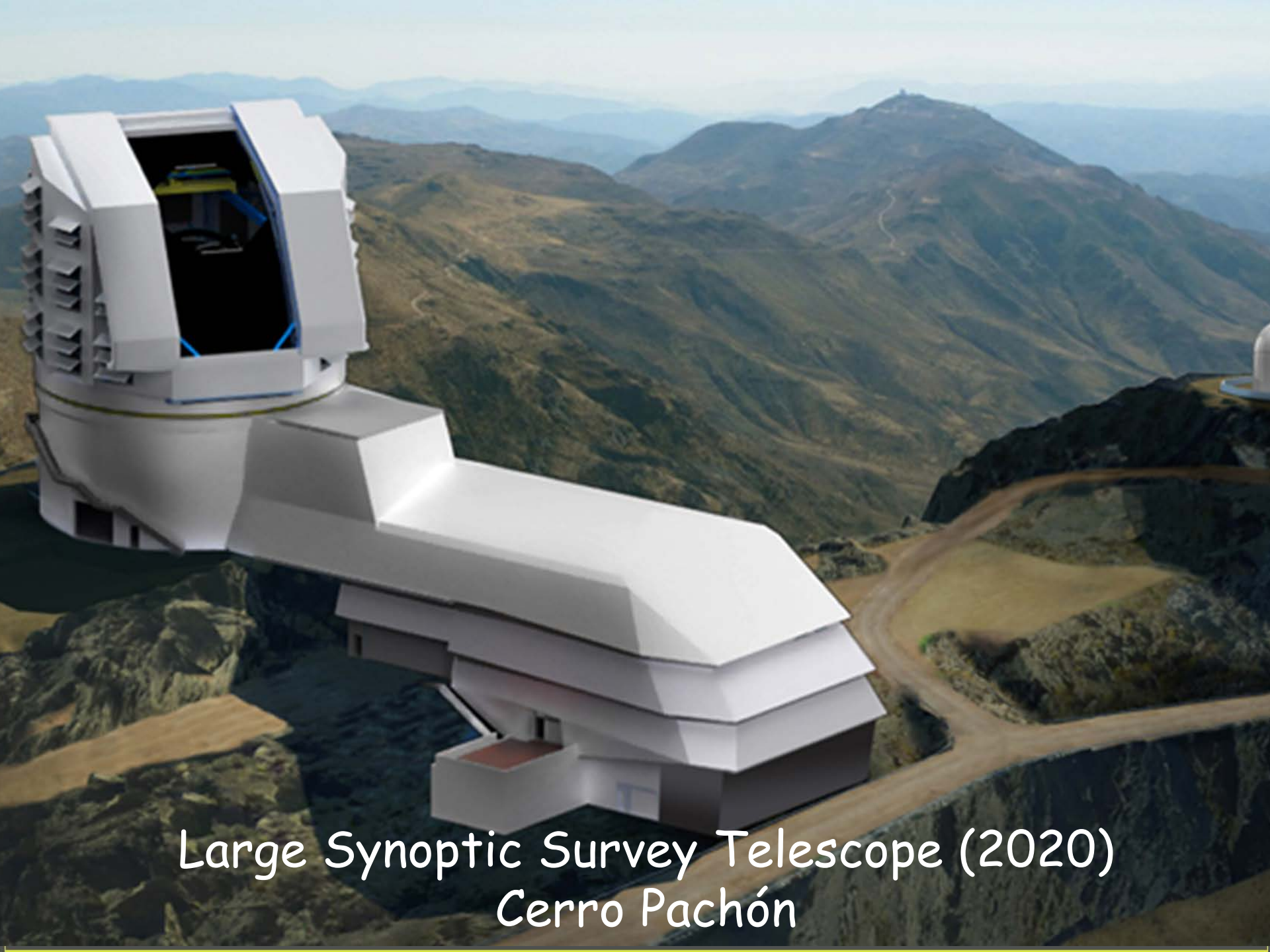
MILLENNIUM INSTITUTE OF ASTROPHYSICS (MAS)

Mario Hamuy W.
Universidad de Chile
Millennium Institute of Astrophysics

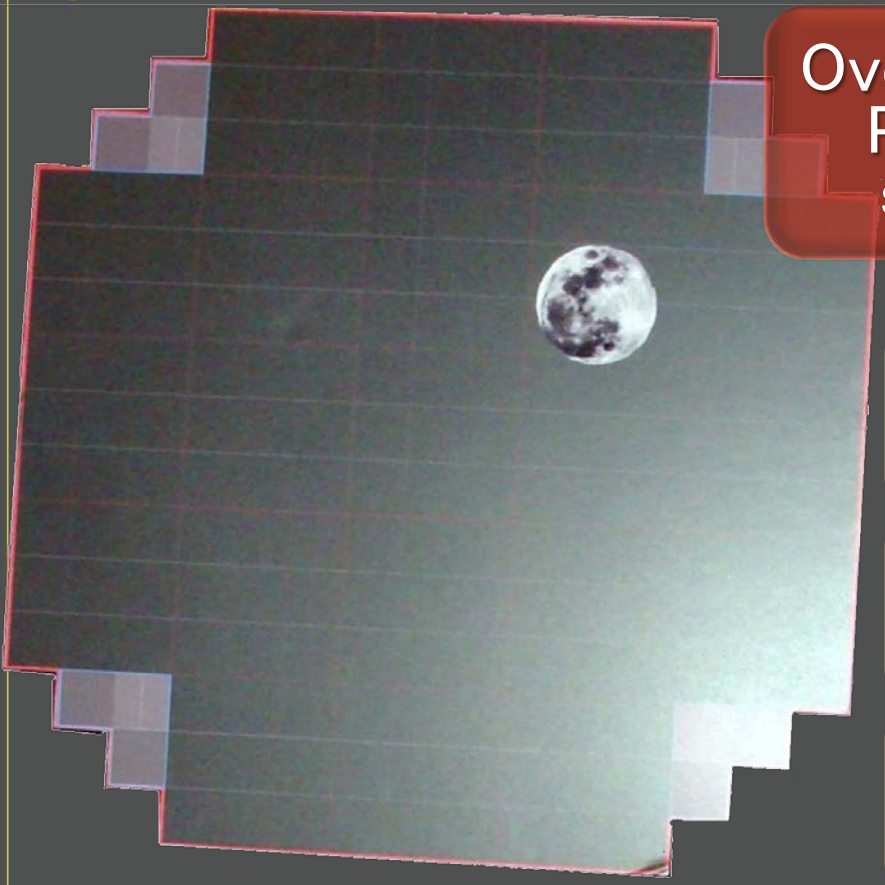
Kavli-IPMU October 15 2014


Large Synoptic Survey Telescope (2020)
Cerro Pachón

INSTITUTO MILENIO DE ASTROFÍSICA

3000 Mpix 3x3 degree field of view

All southern hemisphere in 3 days during 10 years



Over 10 years it will generate a 150 PB imaging dataset with a data stream at a rate of 2 TB/hour

LSST will produce a 3D video of the Universe

Cosmic Cinematography: Exploration of time domain

Plethora of variable phenomena: 1,000,000 transients per night

INSTITUTO
MILENIO DE
ASTROFÍSICA

Challenges for Chile

- LSST will be a discovery machine
- Access to 100% of the data
- But LSST will not do the analysis
- Need to develop efficient algorithms to filter relevant information

Millennium Institute of Astrophysics

INSTITUTO MILENIO DE ASTROFÍSICA

MAS was created with a funding horizon of 10 years in order to cope with the new paradigm of data-driven astronomy

Iniciativa Científica Milenio
Ministerio de Economía, Fomento y Turismo
Gobierno de Chile

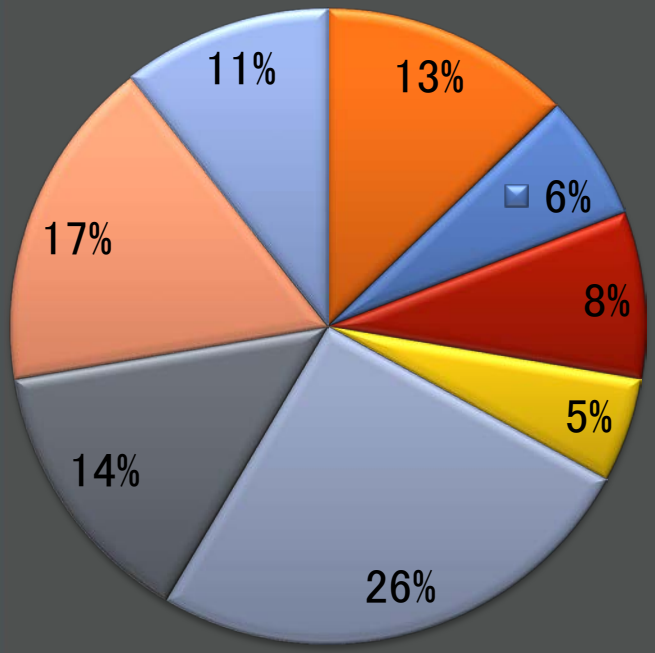
Interdisciplinary effort (Astrophysics, Statistics, Informatics) focused in Time Domain Astronomy to exploit a new dimension of the exploration of the Universe

INICIATIVA CIENTIFICA MILENIO
ICM

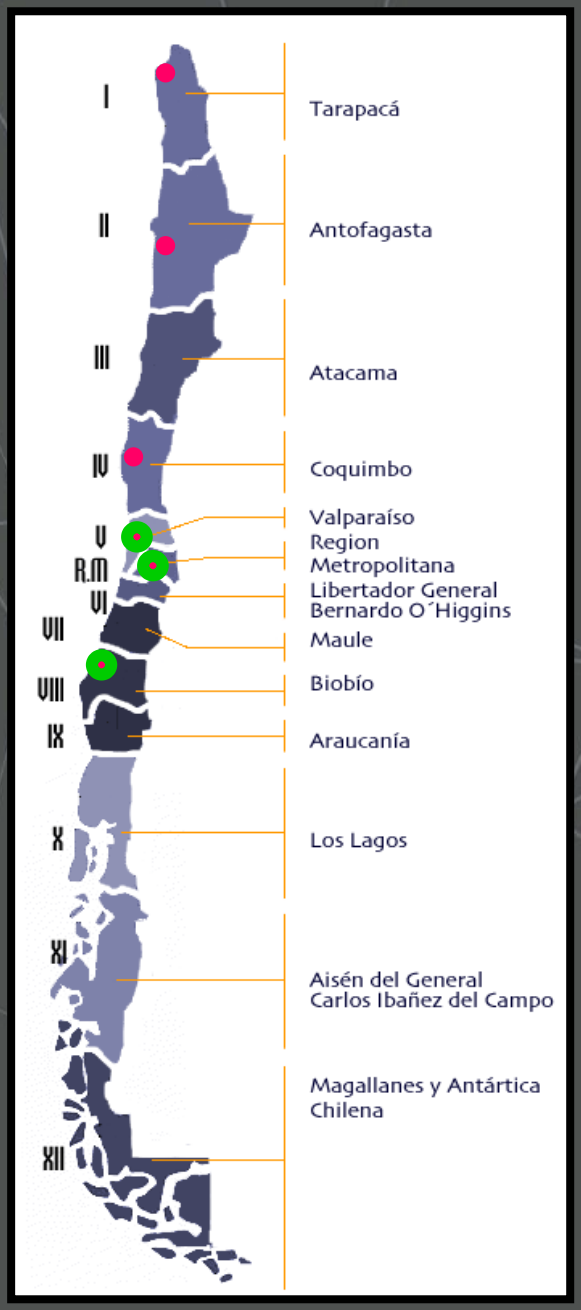
The main goal is to prepare the Chilean community for the challenges posed by the avalanche of data that will be come from LSST and other future, large scale surveys.

INSTITUTO MILENIO DE ASTROFÍSICA

MAS Community
97 researchers



- Investigadores Asociados
- Investigadores Adjuntos
- Investigadores Jóvenes
- Investigadores Senior
- Postdoctorados
- Doctorandos
- Master
- Pregrado



INSTITUTO
MILENIO DE
ASTROFÍSICA

MAS Host Institutions

Organization

INSTITUTO MILENIO DE ASTROFÍSICA

Executive Committee

Director
Dr. Mario Hamuy

Deputy Director
Dr. Dante Minniti

Supernovae
Dr. Giuliano Pignata

Milky Way and Local Group
Dr. Márcio Catelan

Transients
Dr. Andrés Jordán

Astrostatistics and Astroinformatics
Dr. Pablo Estévez

Outreach
Dr. Alejandro Clocchiatti

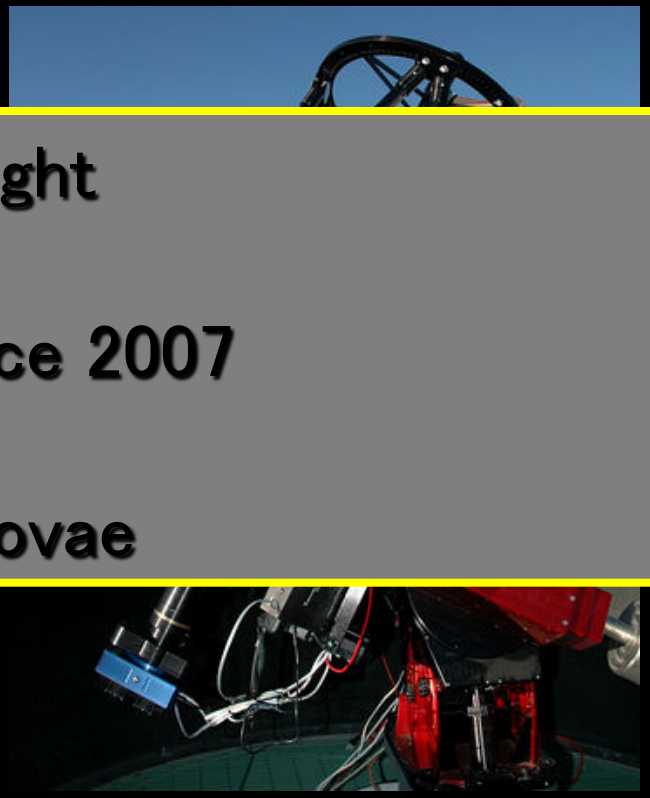
Networking
Dr. Jordanka Borissova

Executive Director
Marcela Valle

CHASE - Chilean Automatic Supernova sEarch

(PI G. Pignata)

6x40 cm telescopes on Cerro Tololo (down to 19th mag)
Targeted optical survey of 5500 pre-selected galaxies
1-7 days cadence
Full Data processing in < 12 hours + Daily inspection

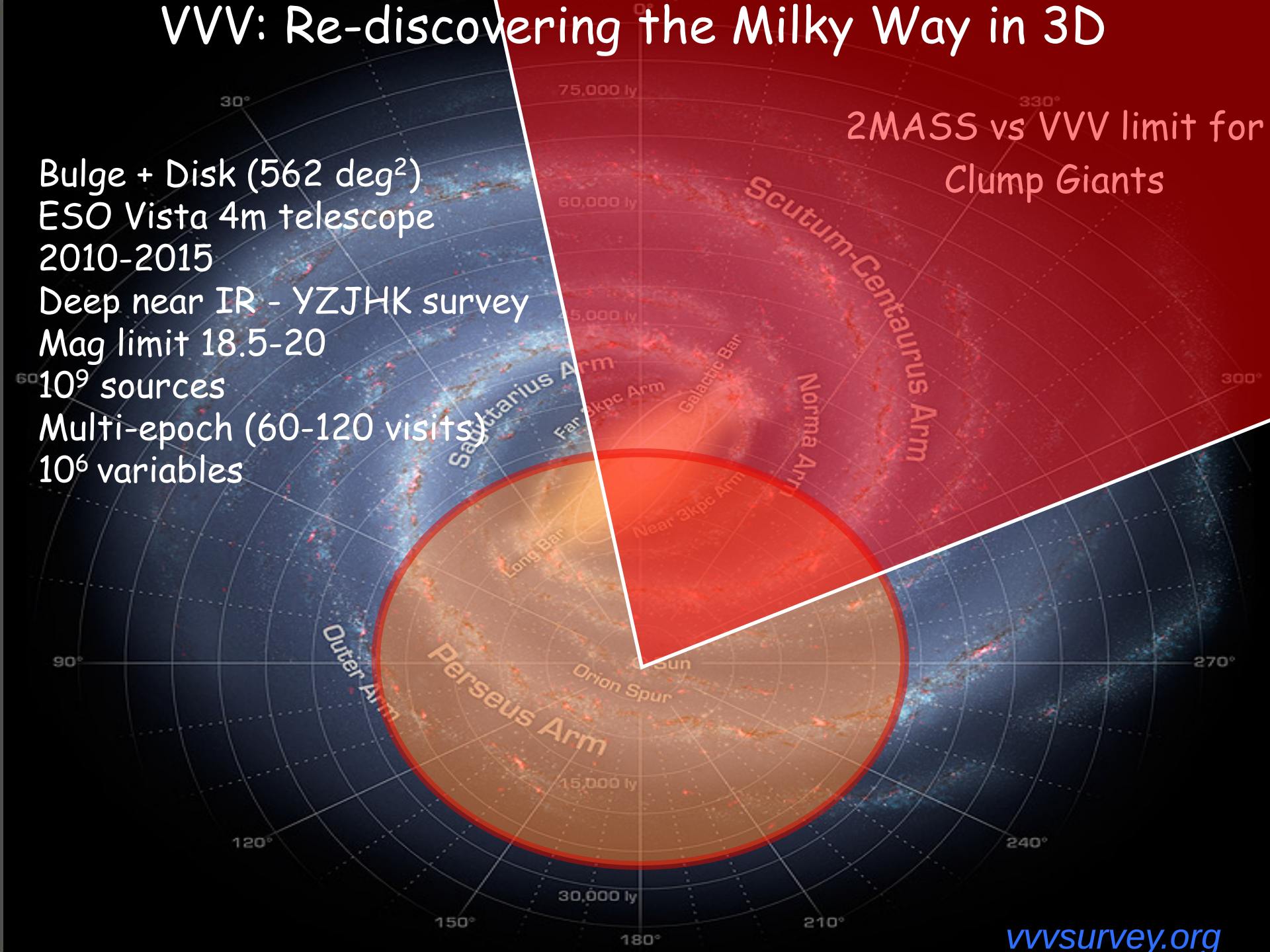


560 images per night

1,500,000+ images since 2007

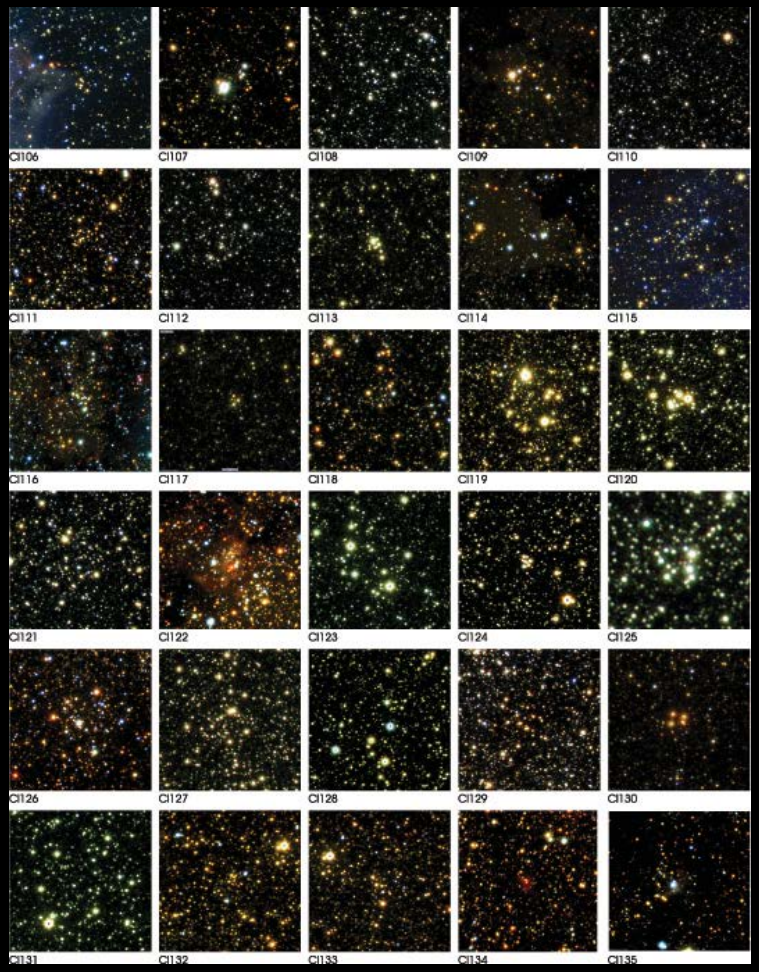
205 nearby supernovae

VVV: Re-discovering the Milky Way in 3D

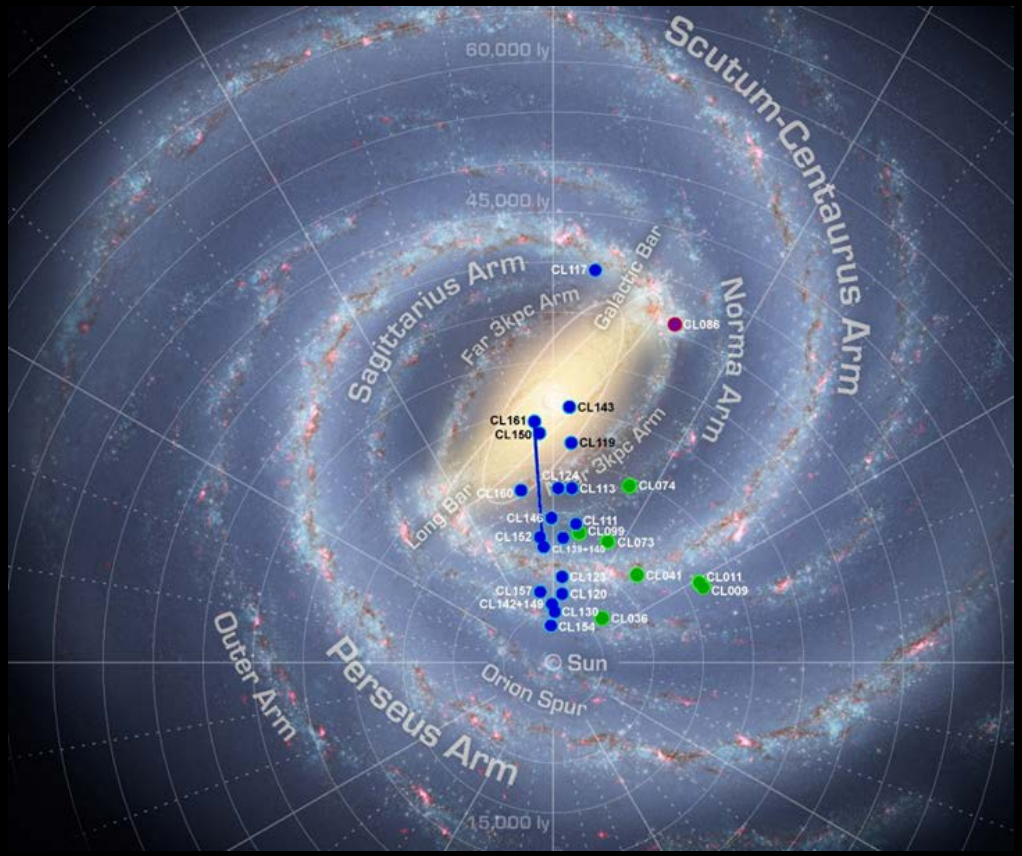


New Galactic star clusters discovered by VVV

58 new star clusters discovered in the inner 10 degrees around Galactic center using VVV (Borissova et al. 2014)



Color composed J, H, Ks images of the newly discovered clusters



Positions of the clusters

ASAS-SN (All-Sky Automated Survey for Supernovae)

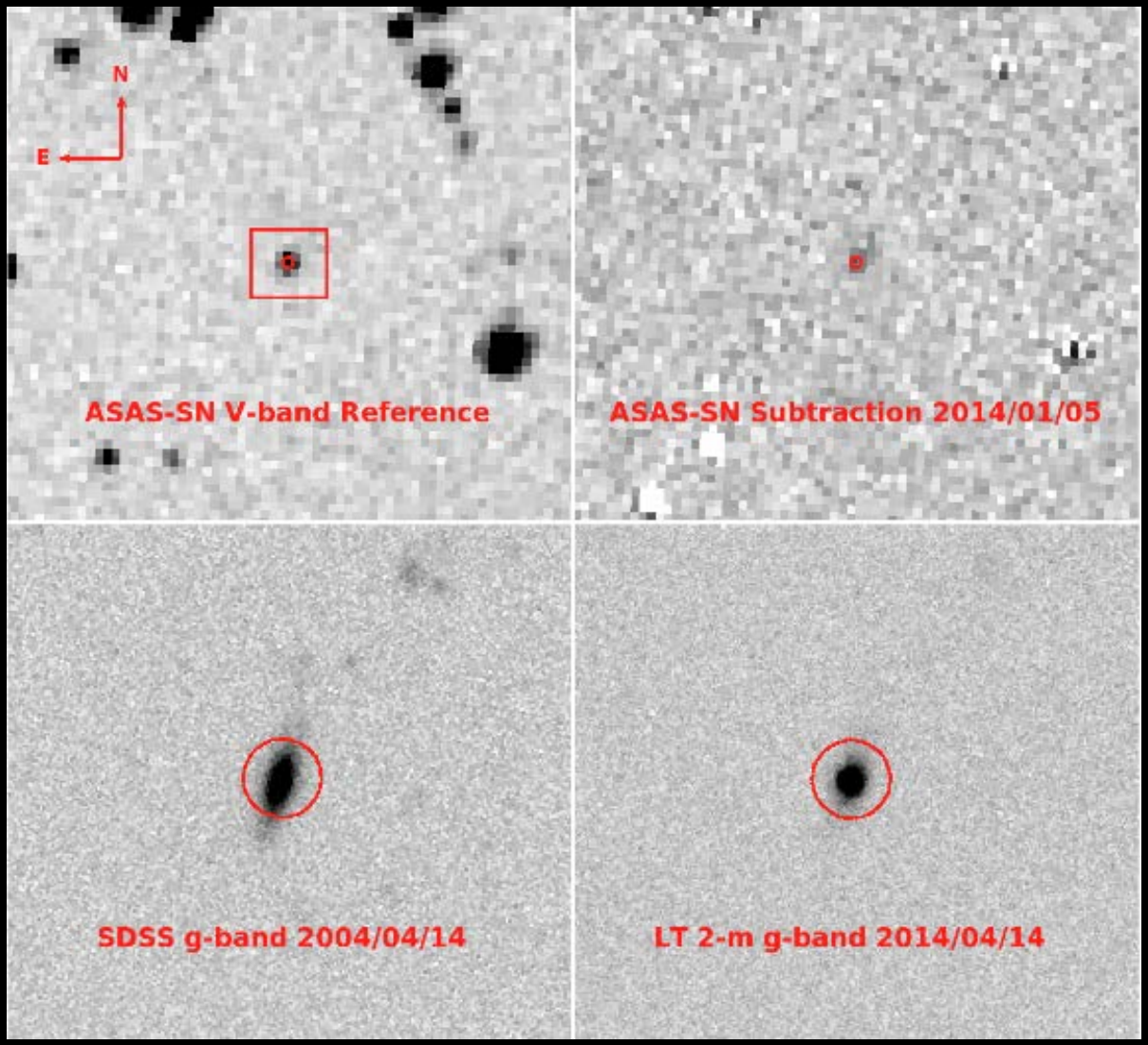
Kochanek, Prieto, et al.

6x14 cm telescopes on Haleakala and Cerro Tololo
Blind optical survey - 15,000 deg^2
down to 17th mag
7.5 arcsec / pixel
2 nights cadence
2014-
50% of all nearby supernovae

http://www.astronomy.ohio-state.edu/~assassin/index.shtml

ASAS-SN Discovery of a tidal disruption of a star by a super massive black hole

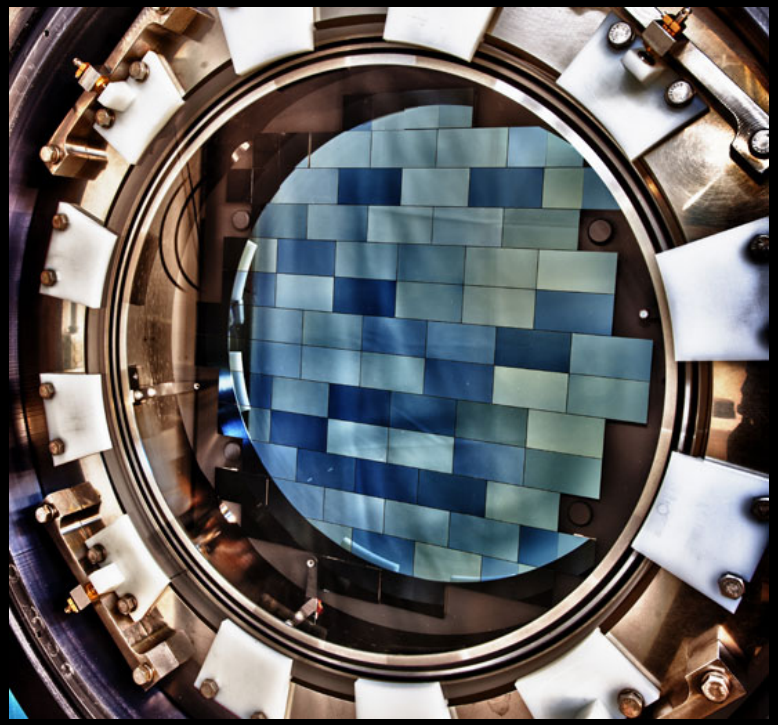
Holoien (Ohio State U.), Prieto (MAS/UDP), et al., MNRAS, 2014



HITS (High Cadence Transient Survey)

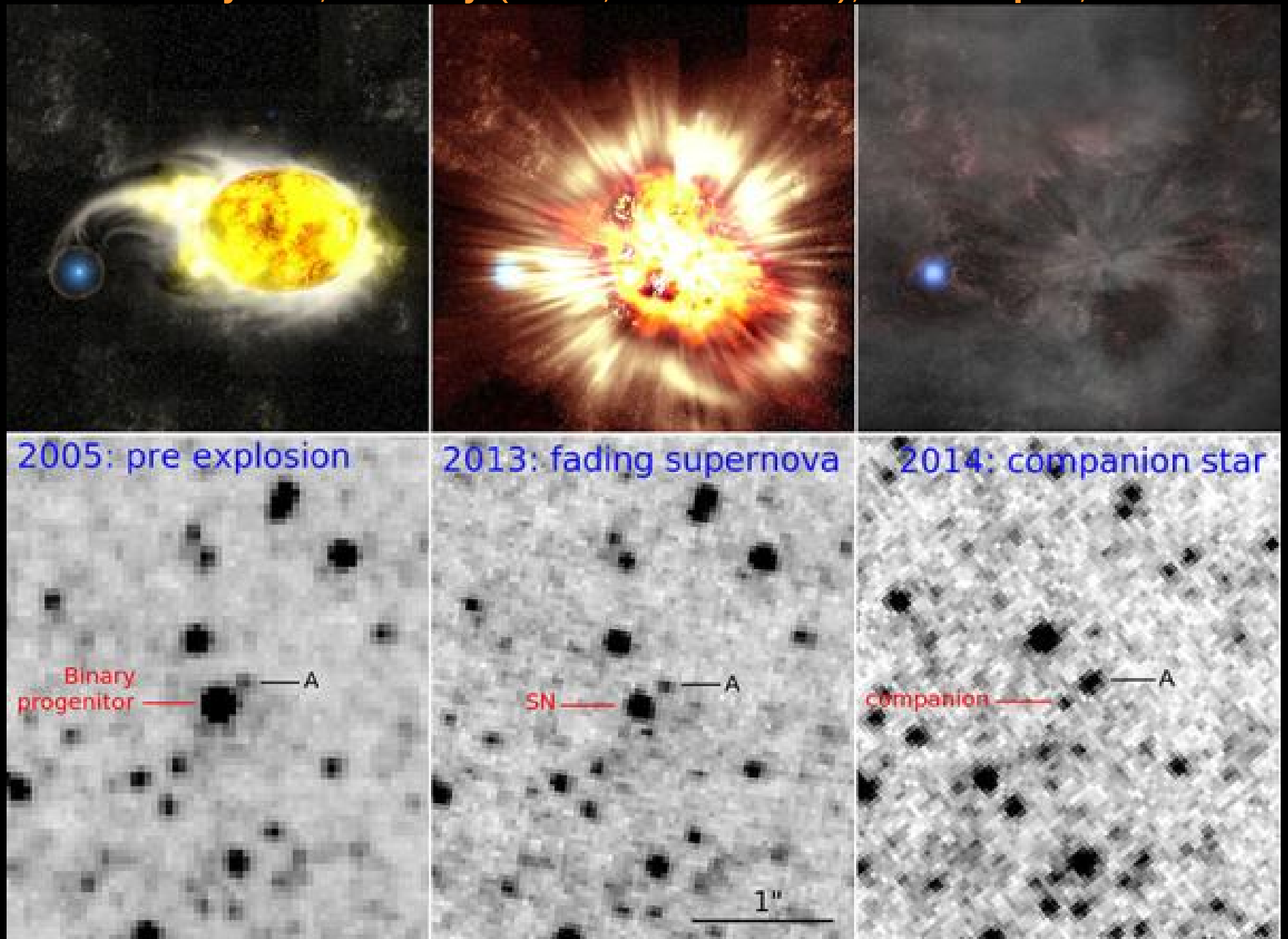
(PI F. Forster)

Cerro Tololo 4m telescope + DECam
Blind optical survey - 120 deg^2
0.27 arcsec/pix
down to 25th mag
2 hours cadence – 5 nights
2013-



Japan-Chile collaboration
Discovery of progenitor system for the hydrogen poor SN 2011dh

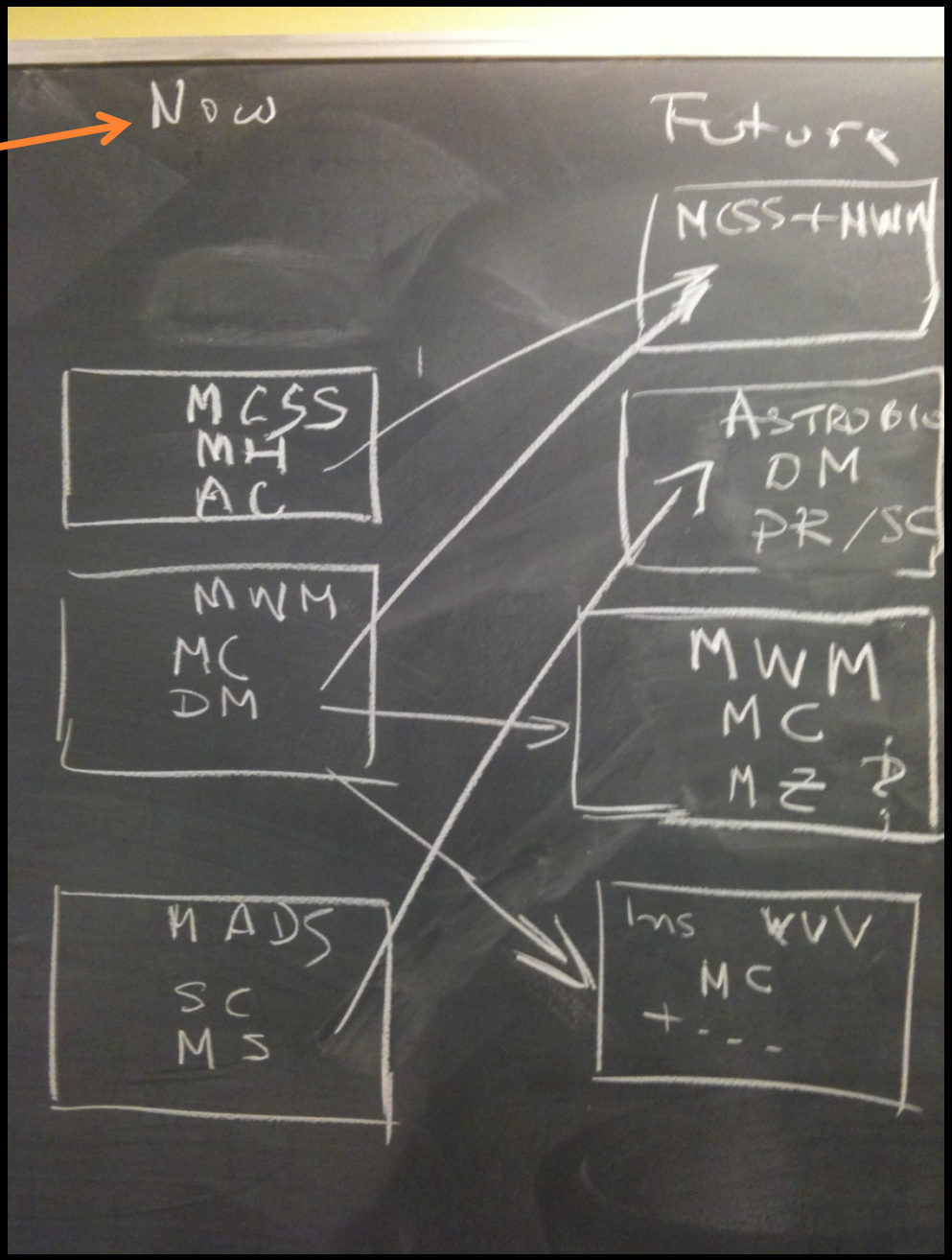
Folatelli, Bersten, Maeda, Nomoto (Kavli-IPMU, U. Tokyo, Kyoto U.)
Kuncarayakti, Hamuy (MAS, U. de Chile), et al. ApJL, 2014



First MAS Workshop (Aug 7-8)

From MCSS to MAS: The IPMU blessing

December 2012




Millennium Institute of Astrophysics