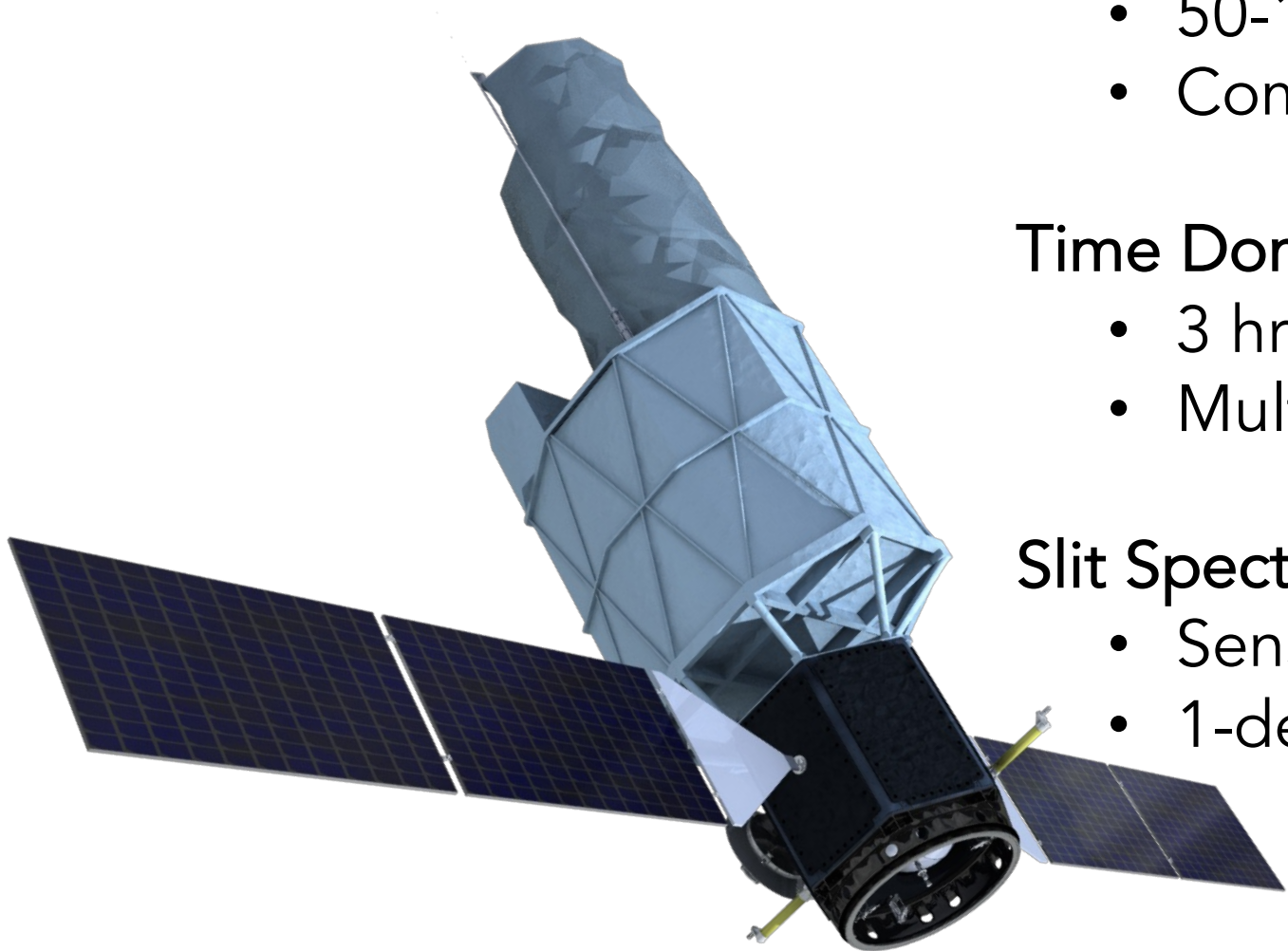




# Mission Overview

Brian Grefenstette

2023-03-13



## Synoptic Two-Band All-Sky Survey

- 50-100x deeper than GALEX
- Complementary to Rubin, Euclid, Roman

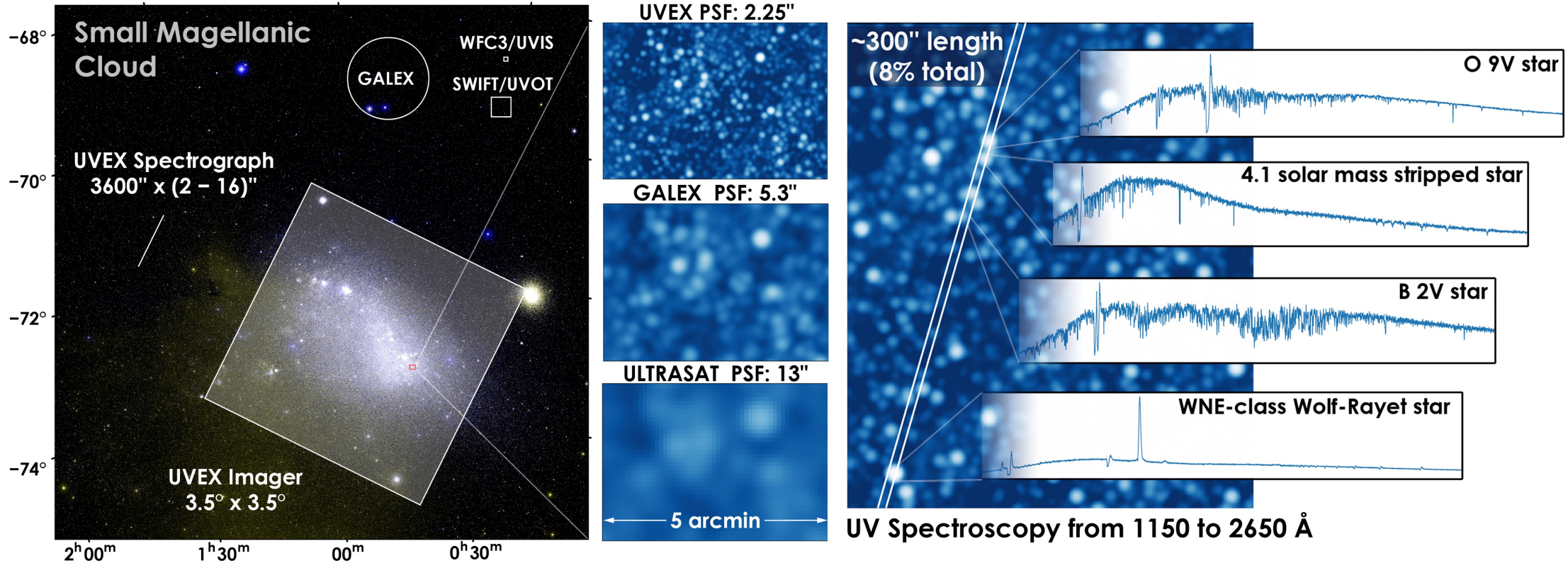
## Time Domain Capabilities

- 3 hr target-of-opportunity response time
- Multiple cadences from hours to months

## Slit Spectroscopy

- Sensitive,  $R > 1000$  over broad bandpass
- 1-degree long slit with multiple widths

# UVEX – Instrumentation



12 deg<sup>2</sup> field of view  
Covers LMC/SMC in 7 pointings

<2.25'' FWHM PSF  
Can resolve all but the densest regions of the LMC/SMC

1° long, multi-width slit  
R>1000 across broad UV band, multitude of serendipitous spectra



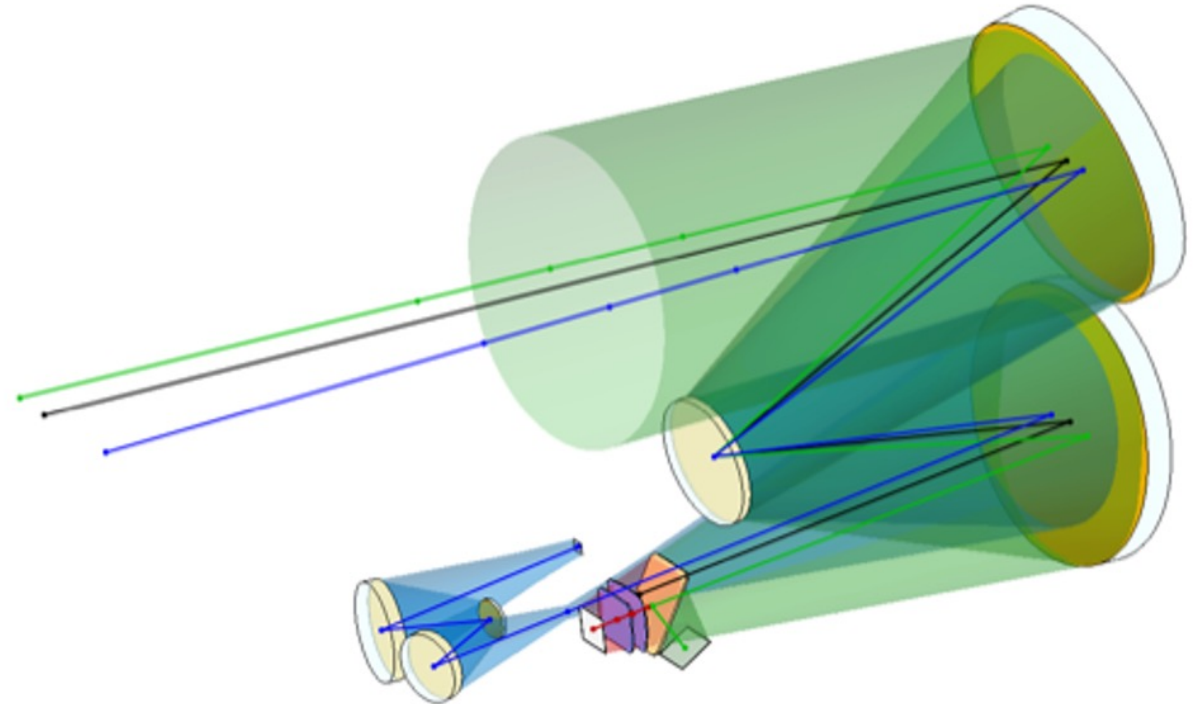
## FUV and NUV Imagers:

- Imaging FoV  $3.5^\circ \times 3.5^\circ$
- Imaging PSF  $<2.25''$  HPD
- Pixel Size  $1''$
- FUV Band  $1390 - 1900 \text{ \AA}$
- NUV Band  $2030 - 2700 \text{ \AA}$
- Detectors  $4k \times 4k$  CMOS

## Spectrometer

- Bandpass  $1150 - 2650 \text{ \AA}$
- Slit size  $2'' / 4''$
- Slit length  $1^\circ$
- $R (\lambda/d\lambda)$   $1450 - 3150$

Simultaneous Imaging + Spectroscopy



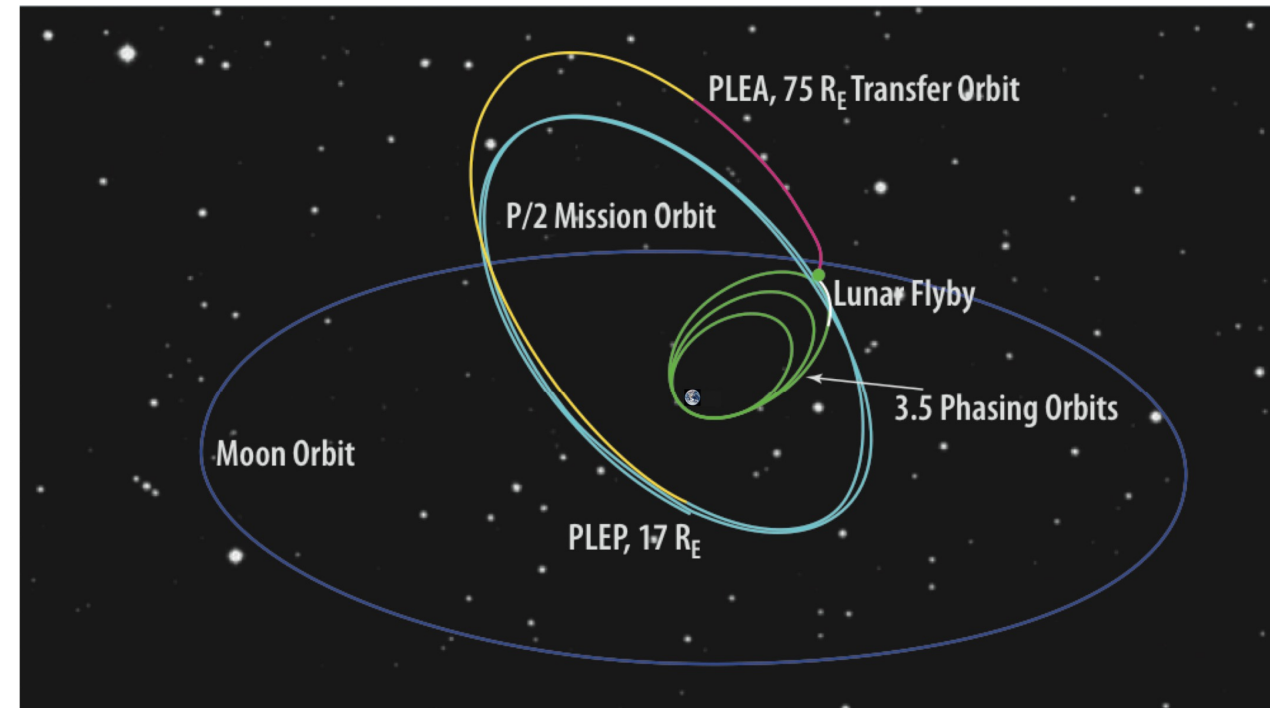
# UVEX – Mission Design



TESS-like 2:1 lunar resonance orbit

Unlike TESS, downlink data every 6 hr

Data releases ~daily cadence  
+fast alerts



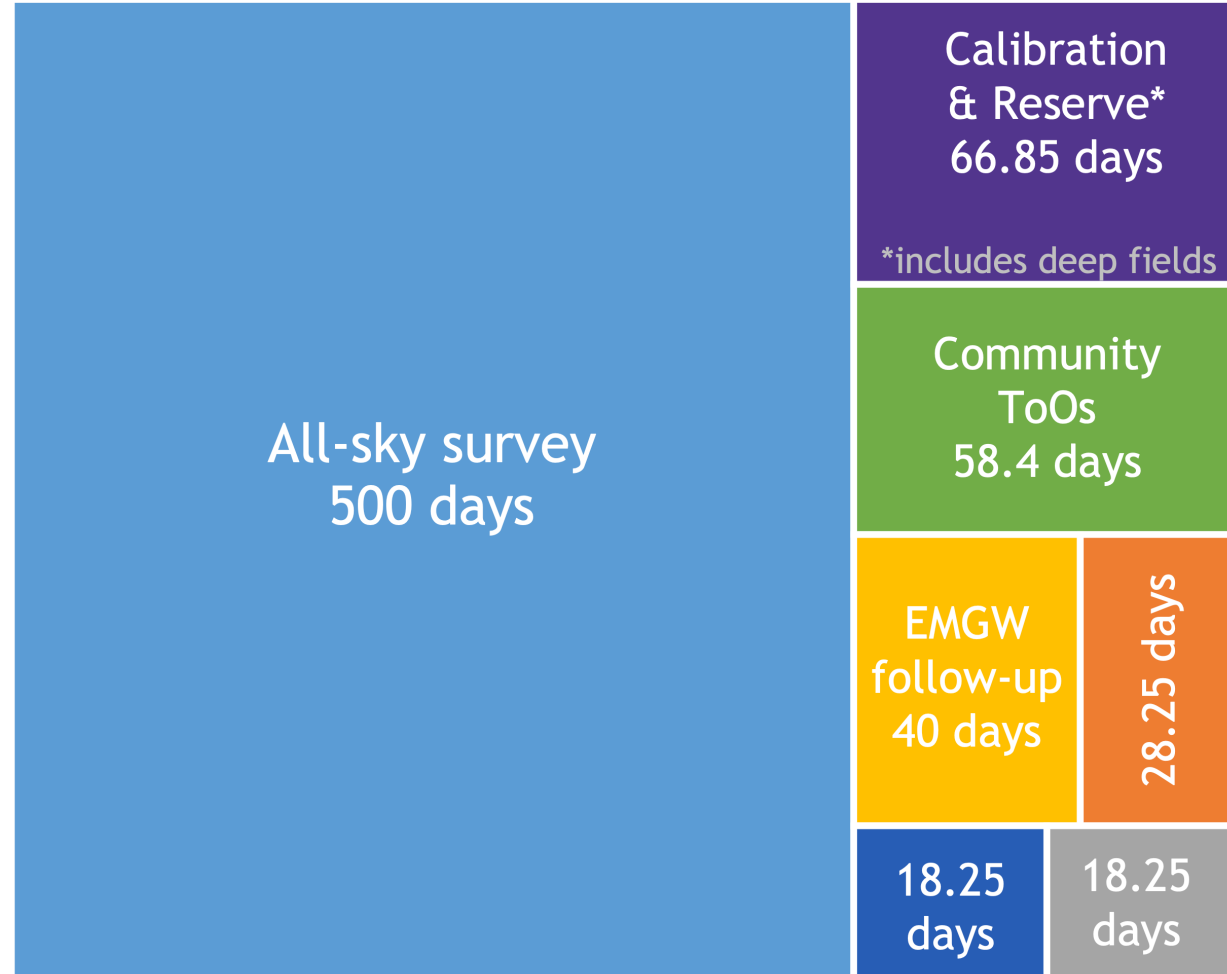
Ricker et al (2015)



# UVEX – Mission Design



730 days of science operations



\*includes deep fields

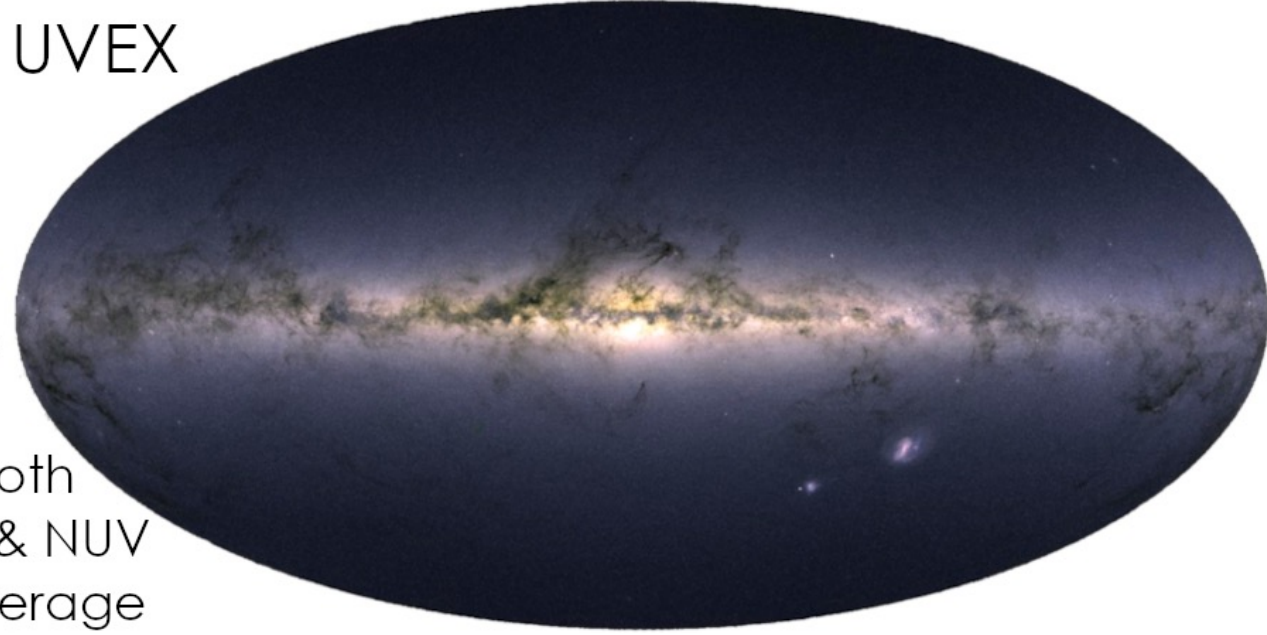
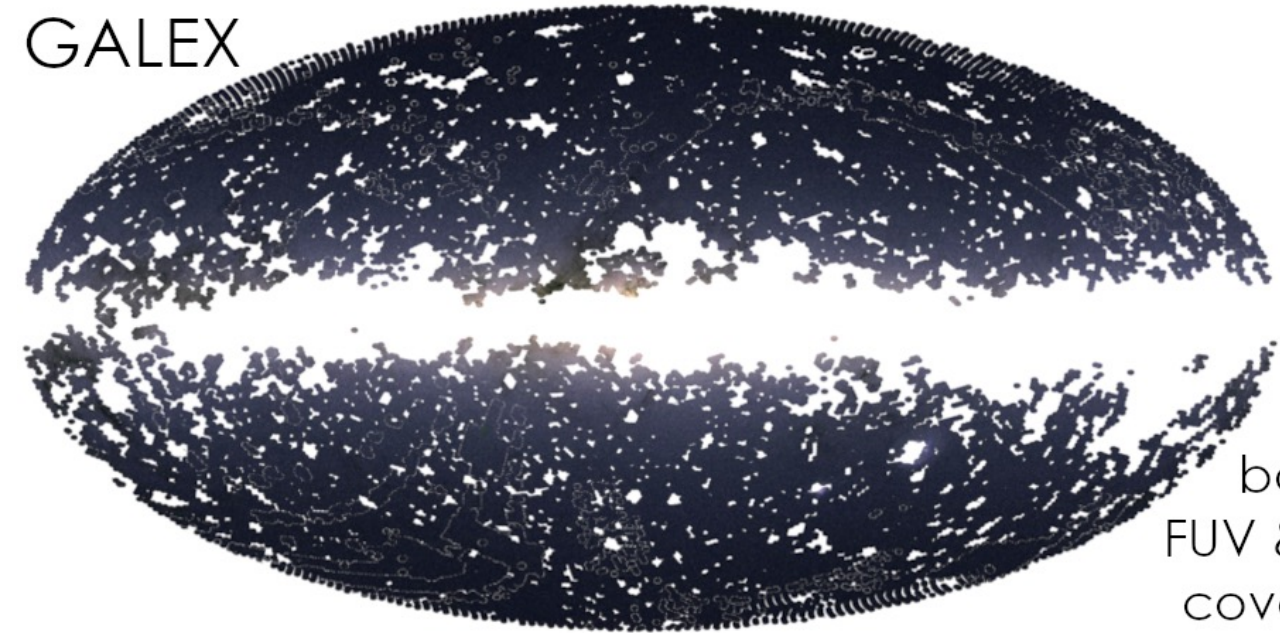
- All-sky Synoptic Survey
- LMC/SMC Weekly Survey
- LMLZ Spectroscopic Survey
- Targets of Opportunity
  - EMGW Rapid Response
  - SNe Rapid Response
- Community ToOs

Low Metallicity Galaxies spectroscopy

Rapid CC SNe spectroscopy

LMC/SMC (imaging & spectroscopy)

# UVEX – Synoptic Survey



both  
FUV & NUV  
coverage

All sky reference surveys (~50 days) at launch and ~1 year



Year One

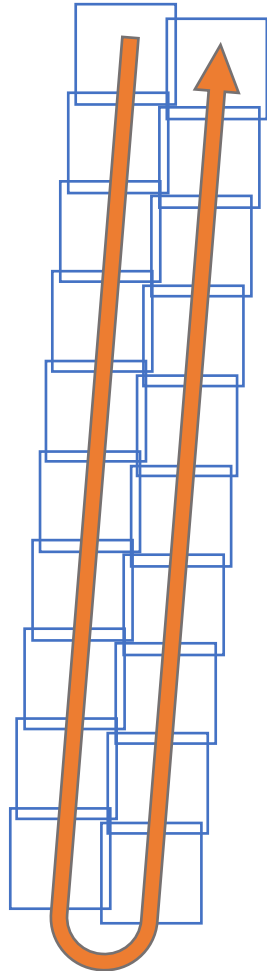
Year Two

# UVEX – Synoptic Survey



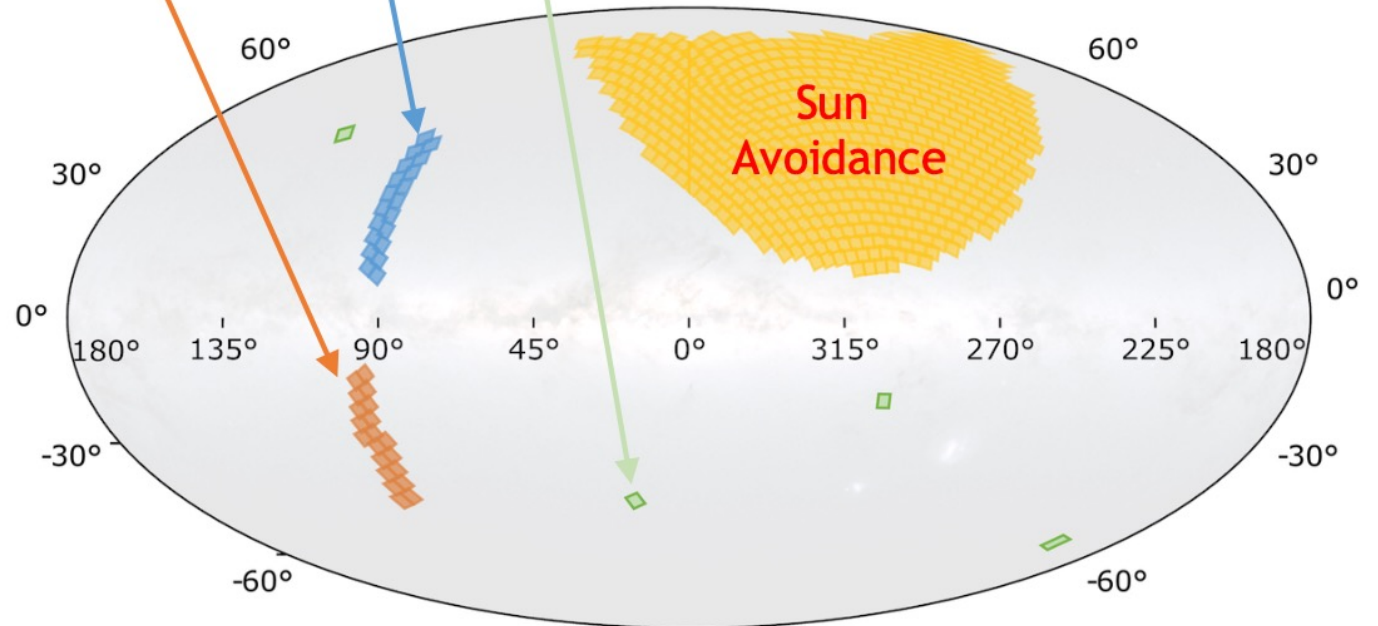
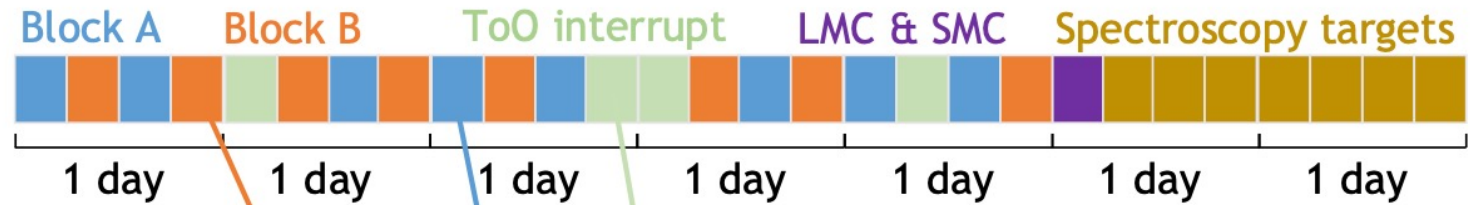
One 6-hr Survey Block =  
20 contiguous fields  
One dwell per field

One Dwell =  
3 x NUV Images  
1 x FUV Image  
1 x LSS image  
All simultaneous  
w/overheads  $\approx$  930s



## High Cadence Survey

2 blocks at  $\sim$ 12-hr cadence, including interrupts,  $\sim$ 5 days total



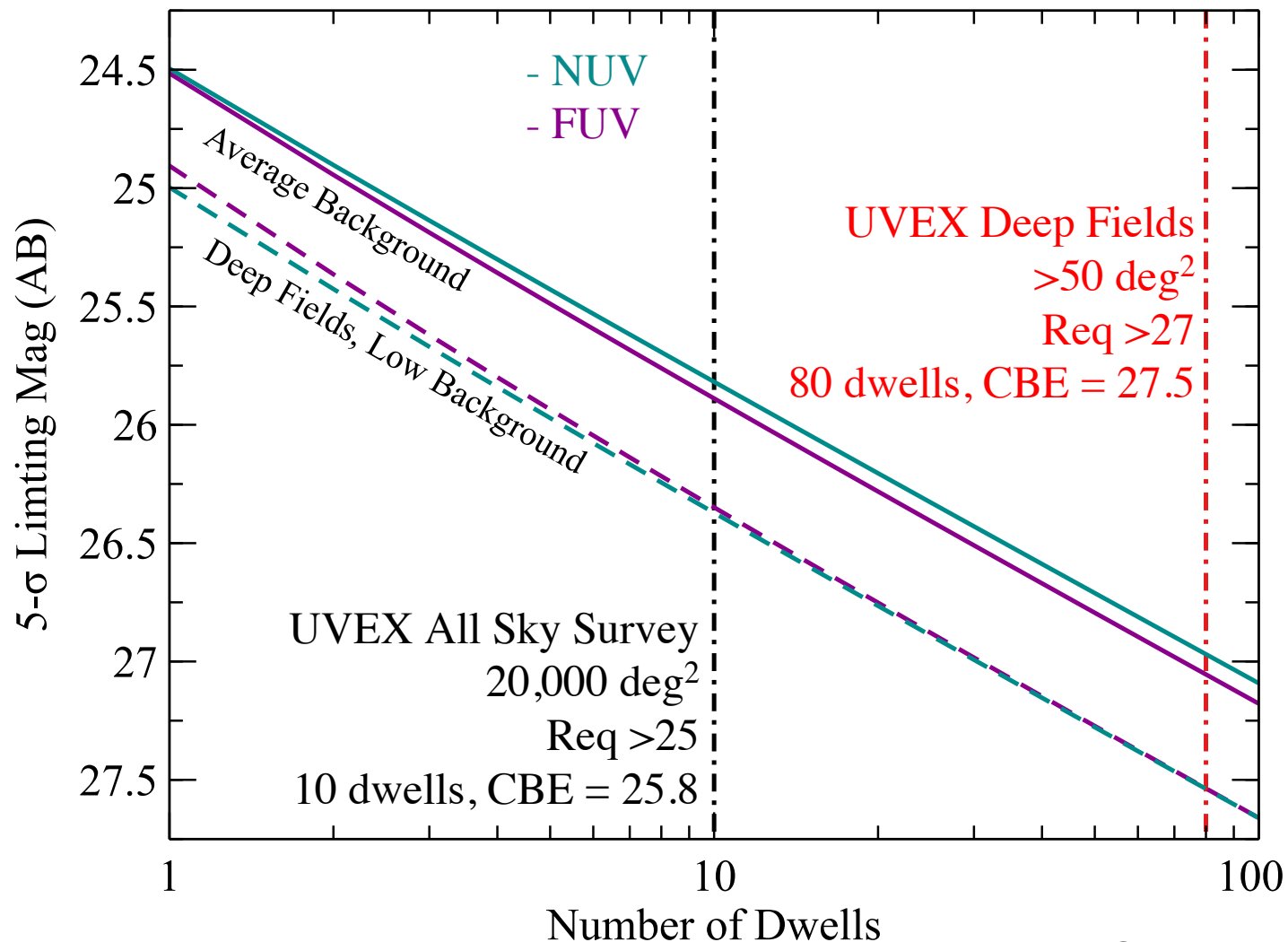


# UVEX – Performance, Imaging



- Single-visit depth  $>24.5$  AB
- Depth after all-sky survey  $>25$  in both bands
- Deep fields\*  $>27$

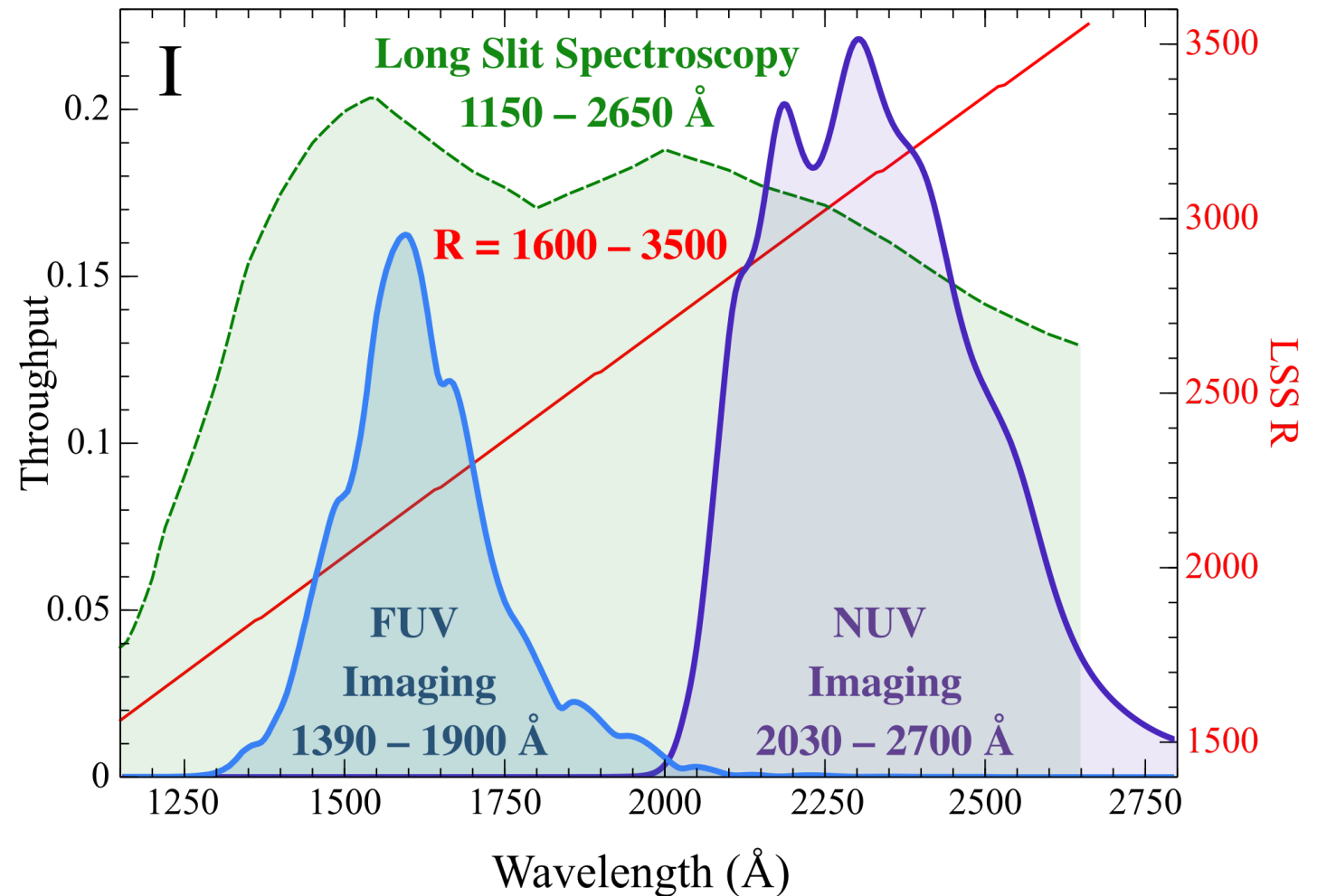
\*also imaging fields near LSS targets...



# UVEX – Performance, Spectroscopy



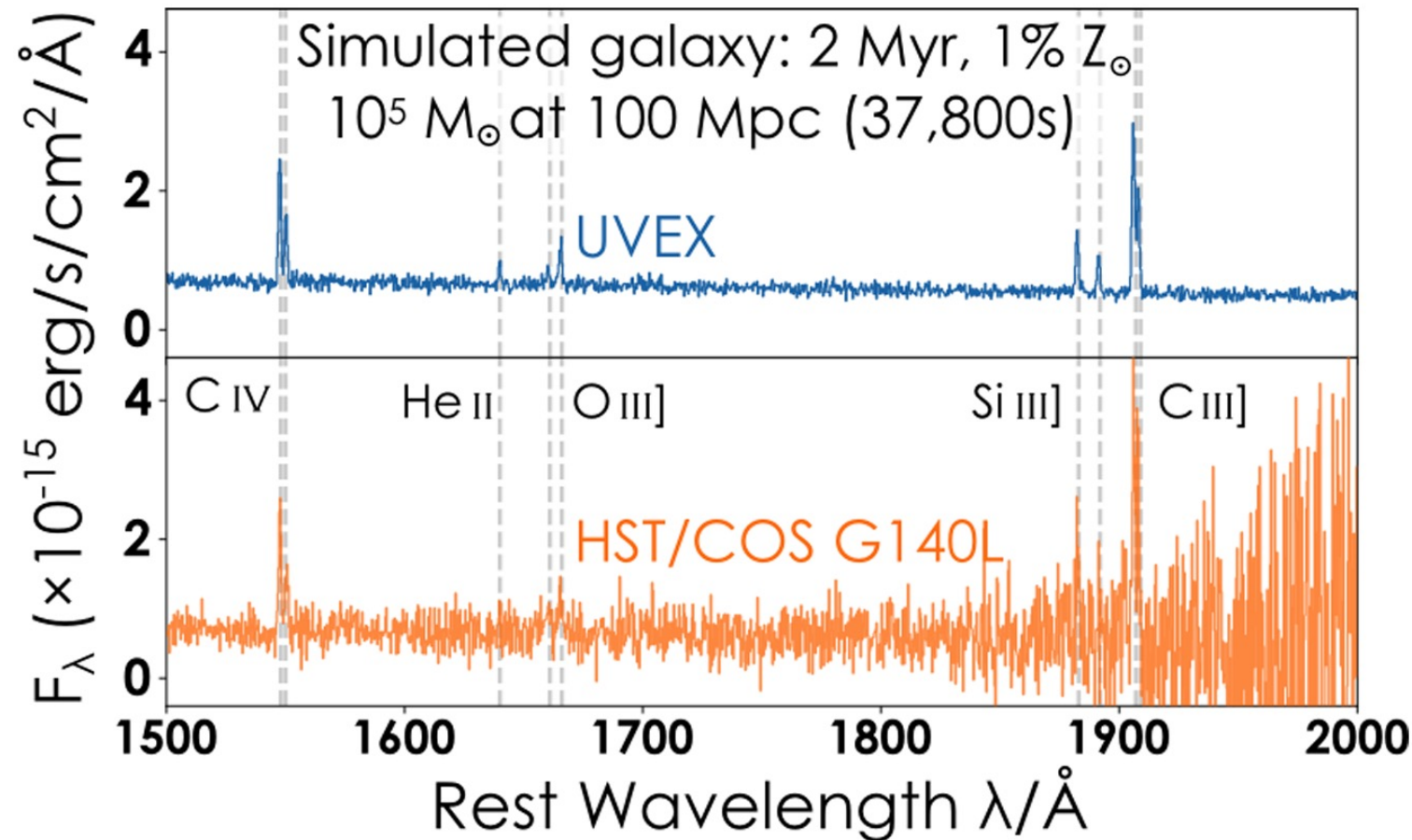
- Line flux sensitivity  
 $\sim 10^{-15}$  ergs / cm<sup>2</sup> / sec / Å
- Bandpass extends below  
1210 Å
- Max single-exposure  
 $\sim 1800$ -s



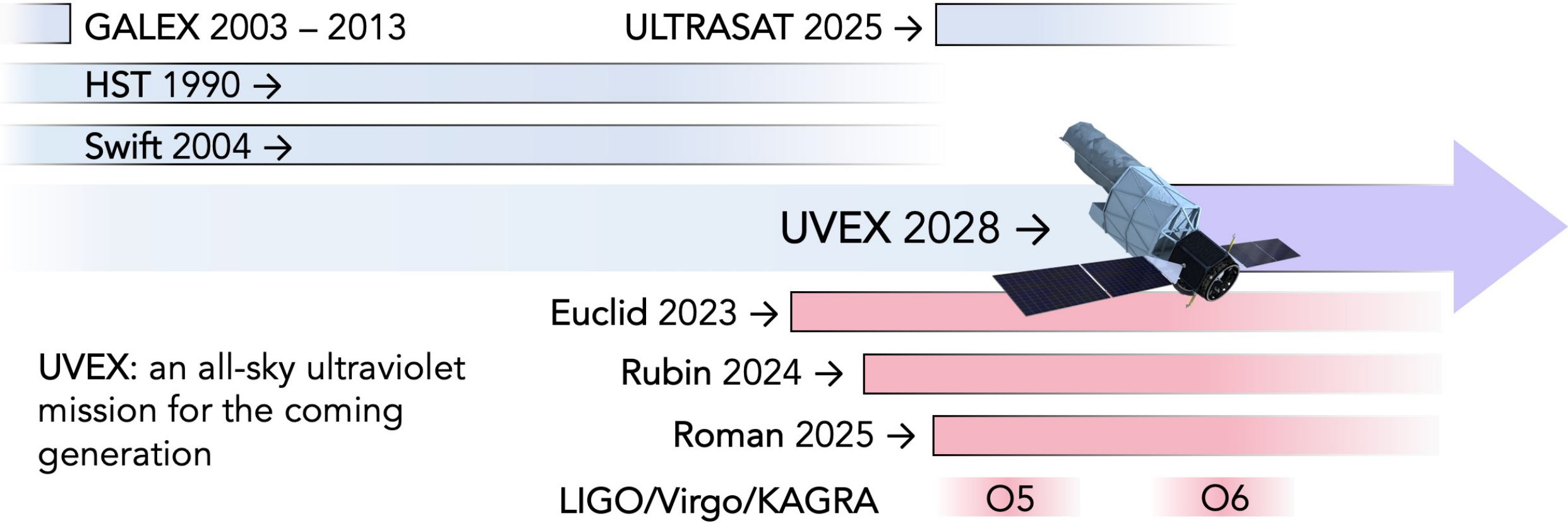
# UVEX – Performance, Spectroscopy



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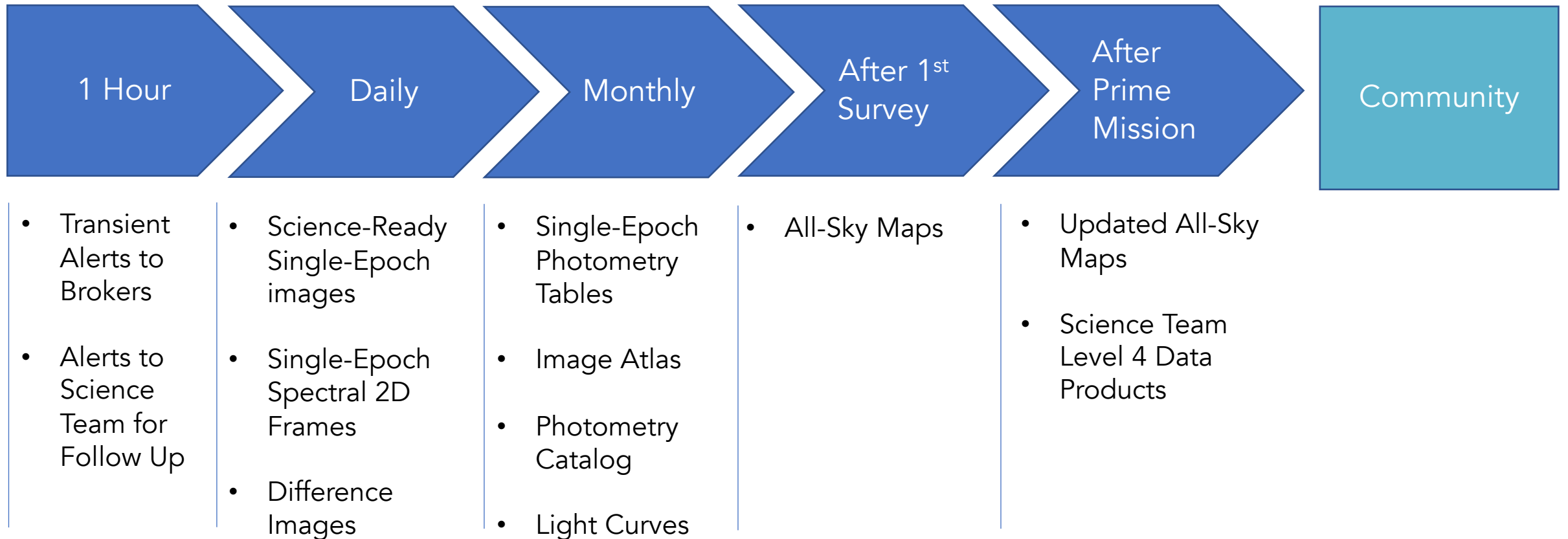


# UVEX – Timeline



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

# UVEX – Data Release Schedule



- Imaging ETC
  - Backgrounds for RA/Dec + Time
  - Latest Instrument Performance
  - Computes Limiting magnitudes / SNR estimates
- Spectroscopy Simulator
  - Generate synthetic spectra
  - Estimate SNR per resolution element
- Based on astropy / synphot / specutils with example jupyter notebooks
- <https://github.com/uvex-mission/uvex-etc>
- Imaging simulator coming this summer

