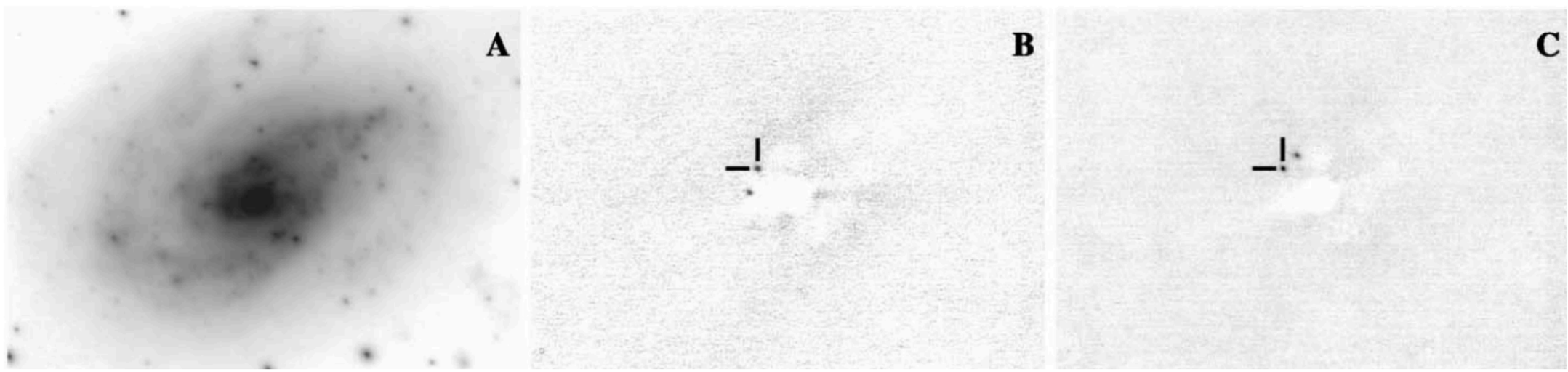
The landscape of near-IR time domain astronomy

Kishalay De
Caltech

Infrared transients and surveys

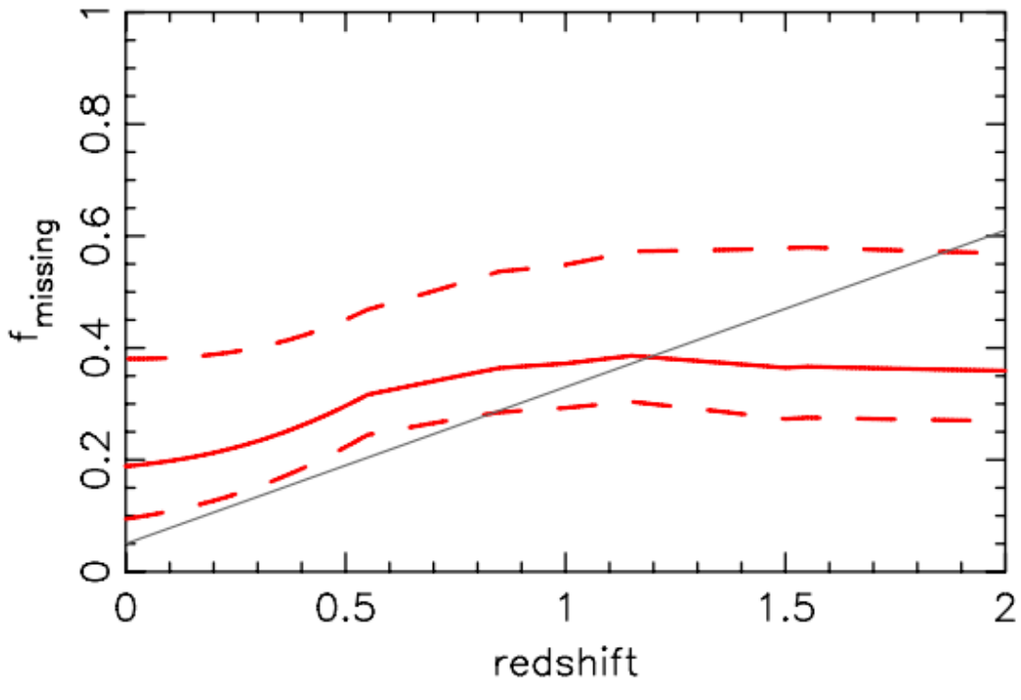
Targeted surveys of nearby dusty LIRGS



VLT Ks-band detection of SN in IRAS 18293-3413 (~ 40 mag extinction?)

Mattila+ 2007

Also done with Spitzer observations and VLBI

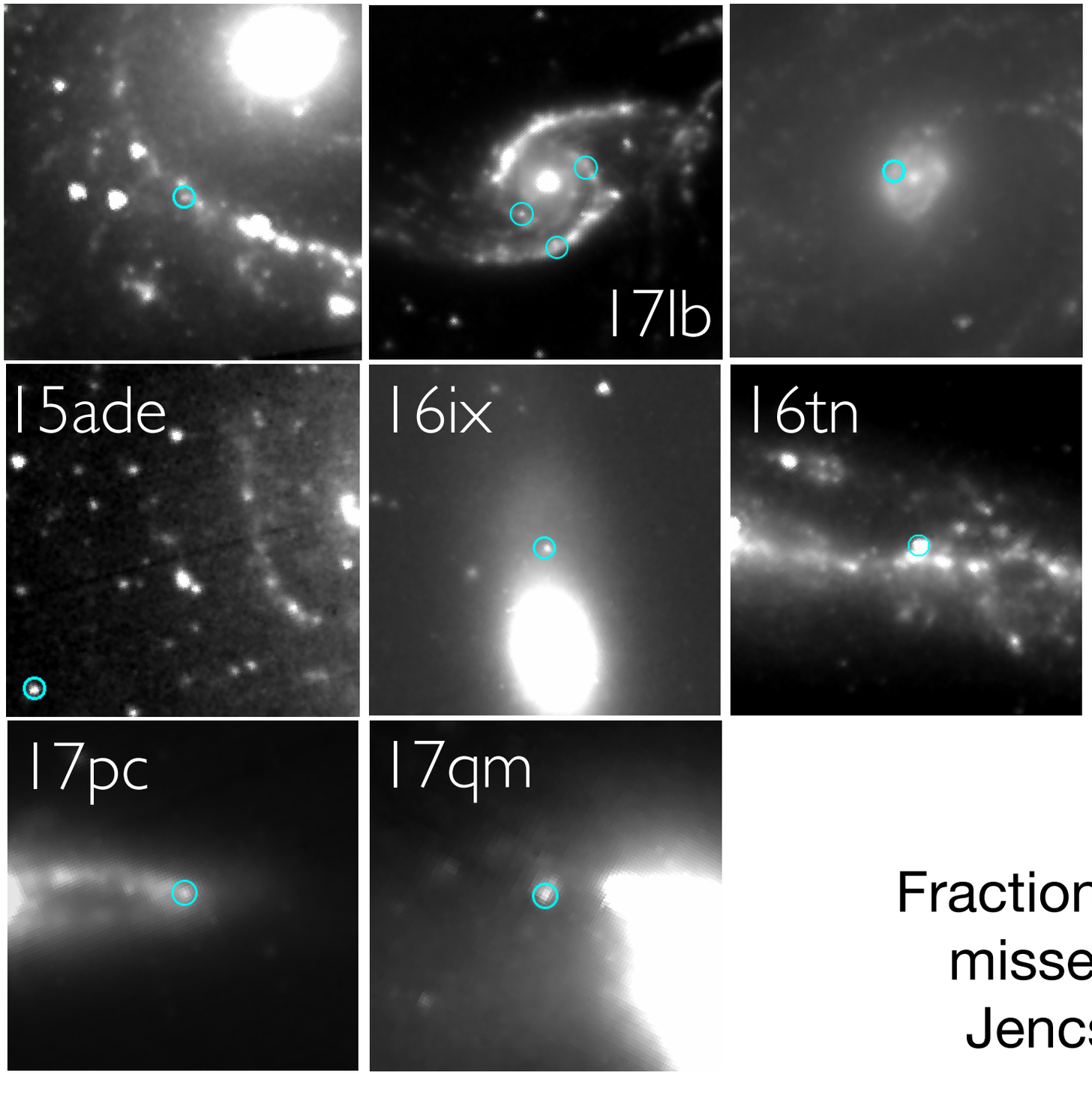


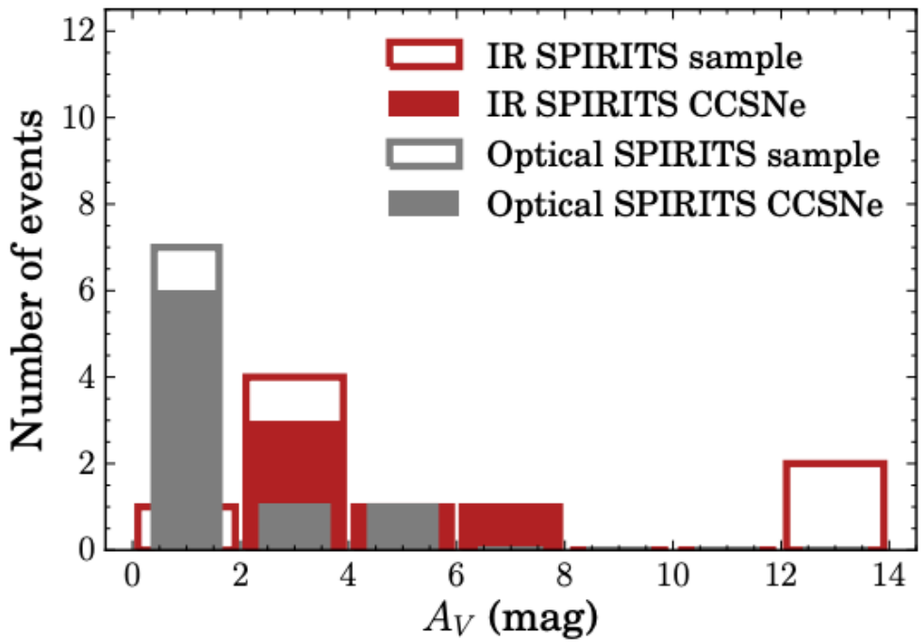
SN missing fraction as function of redshift

Mattila+ 2012

Infrared transients and surveys

SPIRITS : Spitzer time domain survey of nearby star-forming galaxies



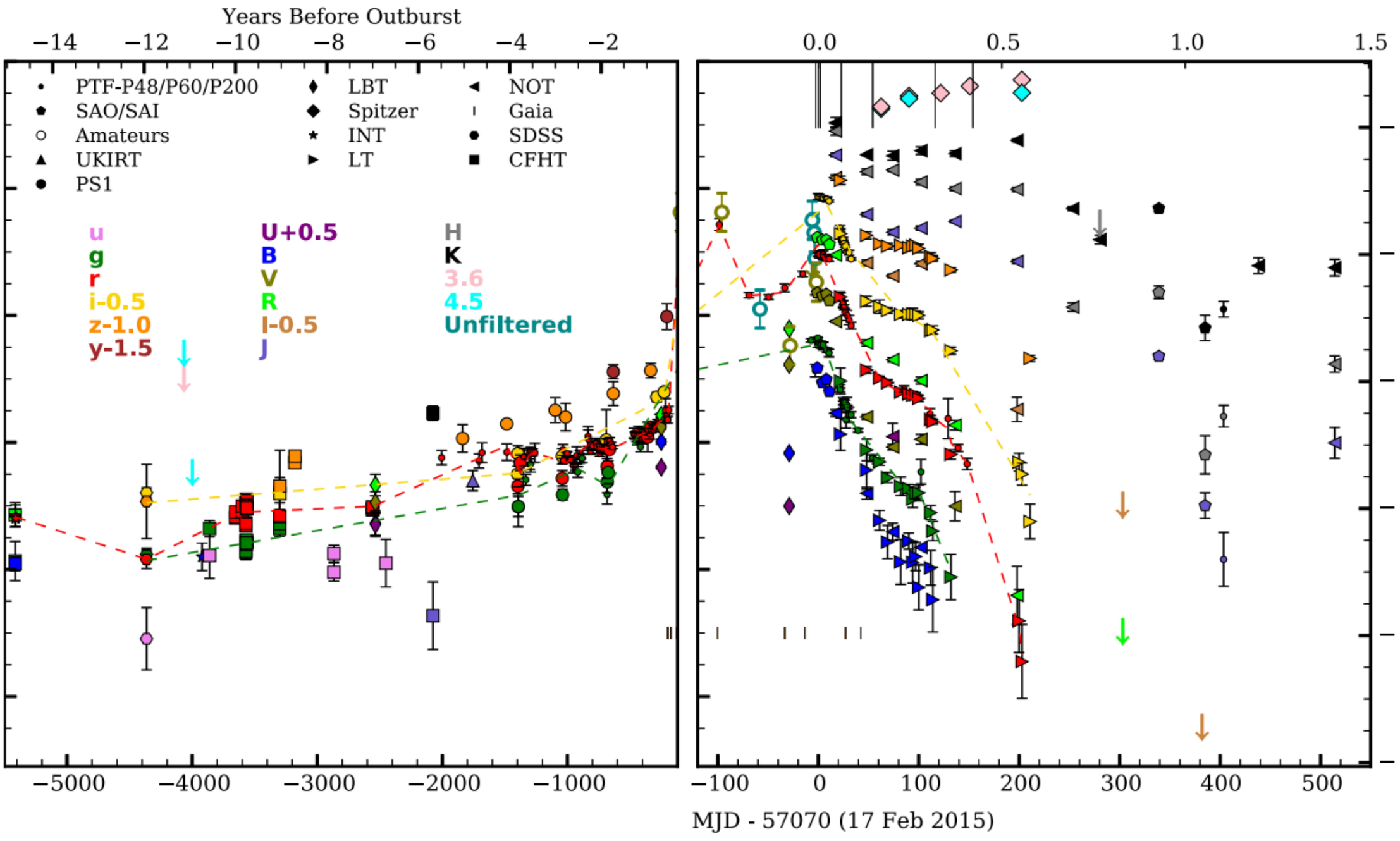


Extinction distribution of optical and infrared discovered transients

Fraction of core-collapse supernovae missed in nearby galaxies ~ 40%
Jencson+ 2019, Kasliwal+ 2017

Infrared transients that are not supernovae

Luminous red novae

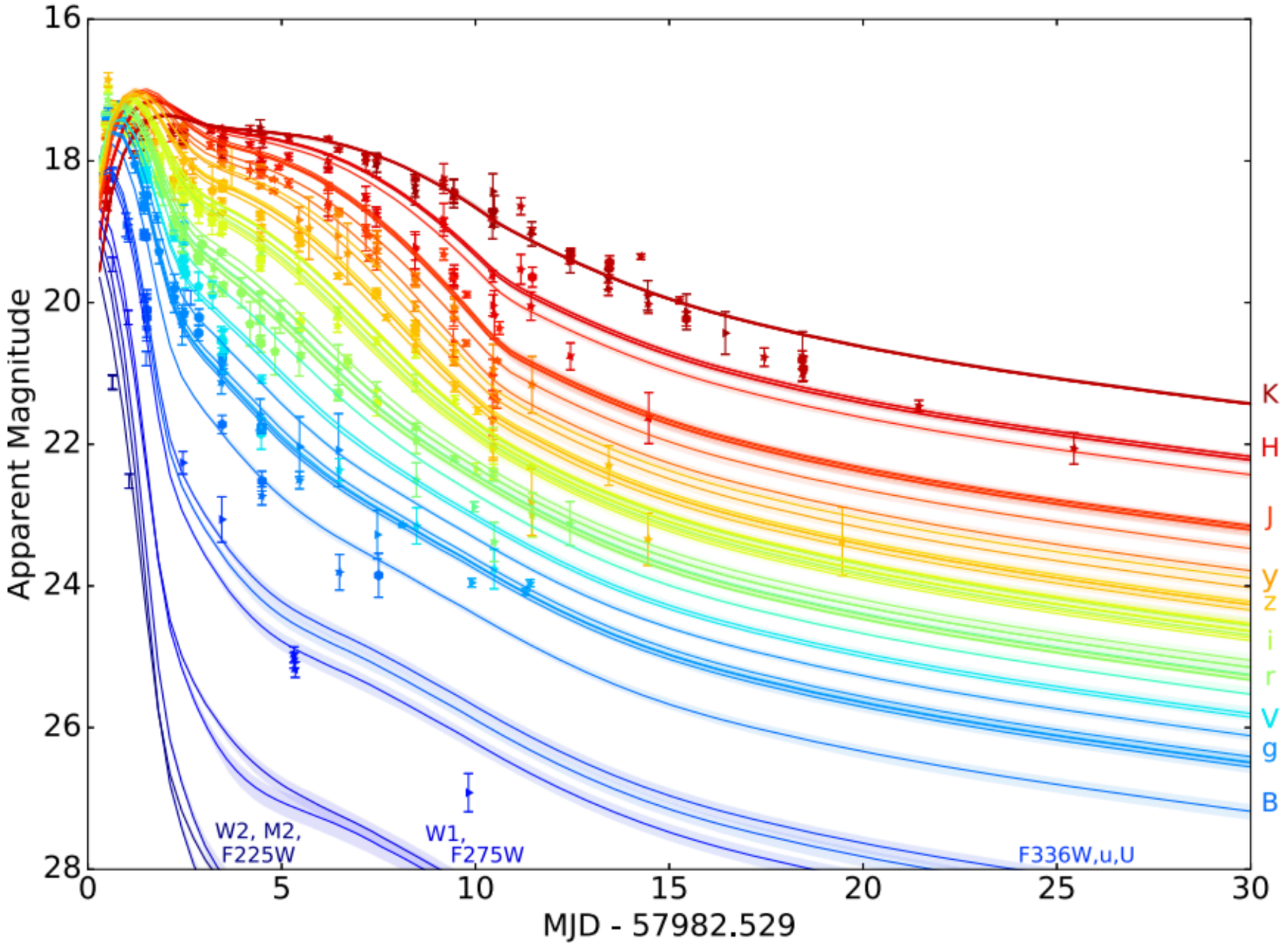


Multi-color light curves of M101-OT

Blagorodnova+ 2017

Infrared transients that are not supernovae

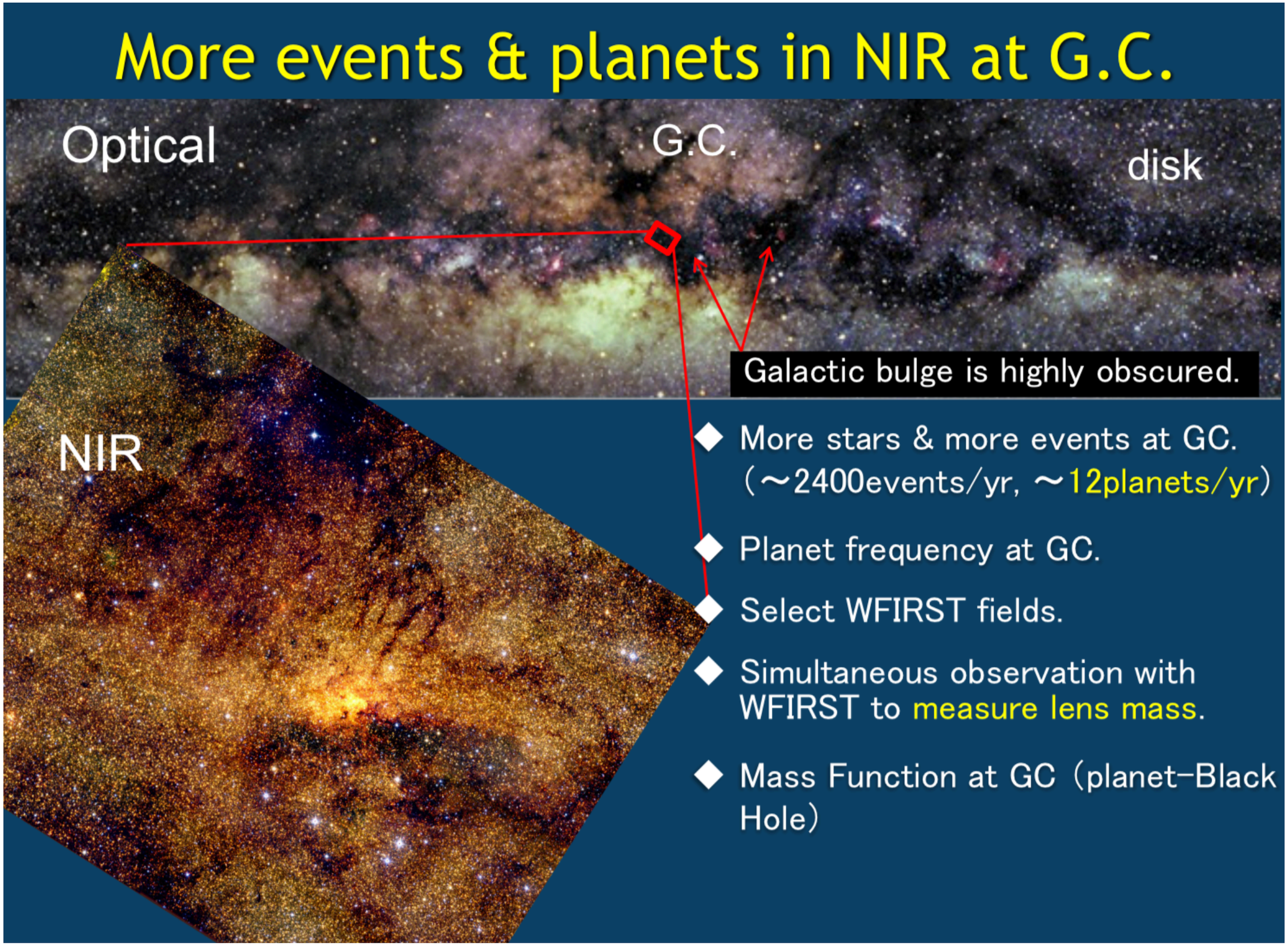
Infrared emission ubiquitous in kilonova models



Long-lived infrared emission from GW170817

Villar+ 2017

Infrared variability



Takahiro Sumi

Infrared transient surveys

What would you do with a wide-field, shallow near-infrared transient survey?

Lessons from optical wide-field surveys? (PTF, ASASSN, ATLAS, ZTF ..)

Infrared transient surveys

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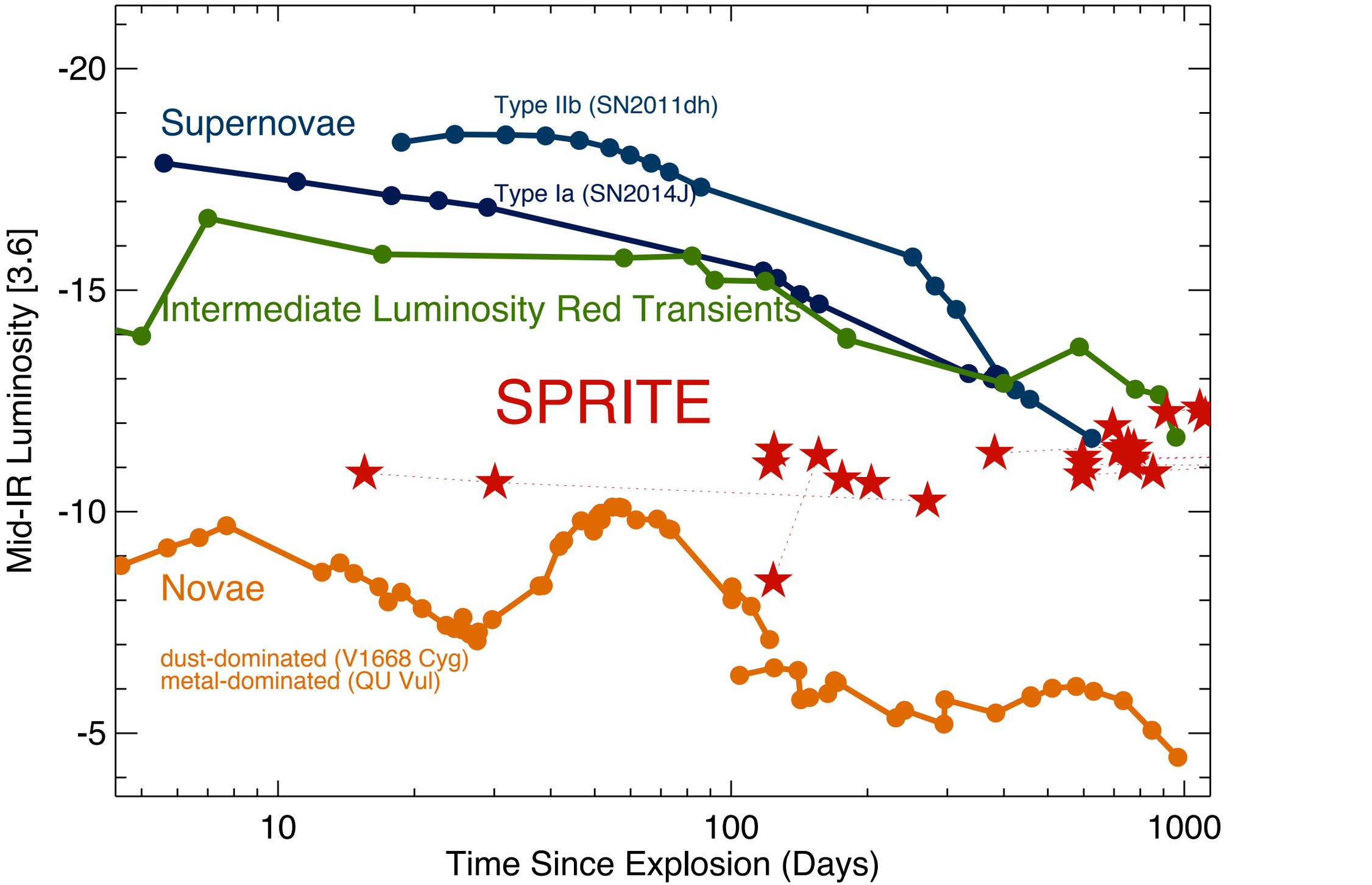
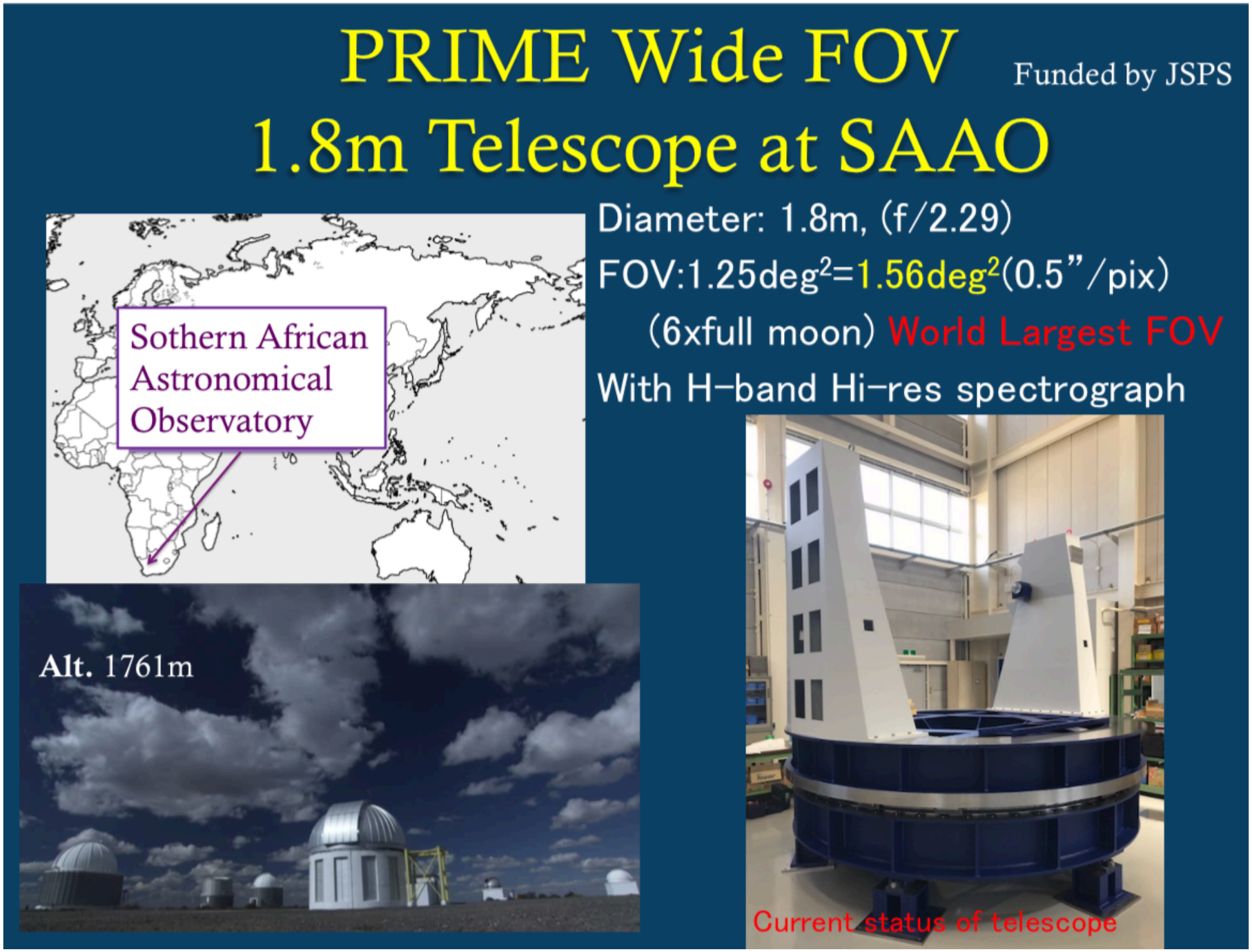
“New phase space”: Is there a population of infrared transients missed in the optical?

Results from SPIRITS



Kasliwal+ 2017

Current and near-future facilities



Takahiro Sumi

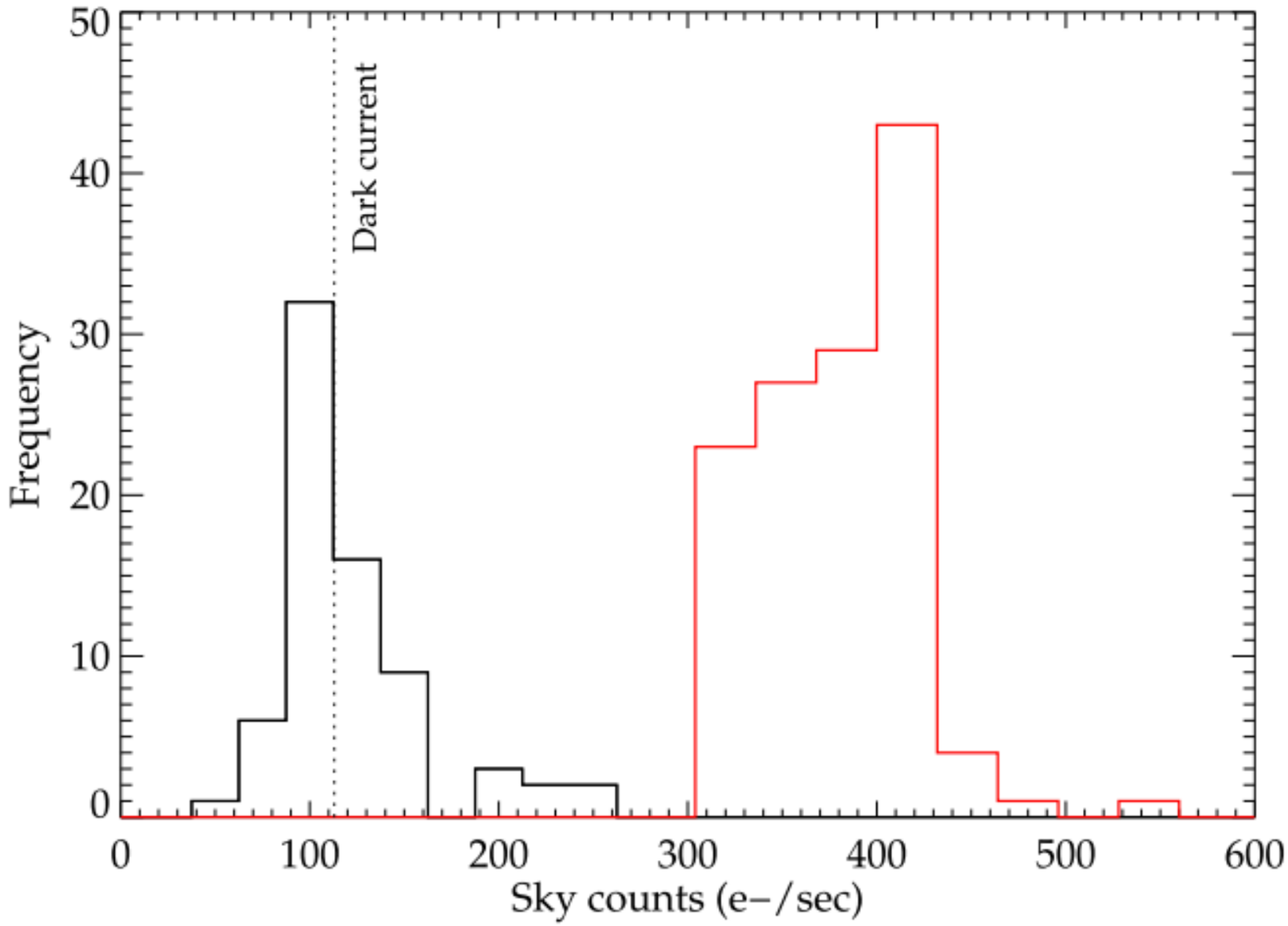
Transient survey proposed in off-bulge season (T. Moriya)

Current and near-future facilities

30 cm telescope, 25 square degree field of view in J band
Limiting magnitude ~ 16 AB mag
2 night cadence over entire sky. **Operational now.**

Advances in detector technology

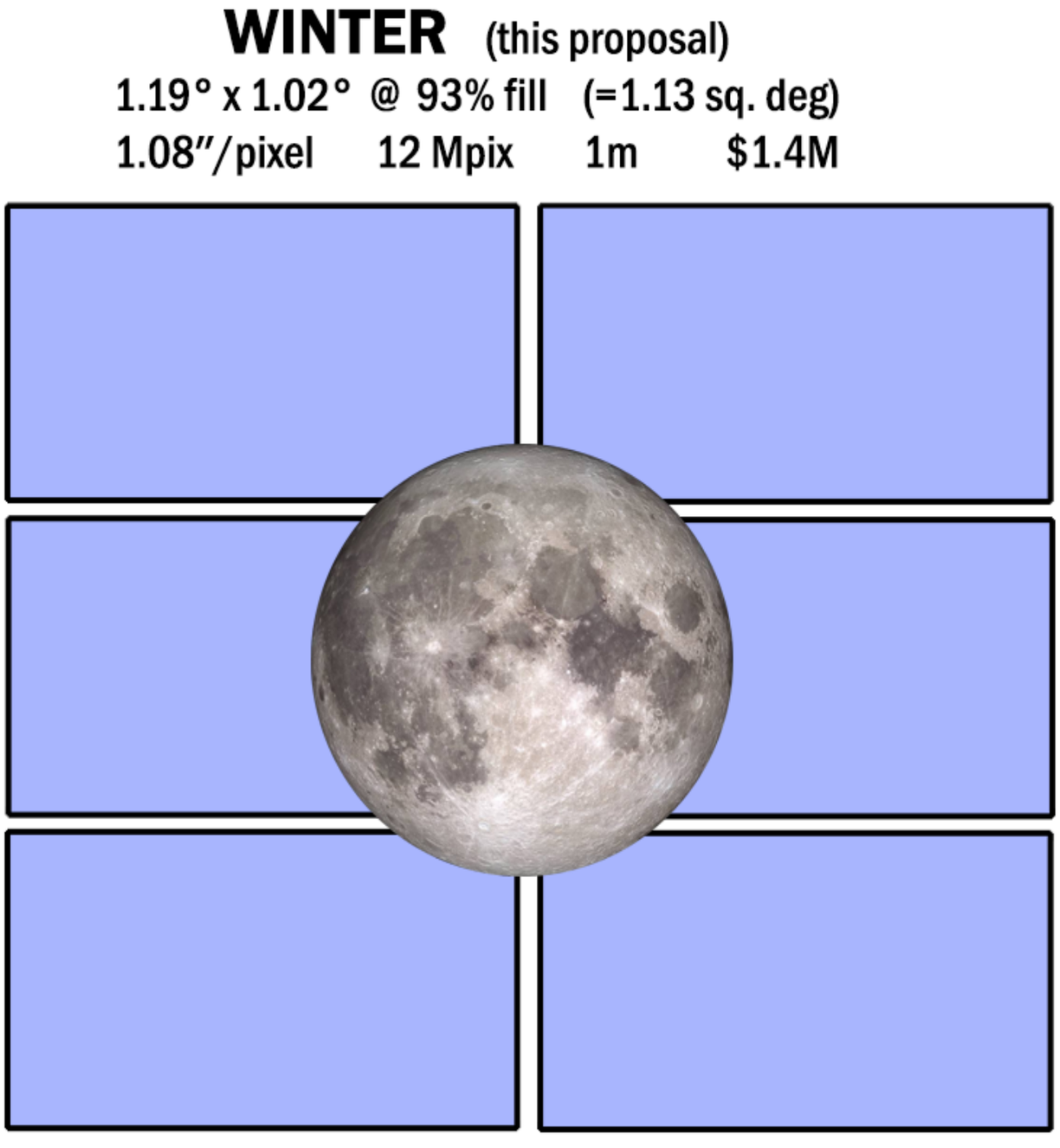
Warm InGaAs detectors (-40 C) as an alternative to cooled H2RG detectors.
Half the cost of H2RG detectors per pixel



Comparison of dark current (black dotted line) to sky background level in Y and J band

Simcoe+ 2019

Current and near-future facilities



- 1.2 sq. deg. y+J+H camera
- 1 m telescope at Palomar
- Single visit depth J ~ 19.2 mag
- **Just funded, first light Summer 2020**
- Synergy with PRIME?

PIs: Simcoe, Kasliwal and Furesz

Transient follow-up and classification

Once you find a near-infrared infrared transient missed in optical surveys, how do you classify it?

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Synergy with MMS facilities

For shallow wide-field surveys (e.g. Gattini-IR), optical MMS facilities may be well matched in depth