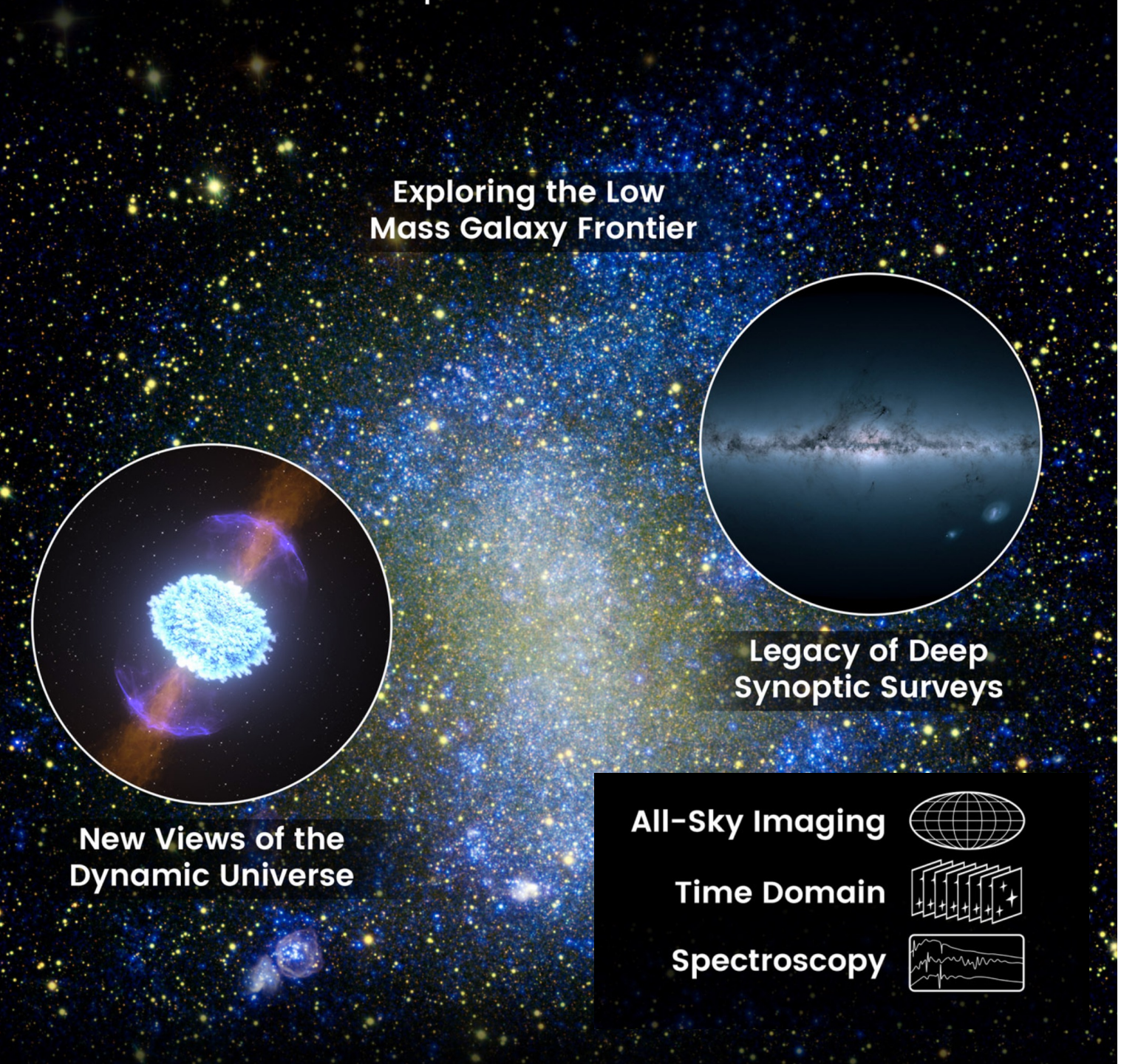


UVEX

The Ultraviolet Explorer

Fiona Harrison

Caltech

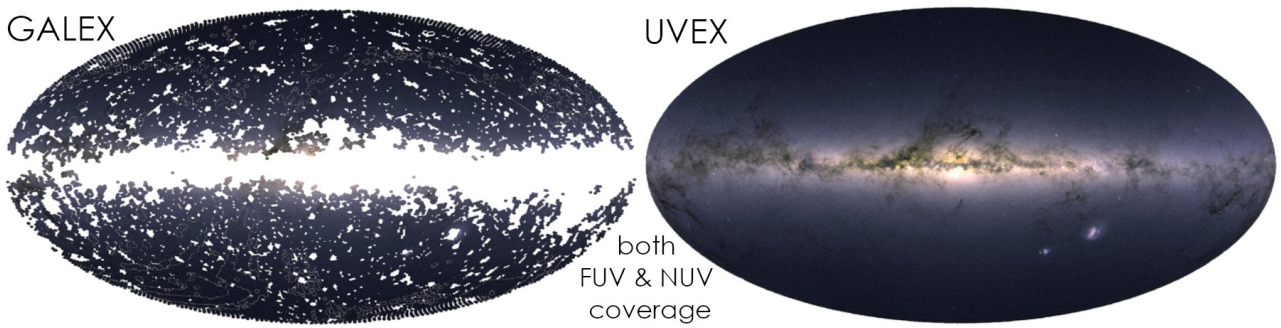
Community Workshop

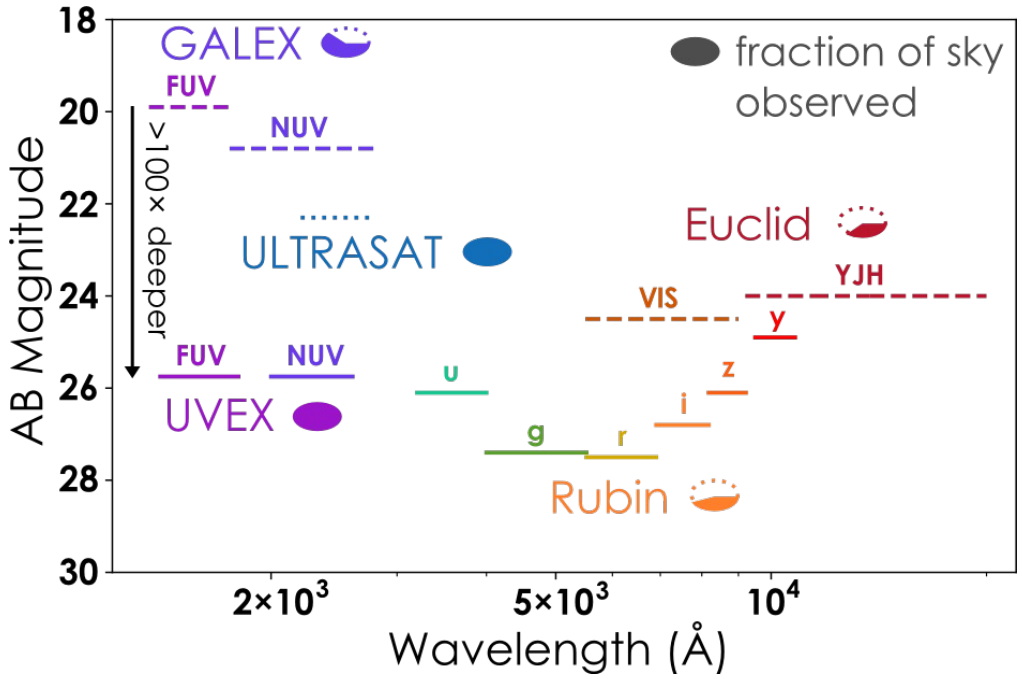
March 13, 2023

Goals of This Workshop

- Provide an opportunity for the community to engage with broad UVEX science
- Serve as a sounding board as the UVEX team refines details of observational approach/plans
  - Cadences, target samples
- Provide input to the UVEX team to help refine requirements and tools, especially as relates to broad objectives
  - Calibration (requirements and observations)
  - Analysis tools (especially high level)

UVEX Capabilities





Synoptic Two-Band Imaging

- 50/100x deeper than GALEX in NUV/FUV with 2″ imaging all-sky
- Depth complementary to Rubin, Euclid, Roman
- Multiple cadences from hours to months

Time Domain Capabilities

- < 3 hr target-of-opportunity response time
- Low (<6 hr) data latency for transient ID
- Spectroscopic and wide-field (10 deg^2) photometric followup

Slit Spectroscopy

- Sensitive, R>1000 over broad bandpass (1150 – 2650 Å)
- 1-degree long slit with 2′ – 12″ widths

UVEX

UVEX Science Objectives

THE LOW-MASS GALAXY FRONTIER

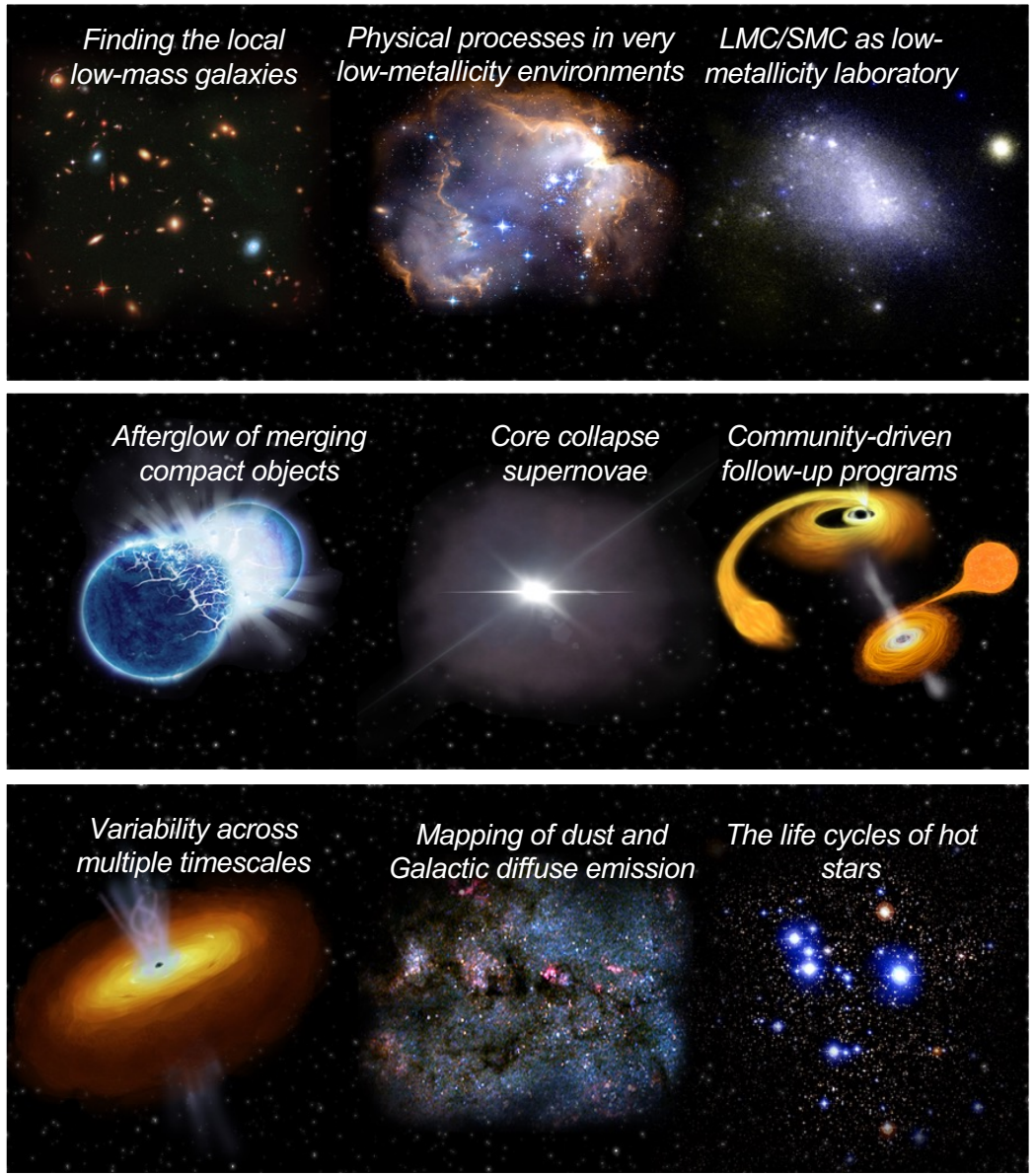
UVEX opens a window onto the lowest mass, lowest metallicity galaxies, and their unique cosmic ecosystems

NEW VIEWS OF THE DYNAMIC UNIVERSE

UVEX captures the early UV emission of transient events, testing models and probing mass loss in the years before stellar collapse

LEGACY OF DEEP, SYNOPTIC ALL-SKY SURVEYS

UVEX leaves a large all-sky legacy dataset, enabling a wide range of scientific studies



Explore the Low Mass, Low-Metallicity Galaxy Frontier

Map the distribution of nearby (d<100 Mpc), low mass (<10^6 - 10^9 M_{sun}), low-metallicity (Z<0.5 solar) (LMLZ) galaxies

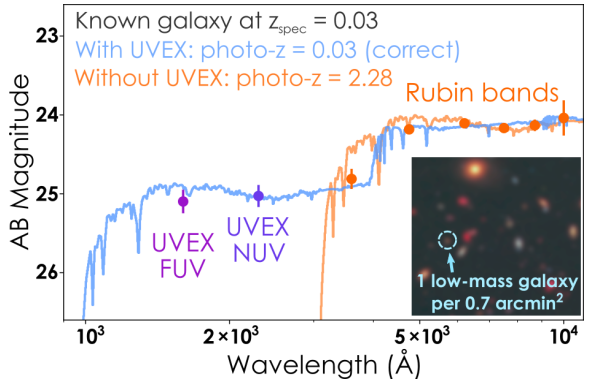
- Deep imaging surveys
  - reach m_{NUV}, m_{FUV} > 25 over ≥15,000 deg^2 of extragalactic sky
  - Reach m_{NUV}, m_{FUV} > 27 over ≥100 deg^2 in deep fields

Diagnose nearby low-mass, low-metallicity galaxies to understand the physical processes taking place in their unique environments

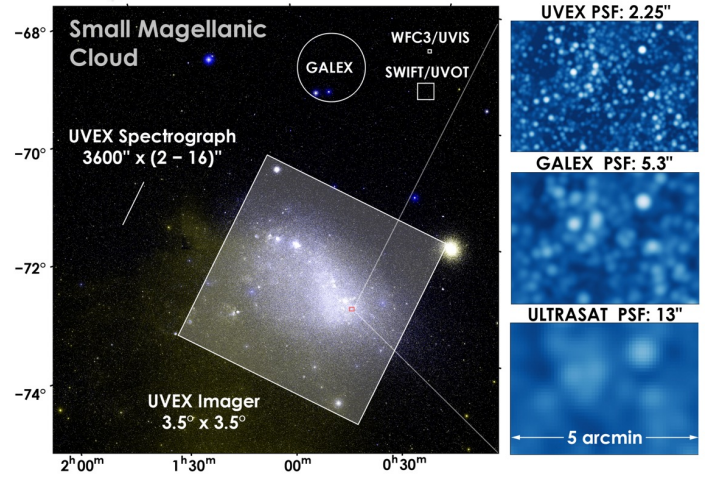
- Spectroscopy survey of ≥100 LMLZ galaxies to characterize nebular emission (C/O ratios, ionizing continuum)

Probe the mass-loss driven evolution of hot and massive stars in the low-metallicity Magellanic clouds

- Cadenced imaging survey covering ≥ 90 deg^2 (LMC), ≥18 deg^2 (SMC)
- Spectroscopic observations of >100 stripped star candidates, >1000 hot, massive single and binary stars



Distinguish the Balmer break at low-z from the Lyman break for high-z systems



Provide New Views of the Dynamic Universe

Perform rapid UV follow-up of events triggered by gravitational wave observatories starting from hours and extending to days after the merger

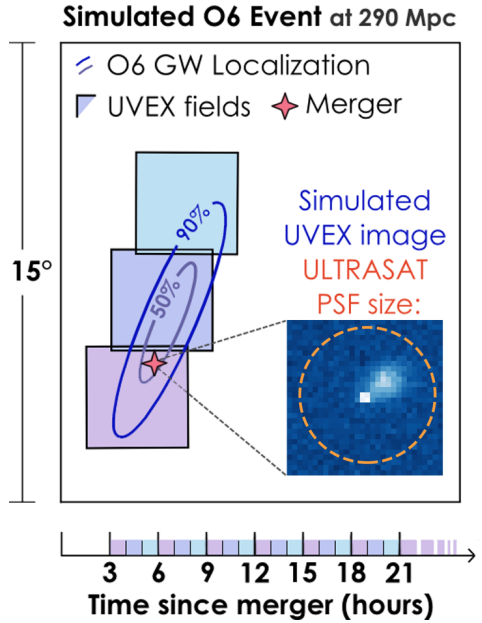
- Two-band photometric follow up of >20 GW error regions

Provide a new window on stellar death and the chemical enrichment of galaxies by massive stars

- Spectroscopic observations of >20 core collapse SNe discovered within 24 hours of explosion. Perform 4 sequences from hours-days post explosion

Provide a community resource for exploring the dynamic sky through rapid spectroscopic follow-up of Target of Opportunity events

- ≥8% of 2-year baseline mission devoted to community ToOs (<6 hour response time)



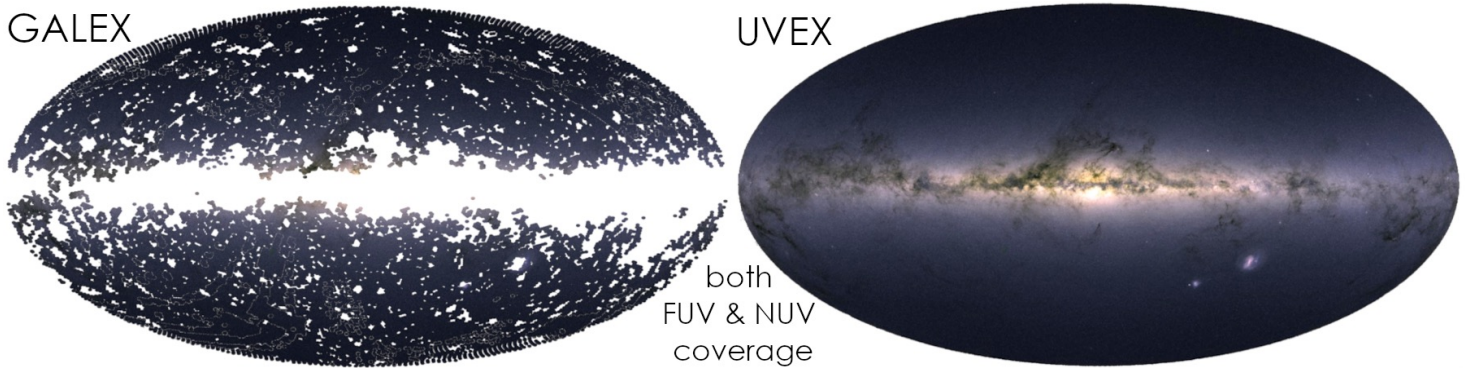
Provide a Legacy of Deep, Synoptic All-Sky Surveys

Perform a photometric survey of the entire sky in the NUV and FUV performed with regions of the sky revisited an average of ten times, with cadences distributed from hours to months

- $M_{NUV,FUV} > 25$ in extragalactic sky
- 10 visits with ~900s integration all-sky

(Large legacy of spectroscopic data)

- >1 deg-long slit read out with every exposure



ToO and Data Release

- Locations of variable and transient objects in imaging fields distributed within 8 hours of observation (average of 4 hours)
  - Image cutouts, photometry, timing information, cross-matched catalog information
- Data release schedule to the archive (IRSA):

  Daily: full-frame photometric and spectroscopic images

  Monthly: stacked and aligned sky images
- Within 6 months of baseline mission end

  Stacked and calibrated all-sky maps, catalog data, Level 4 products (LMLZ catalog, etc)

UVEX Timeline

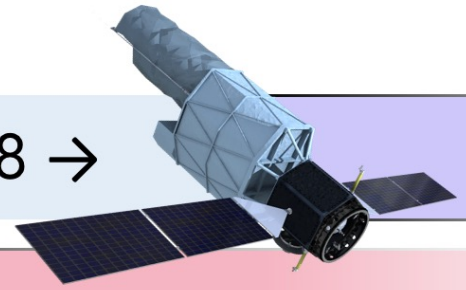
GALEX 2003 – 2013

ULTRASAT 2025 →

HST 1990 →

Swift 2004 →

UVEX 2028 →



Euclid 2023 →

Rubin 2024 →

Roman 2025 →

LIGO/Virgo/KAGRA O5 O6

UVEX: an all-sky ultraviolet mission for the coming generation

UVEX Science Team

Fiona Harrison, Caltech
PI

Brian Grefenstette, Caltech
Project Scientist

Shri Kulkarni, Caltech
Science Team Lead

Hannah Earnshaw, Caltech
Science Team Coordinator

Dan Weisz, UC Berkeley
Low Mass Galaxy Frontier Lead

Suvi Gezari, STScI
Dynamic Universe Lead

Keivan Stassun, Vanderbilt
Legacy Survey Lead

Danielle Berg, UT Austin
Nebular spectroscopy lead

Hugues Sana, Leuven
LMC/SMC lead

Mansi Kasliwal, Caltech
EMGW lead

Rafaella Margutti, UC Berkeley
CCSNe Lead

Matthew Graham, Caltech
Synoptic Survey lead

Harry Teplitz, IPAC, Imaging survey lead

See https://www.uvex.caltech.edu/page/team

Resources

- Science paper: Science with UVEX

https://ui.adsabs.harvard.edu/abs/2021arXiv211115608K/abstract

- Website

https://www.uvex.caltech.edu/