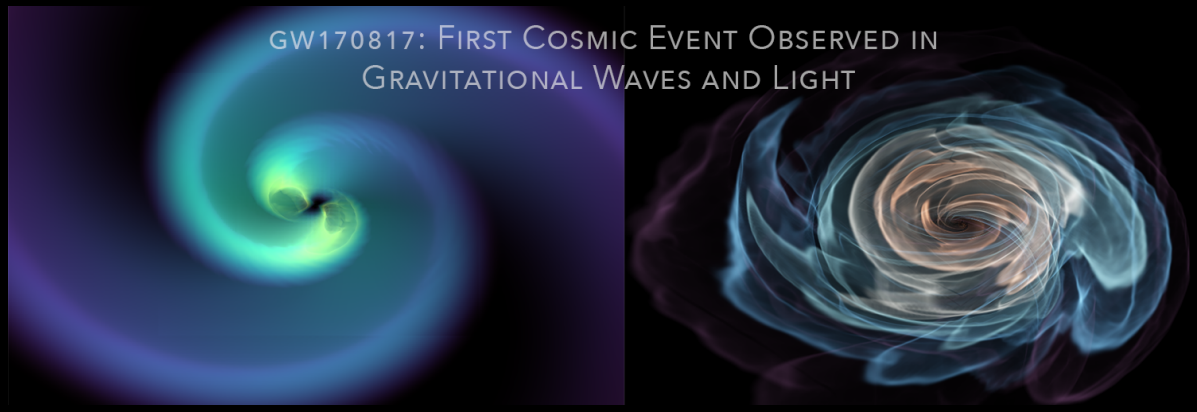


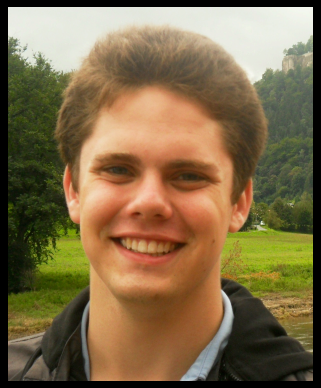
Mansi M. Kasliwal

ASSISTANT PROFESSOR OF ASTRONOMY

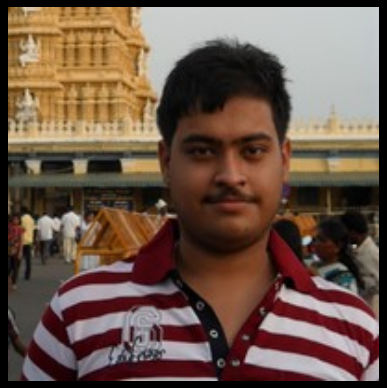
CALIFORNIA INSTITUTE OF TECHNOLOGY

CALIFORNIA INSTITUTE OF TECHNOLOGY 1891 · NSF · NASA · MOUNT CUBA ASTRONOMICAL FOUNDATION · HEISING-SIMONS FOUNDATION · the David & Lucile Packard FOUNDATION

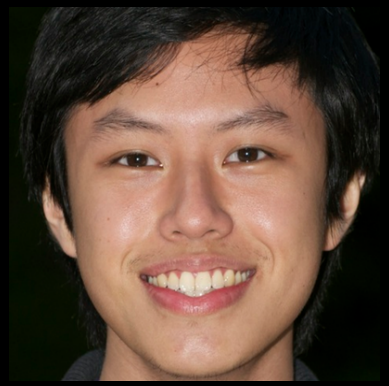
Kasliwal Research Group



Jacob Jencson
(Grad, 5th Year)



Kishalay De
(Grad, 3rd Year)



Samaporn Tinyanont
(Grad, joint w/ Mawet)

Shreya Anand
(Grad, joint w/ Weinstein)

Scott Adams
(Postdoc)

Matt Hankins
(Postdoc)

Christoffer Fremling
(Postdoc, joint w/ SRK)

Igor Andreoni
(Postdoc)

Alumni: Ragnhild Lunnan, Dave Cook, Ryan Lau, Nadia Blagorodnova, Stephanie Kwan, Lindsey Whitesides, Viraj Karambelkar, Chris Cannella

Multi-Messenger Astrophysics Discovery Engines

Gravitational Waves: LIGO, Virgo, LIGO-India, Kagra, LISA, PTA

Neutrinos and UHECRs: Icecube, Pierre Auger, Antares, SuperK

Optical: Evryscope, ASASSN, HATPI, ZTF, KMTNet, CSS-II, PS2, Blackgem, ATLAS, DECAM, HSC (and soon, LSST)

Gamma-Rays Fermi, Swift, Integral

X-ray: MAXI, eROSITA

Radio: LOFAR, MWA, LWA, Apertif, Meerkat, Askap, CHIME, VLASS

MISSING: Wide-field Infrared and Ultraviolet

Why Infrared Fireworks?

I. Nuclear Physics

- Heavy Element Opacity cf Kilonovae & Gravitational Waves
- Line Blanketing cf He-shell detonations cf LISA GW

II. Enshrouded Stellar Fates

- Milky Way Dust cf Galactic Supernova & Neutrinos
- Mass-loss self-obscuration cf core-collapse supernovae

III. Cool Explosions

- Birth of Stellar Black Holes
- Stellar Mergers
- Shocks in Classical Novae

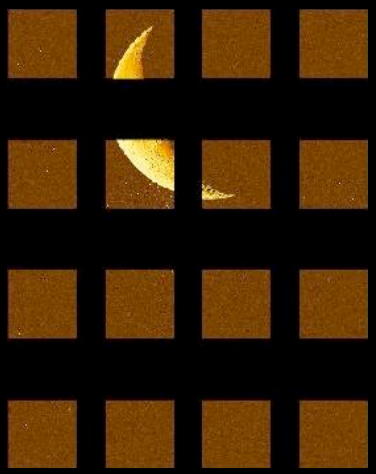
IV. The Unexpected

The Dynamic Infrared Sky is Relatively Pristine

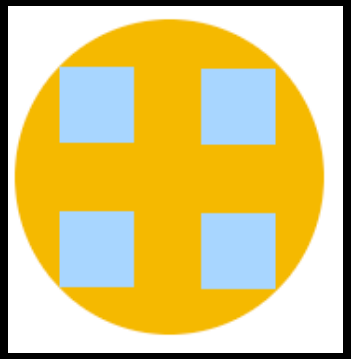
Mansi M. Kasliwal / University of Chicago Colloquium

February 27, 2019

No Wide-Field IR cameras?



VIRCAM on VISTA
0.6 deg^2 on 4m

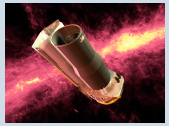
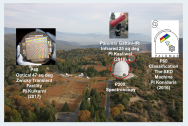
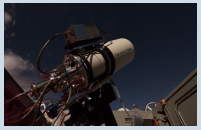
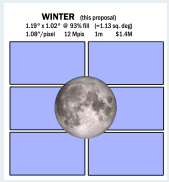


WFCAM on UKIRT
0.2 deg^2 on 4m

WIRCAM on CFH
0.13 deg^2 on 4m

Space

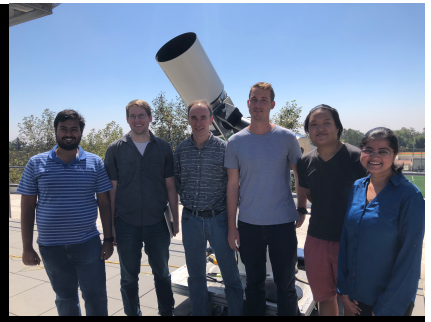
IR TDA Roadmap

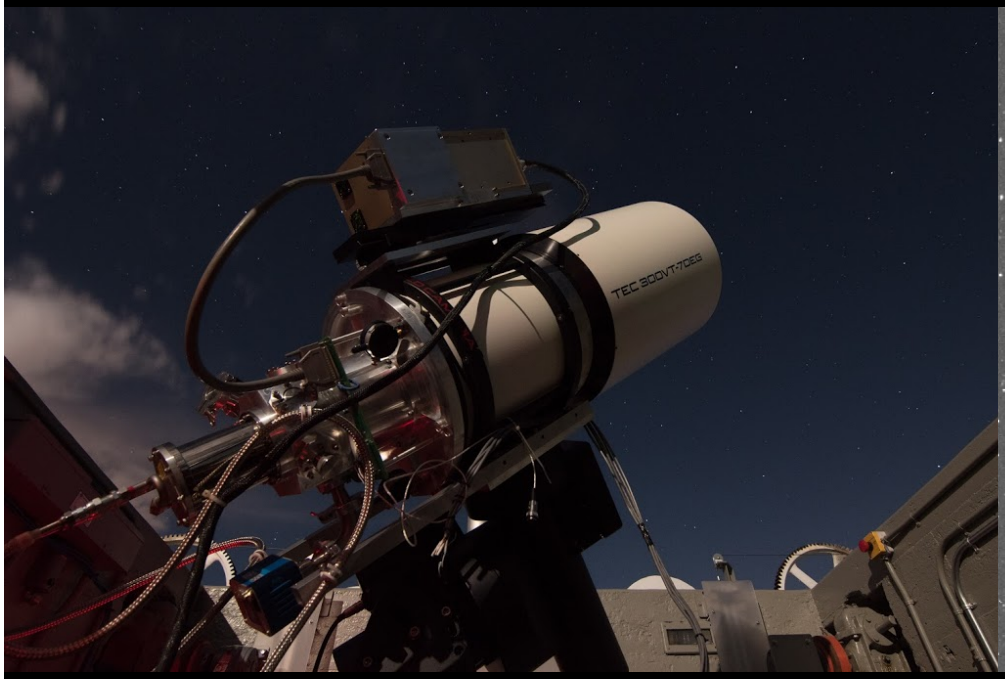
	Project	Description	Status
Phase I 	SPIRITS	Target 200 galaxies with the Spitzer Space Telescope	2014-2019 Ongoing
Phase II 	ZTF	Classify the reddest optical transients	2018-2020 Ongoing
Phase III 	Palomar Gattini-IR	15,000 sq deg every night in J-band to 16.4 mag	Sep 11, 2018 First Light
Phase IV 	WINTER	1 sq deg yJH camera on a 1 meter telescope	Summer 2020 Just Funded

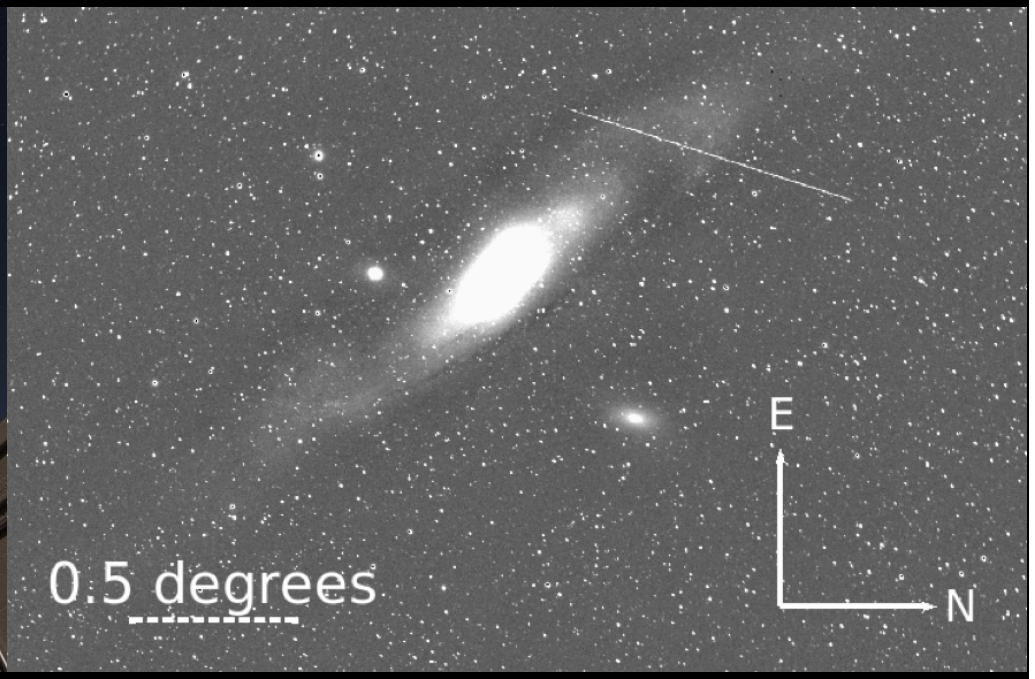
And then perhaps, go to a Polar Location or Space…

Palomar Gattini-IR:

Opening up the dynamic infrared sky



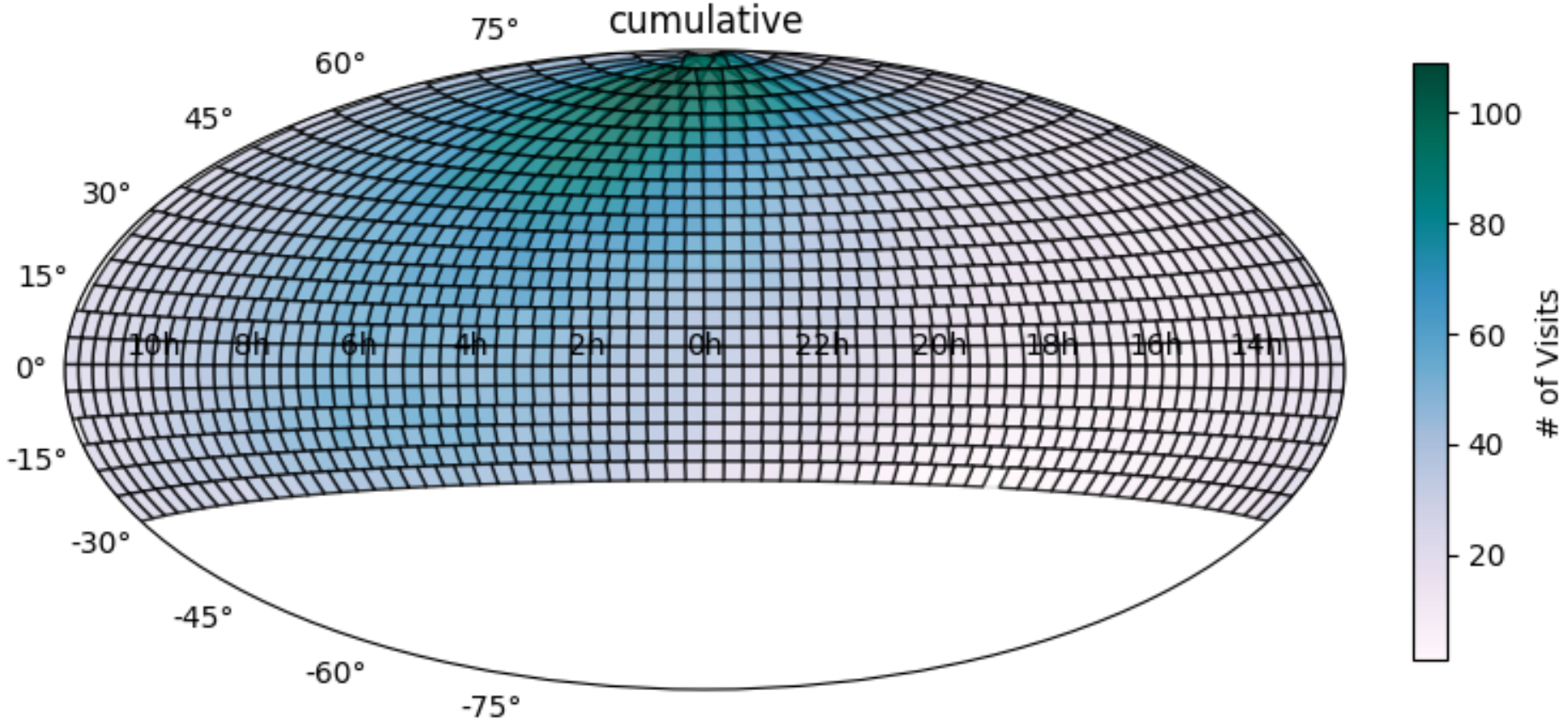




A robotic 30cm telescope with a 25 sq deg FoV camera
Surveys 9,000 sq deg to J < 15.4 mag every single night!
In partnership with Anna Moore (ANU)

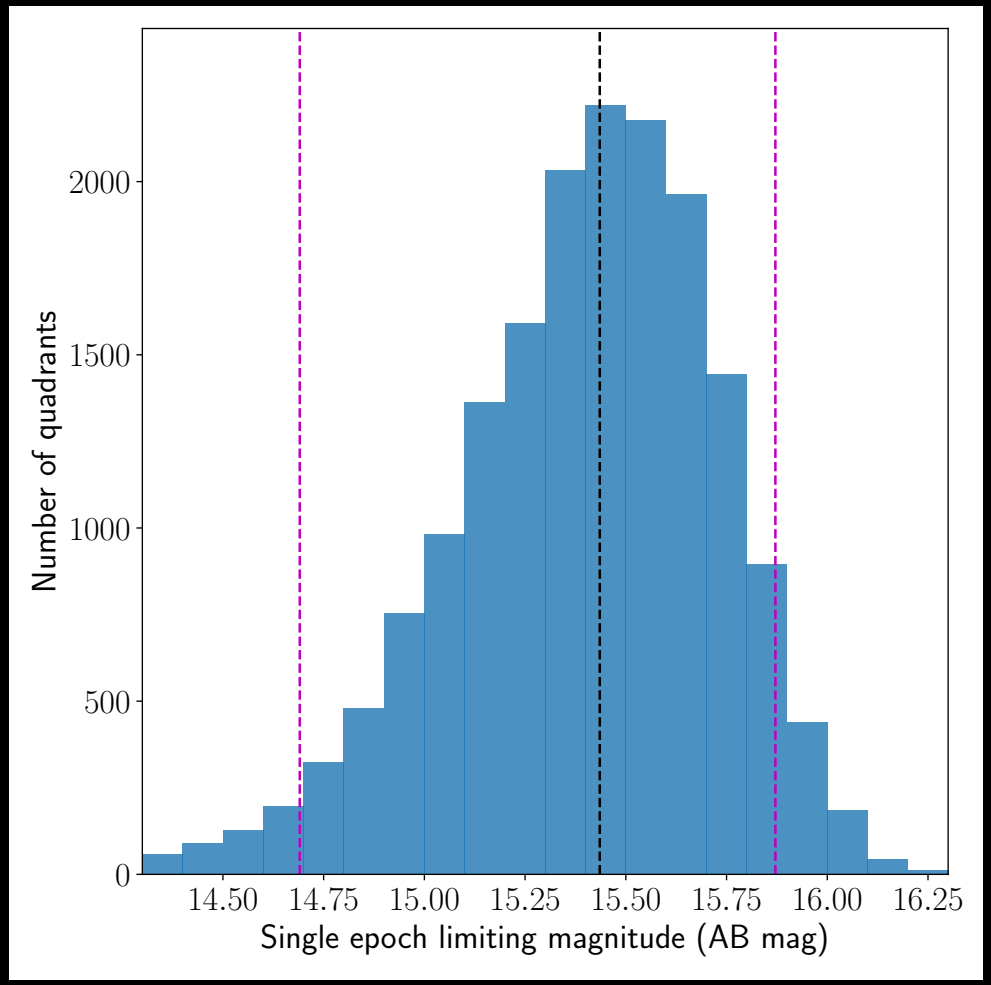
First light: September 11, 2018

Sky Coverage to date

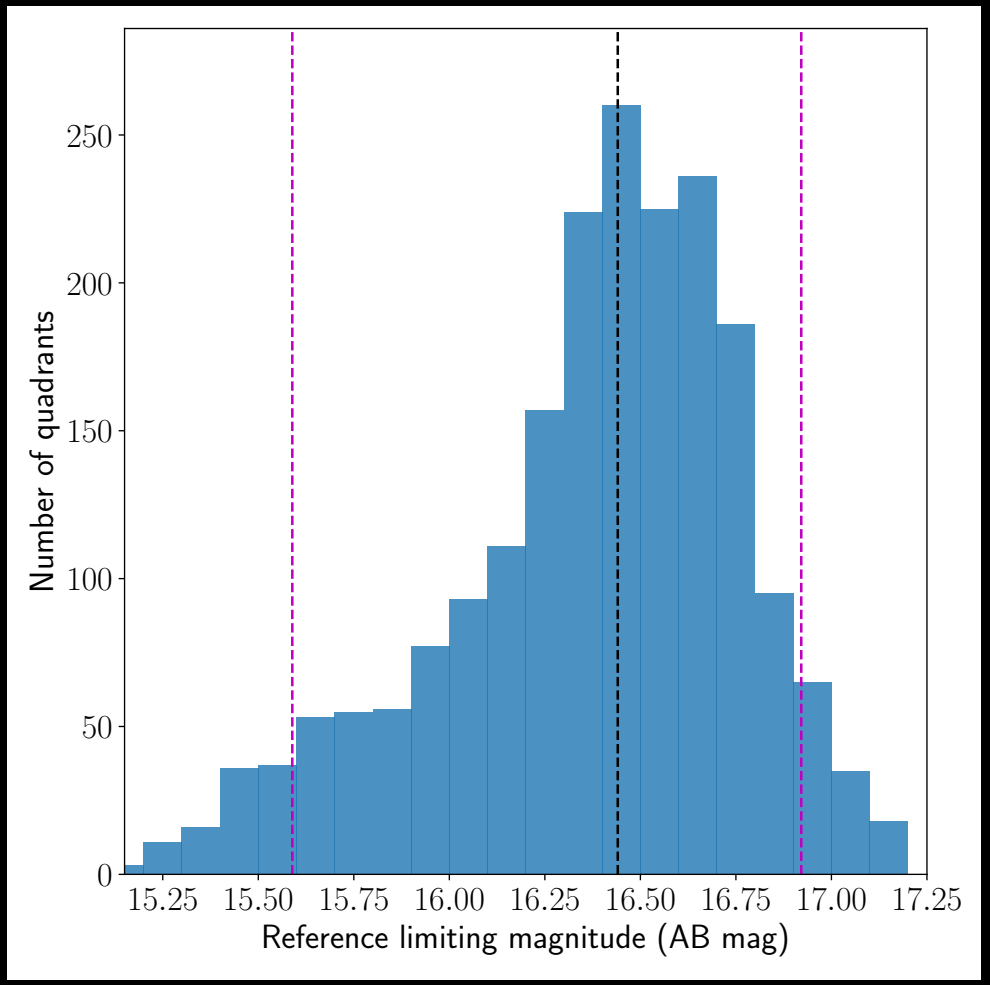


~9000 square degrees mapped every night!

Depth

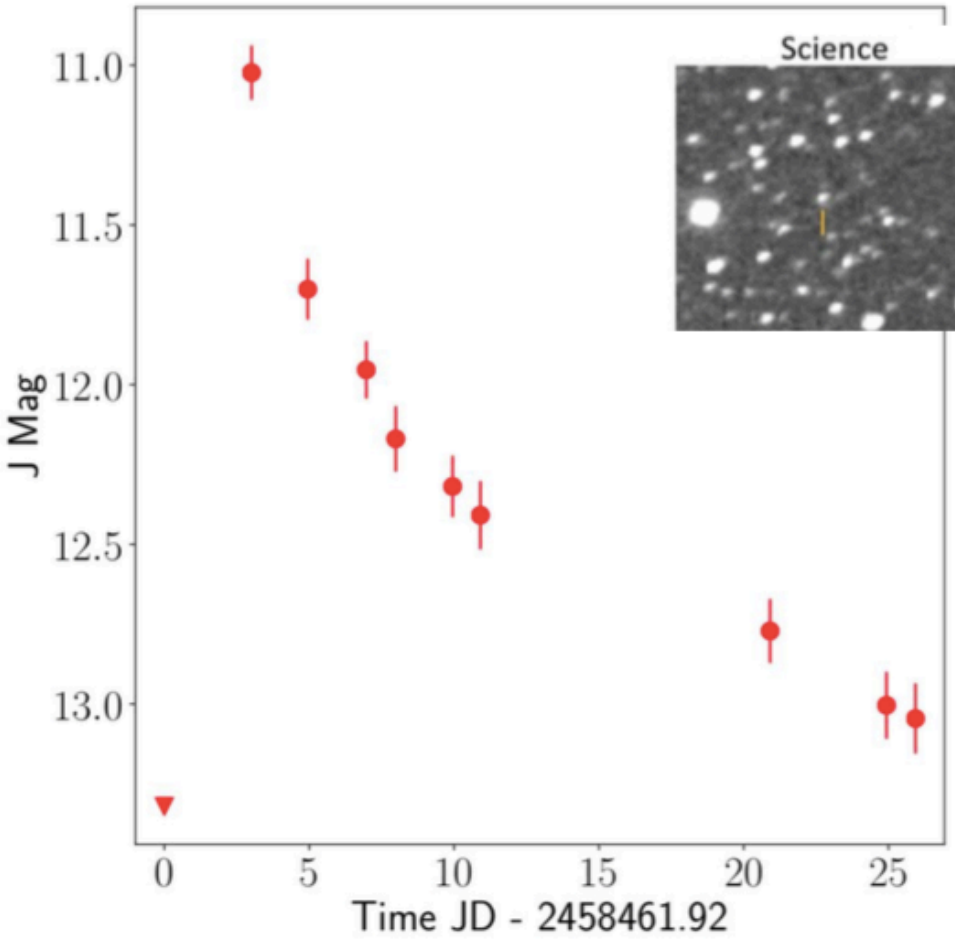


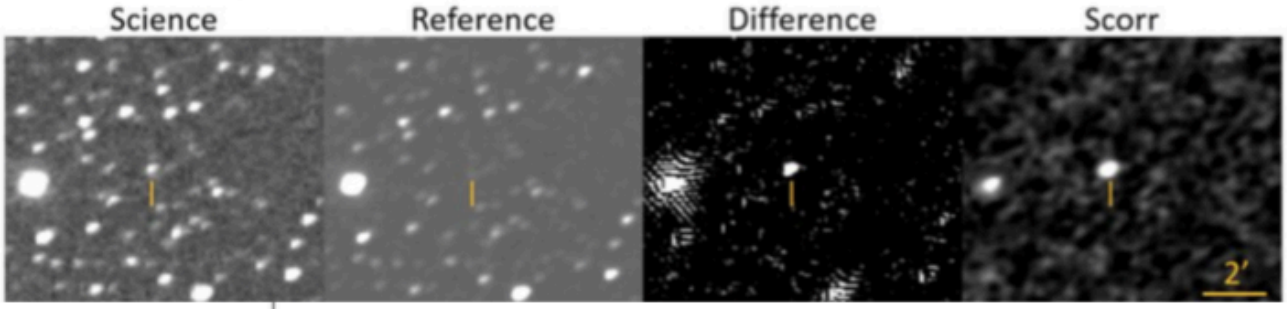
Nightly 5-sigma Depth



Stacked Reference Depth

Light curve of dwarf nova AT 2018jro



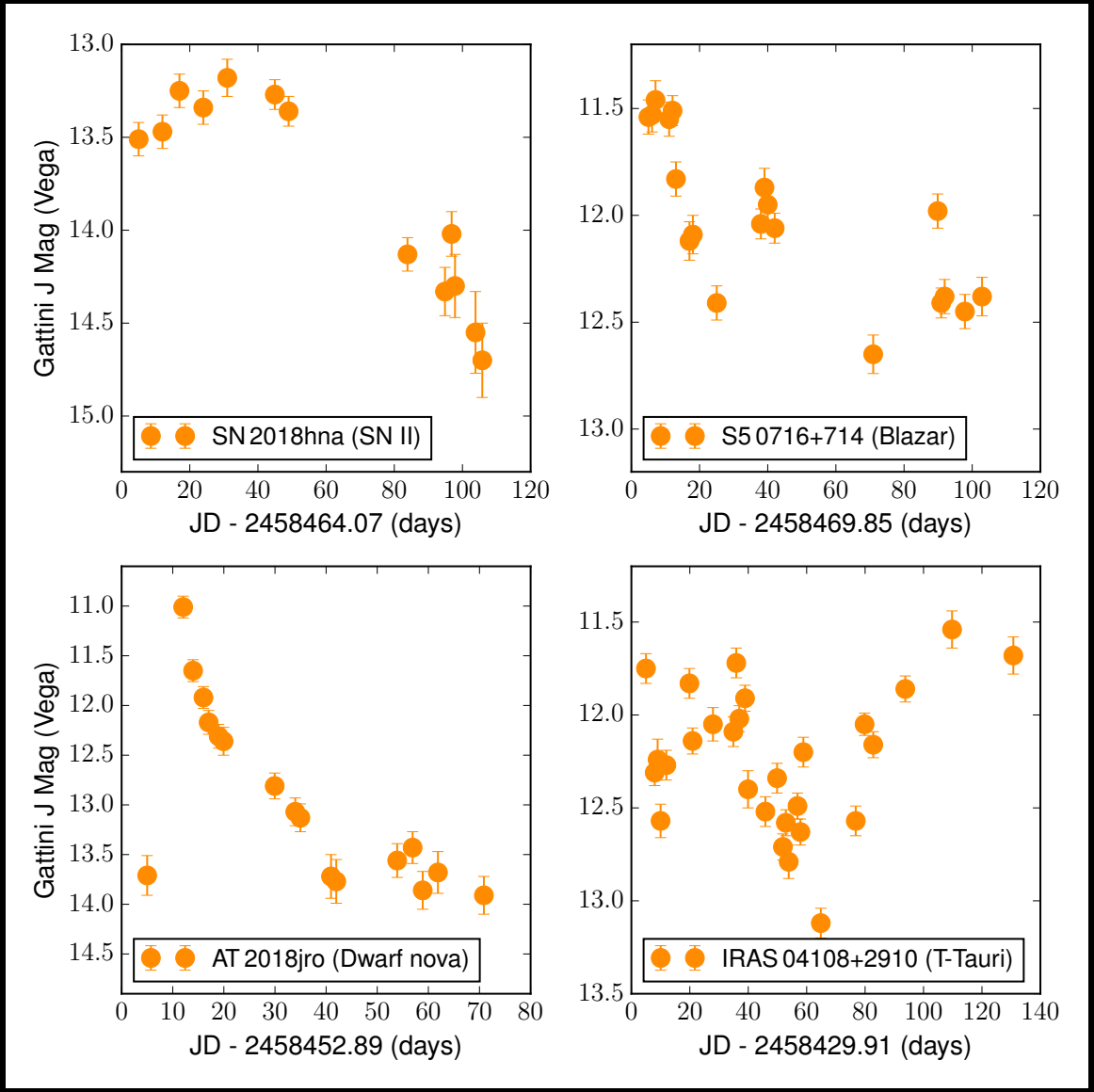


Palomar Gattini-IR J band detections of AT 2018jro

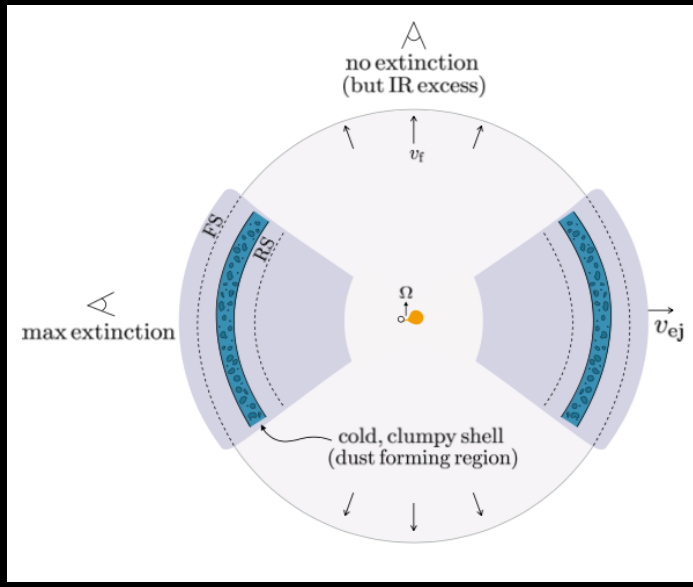
ATel #12305; *K. De (Caltech), M. Hankins (Caltech), M. M. Kasliwal (Caltech), A. Moore (ANU), S. M. Adams (Caltech), M. Ashley (UNSW), J. Burnham (SRL/Caltech), A. Delacroix (COO/Caltech), T. Greffe (COO/Caltech), D. Hale (COO/Caltech), R. Lau (JAXA), D. McKenna (COO/Caltech), E. O. Ofek (Weizmann), R. Smith (COO/Caltech), J. Sokoloski (Columbia), J. Soon (ANU), T. Travouillon (ANU)*
on 18 Dec 2018; 03:33 UT
Credential Certification: Kishalay De (kde@astro.caltech.edu)

Subjects: Infra-Red, Optical, Nova

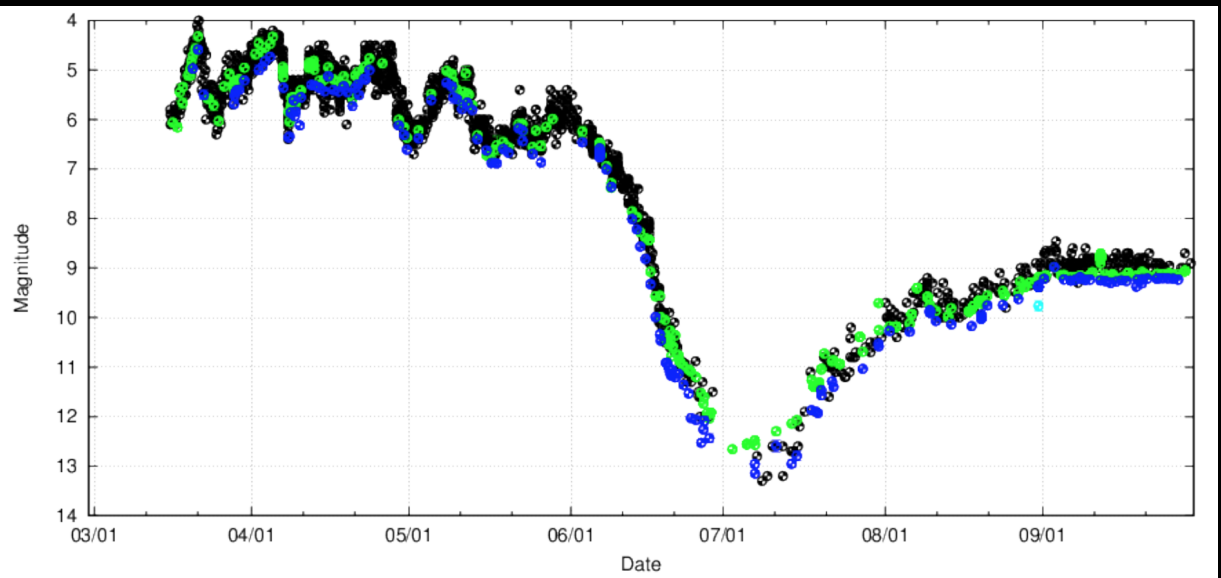
Collage of Palomar Gattini-IR light curves



Classical Novae: Shock-Dust Connection?



Derdzinski et al. 2016

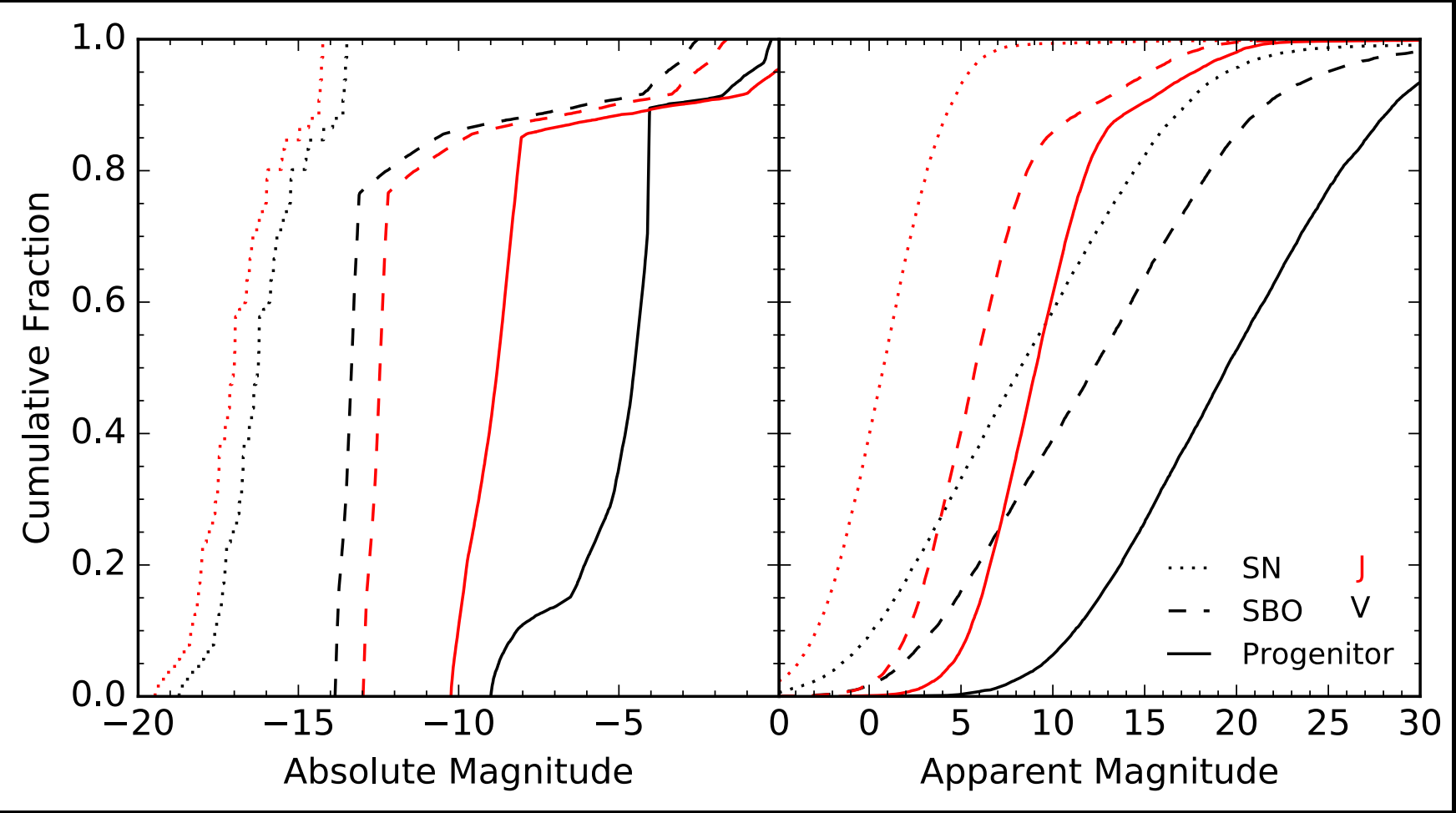


Dust Dip from V5668 Sgr/AAVSO

In partnership with Jeno Sokoloski.

HEISING-SIMONS FOUNDATION

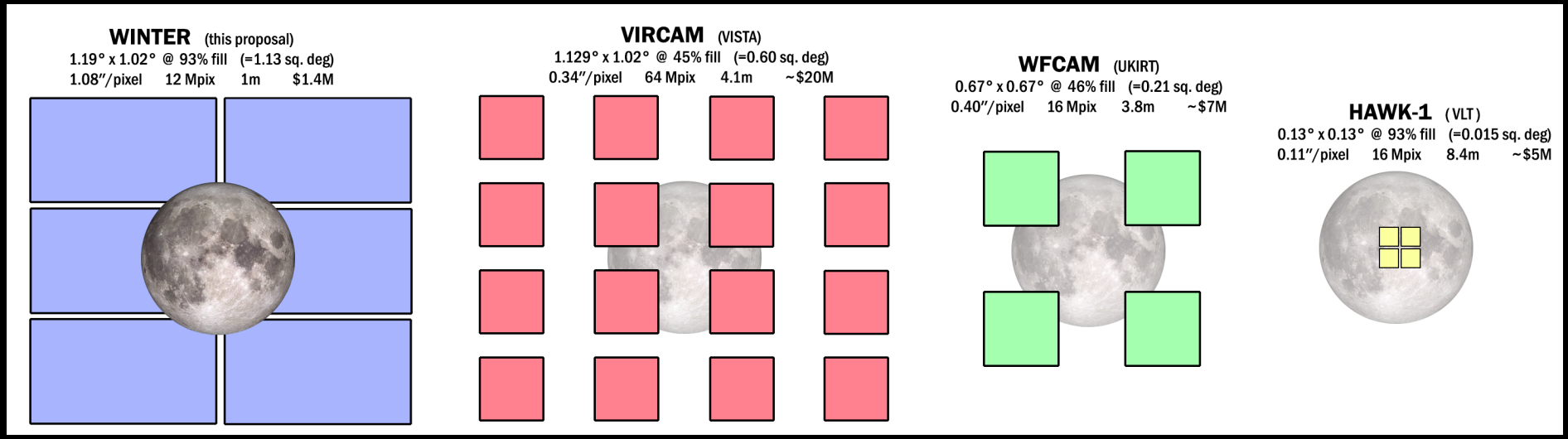
Supernova in the Milky Way

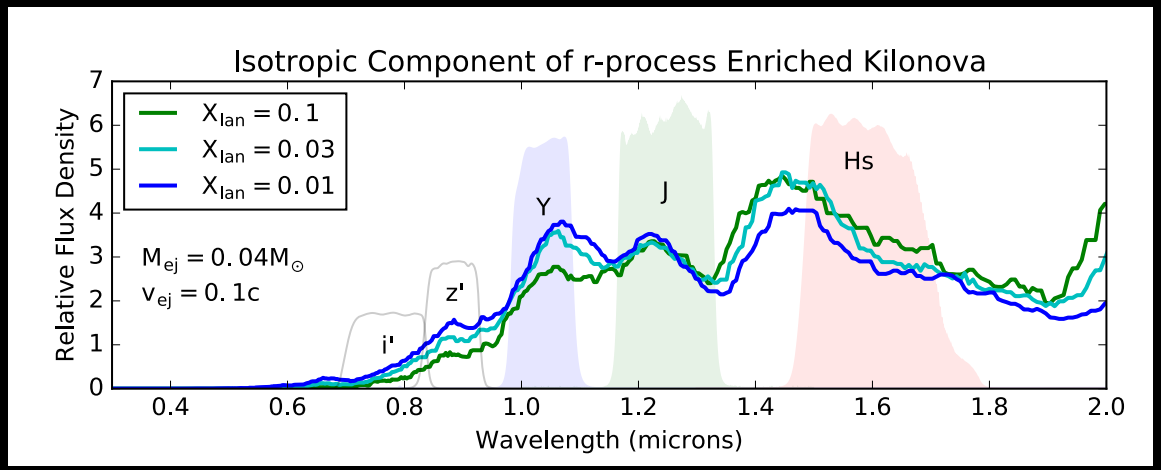


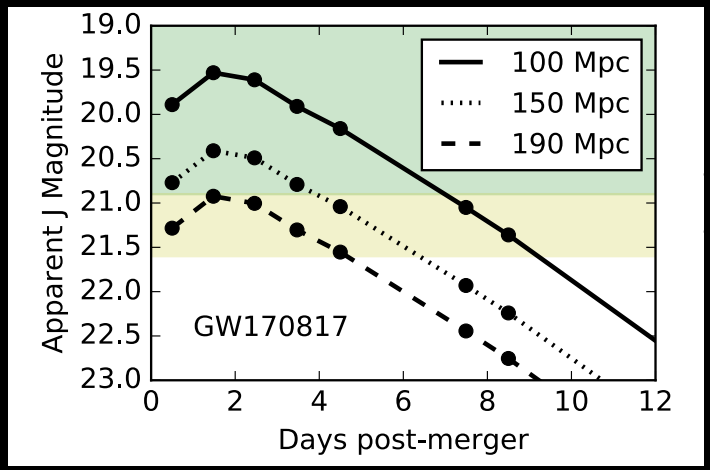
Adapted from Adams et al. 2013

WINTER @ Palomar

Alternative Semiconductor Technology







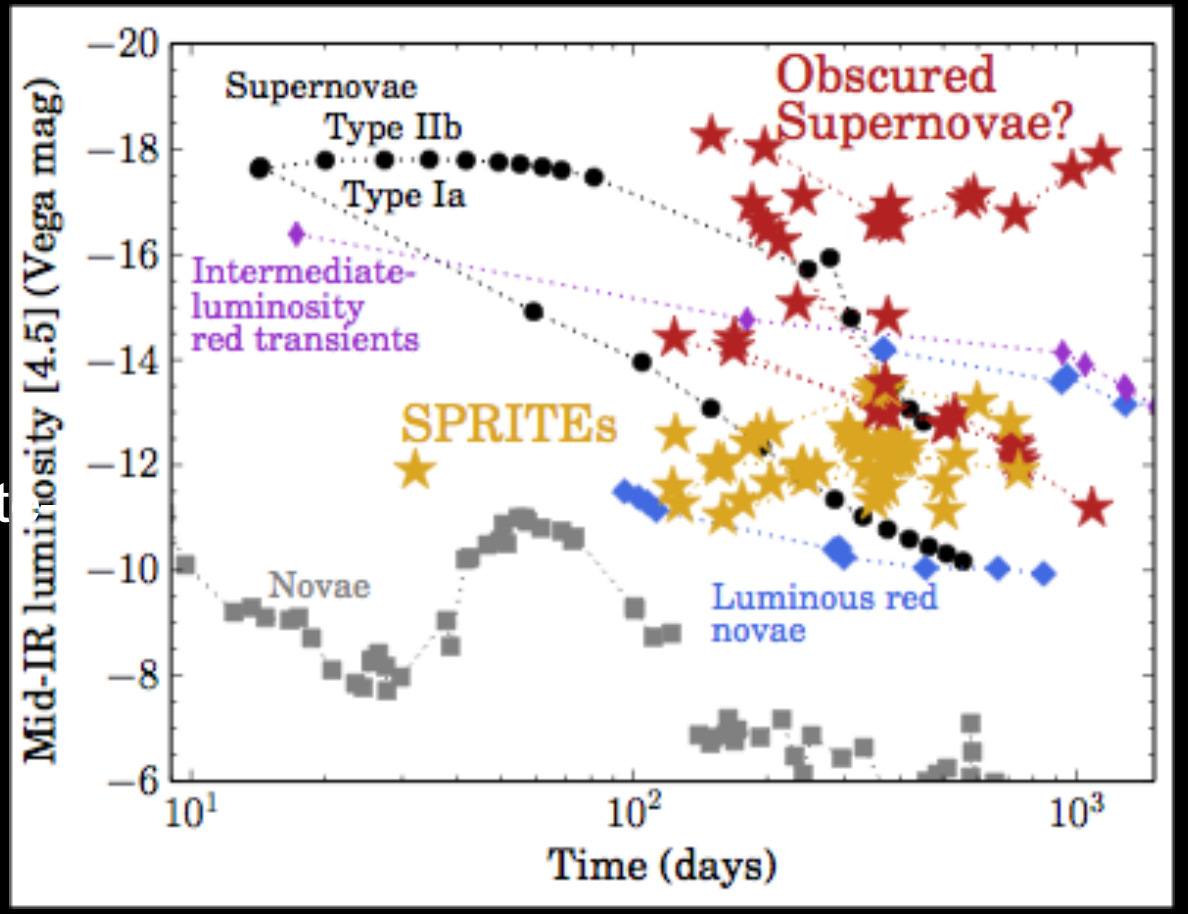
In Partnership with Rob Simcoe (MIT)

Now funded by NSF MRI + Packard; First light: Summer 2020

SPIRITS is discovering a wide range of IR transient sources.

Jacob Jencson

- Identified 131+ transients
- 49 known supernovae
- 10 candidate obscured supernovae
- 8 likely classical novae
- 64 eSPecially Red Intermediat Luminosity Transient Events (SPRITEs)



The Dynamic Infrared Sky is Ripe for Exploration

Mansi M. Kasliwal / University of Chicago Colloquium

February 27, 2019