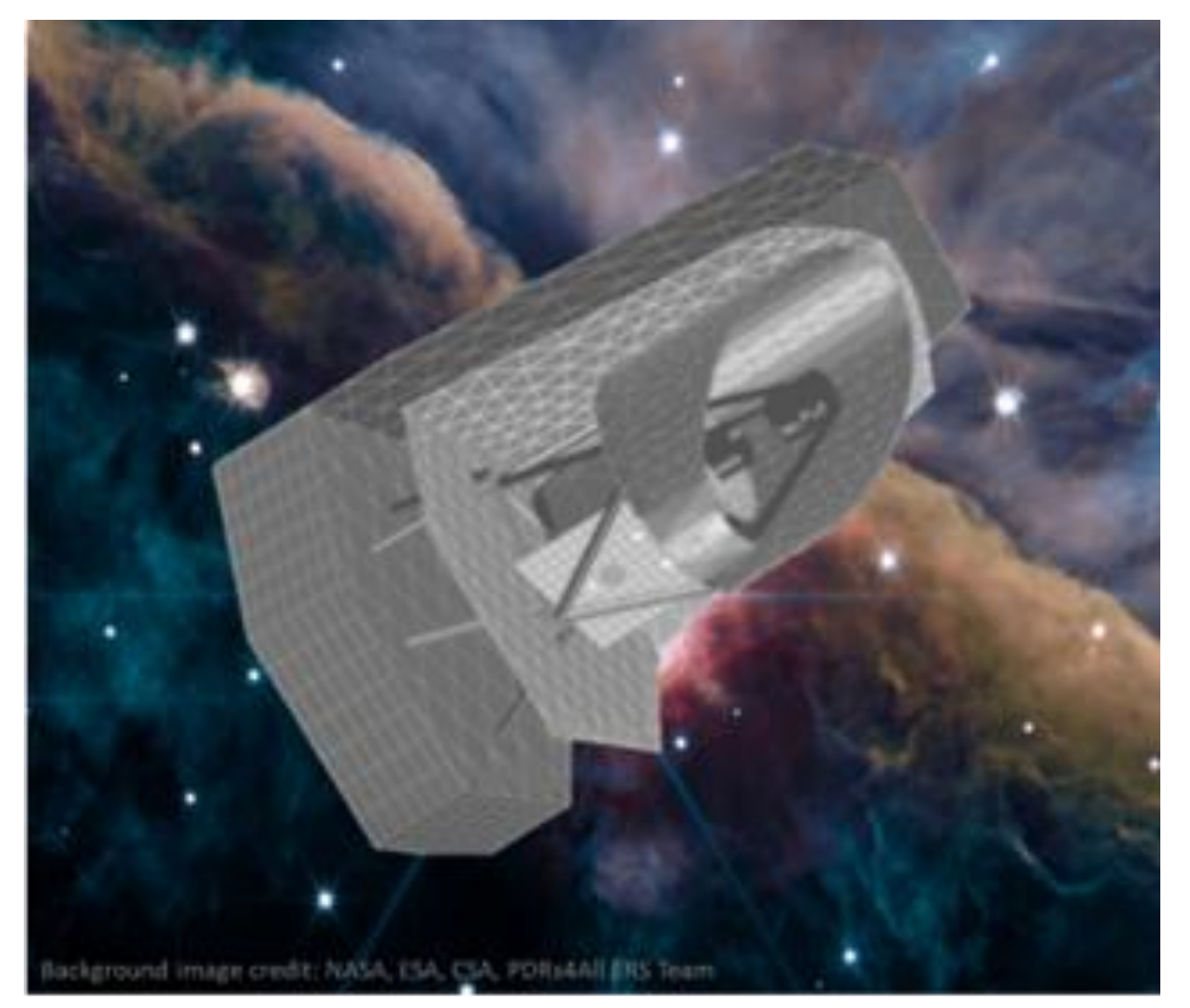


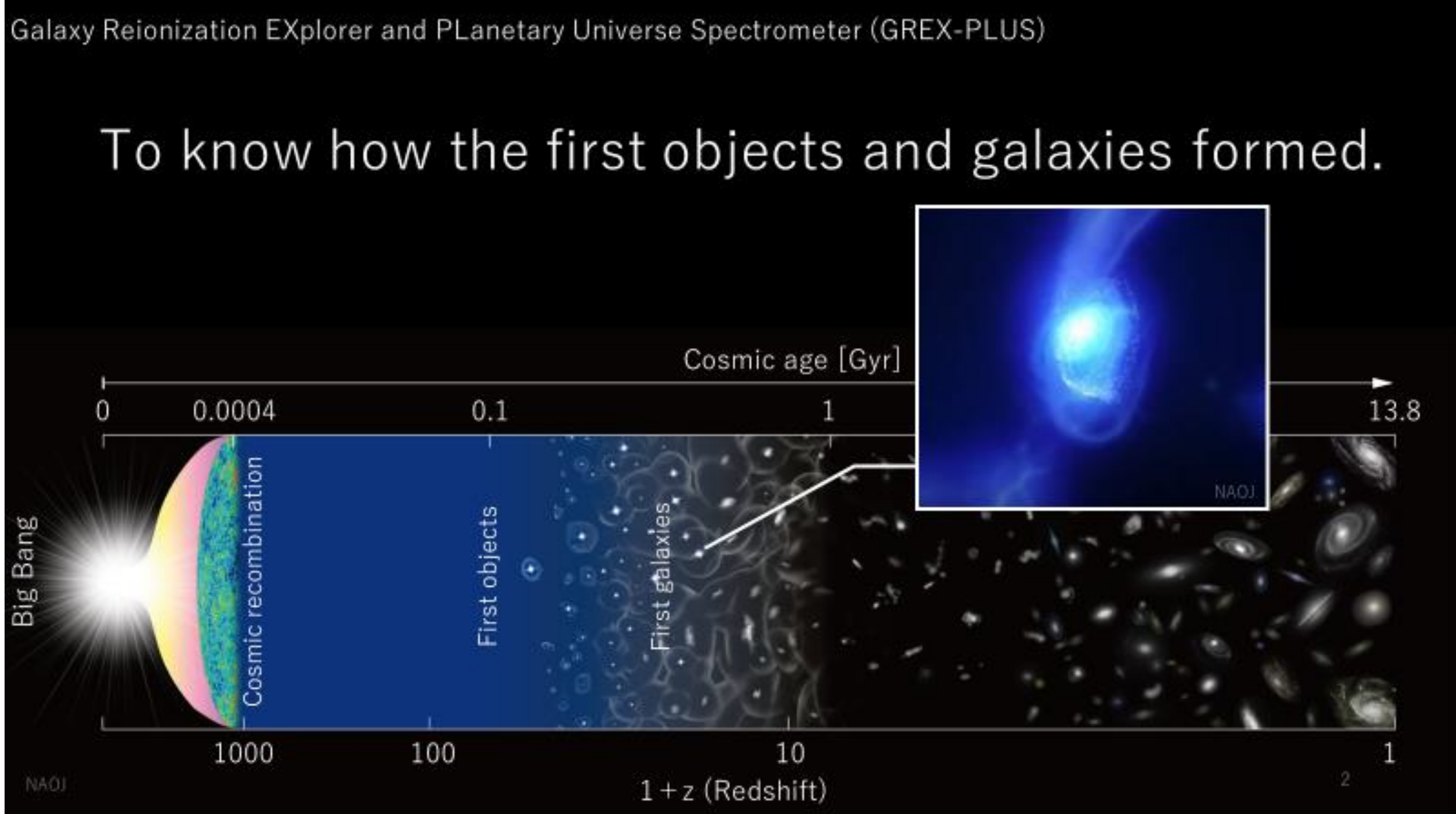
A candidate of the 2030s' strategic L-class mission by ISAS/JAXA:

GREX-PLUS

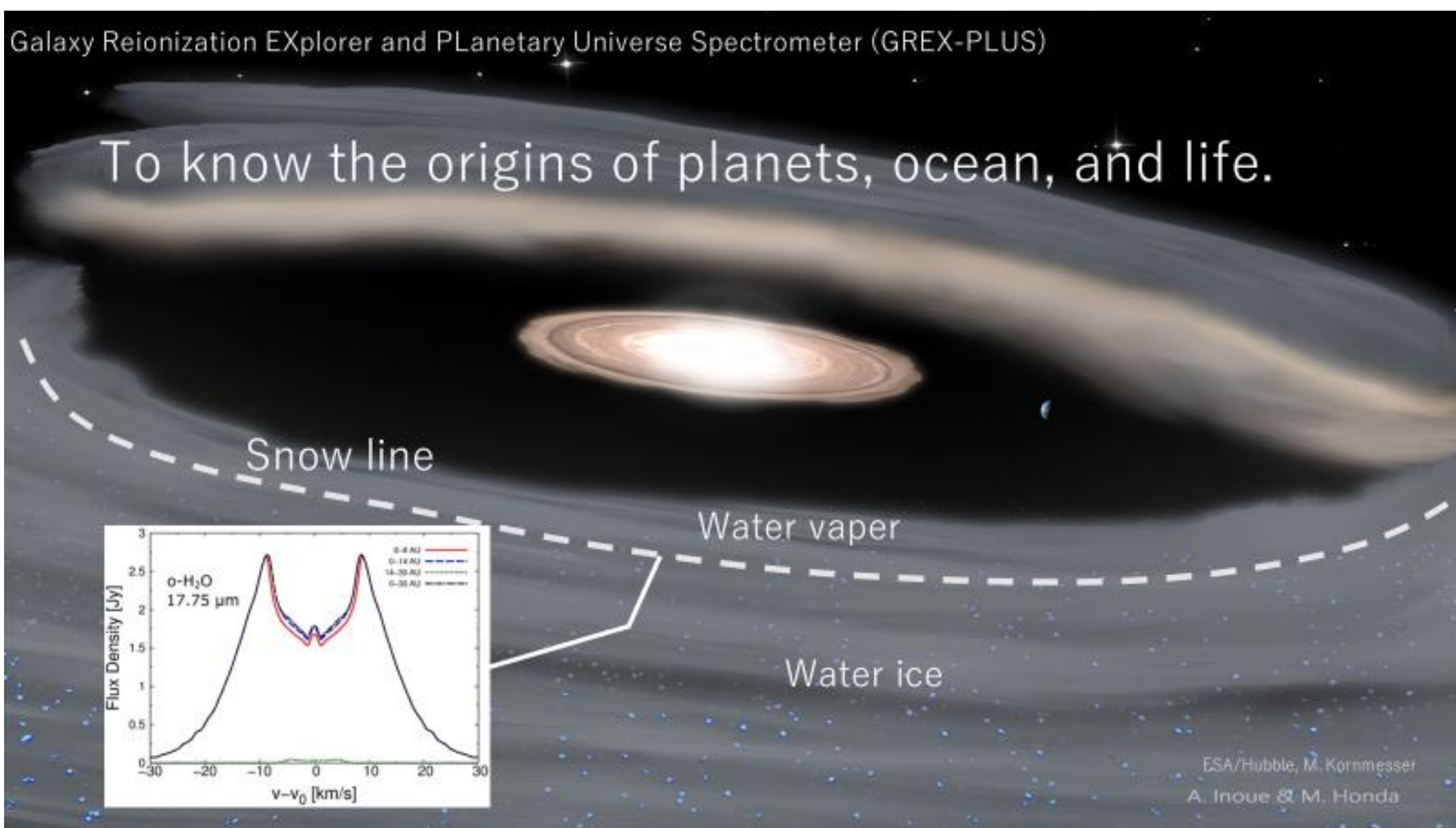
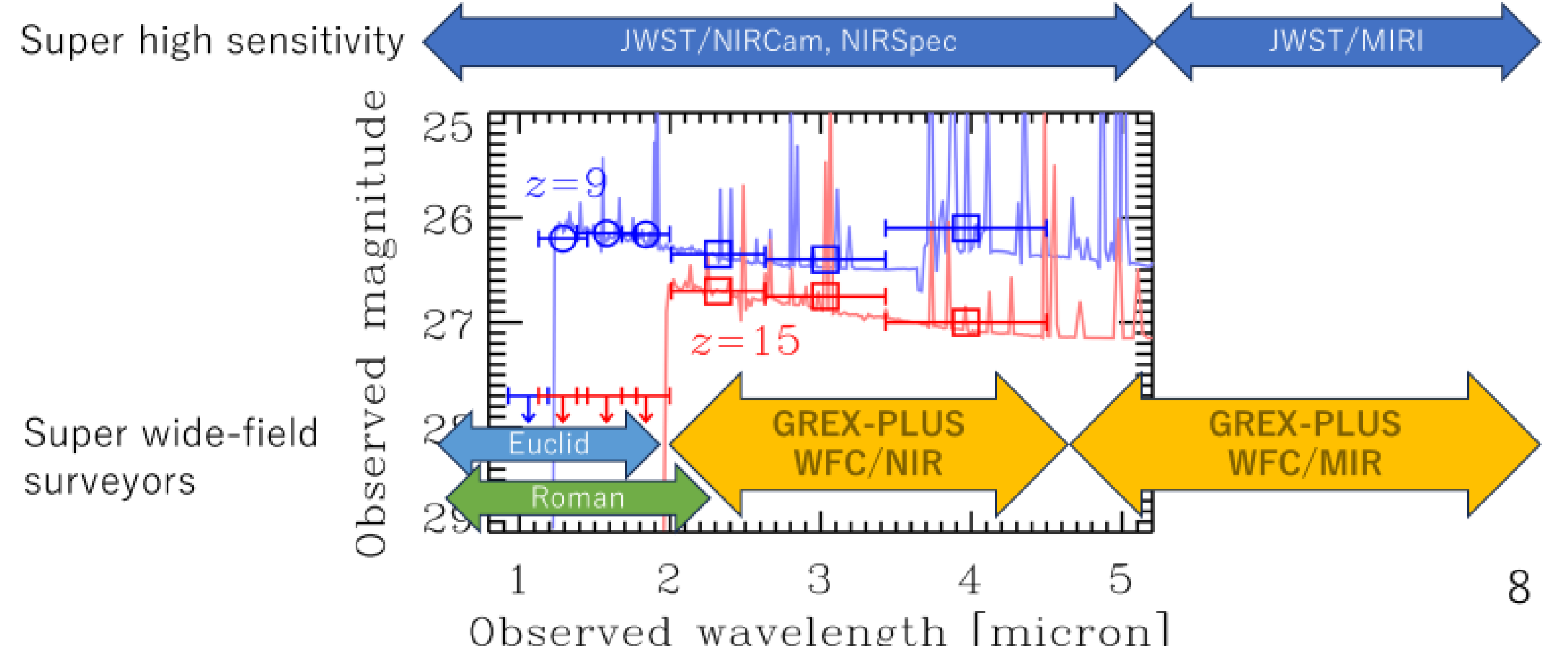
Galaxy Reionization EXplorer and
PLanetary Universe Spectrometer



Akio K. INOUE (Waseda U.) et al. GREX-PLUS Science Book: [arXiv:2304.08104](https://arxiv.org/abs/2304.08104)



Need wide-field imaging in $\lambda > 2 \mu\text{m}$

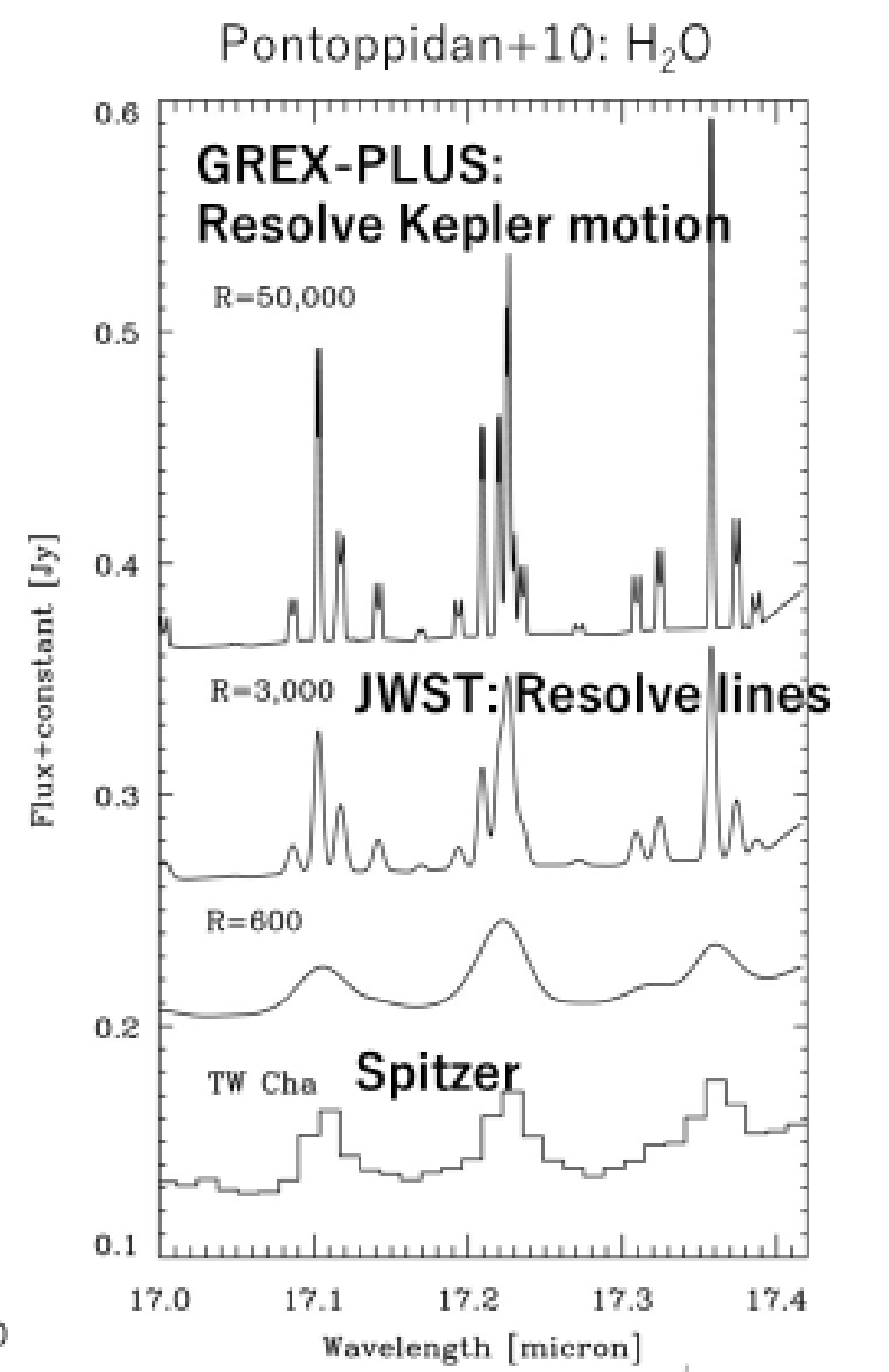
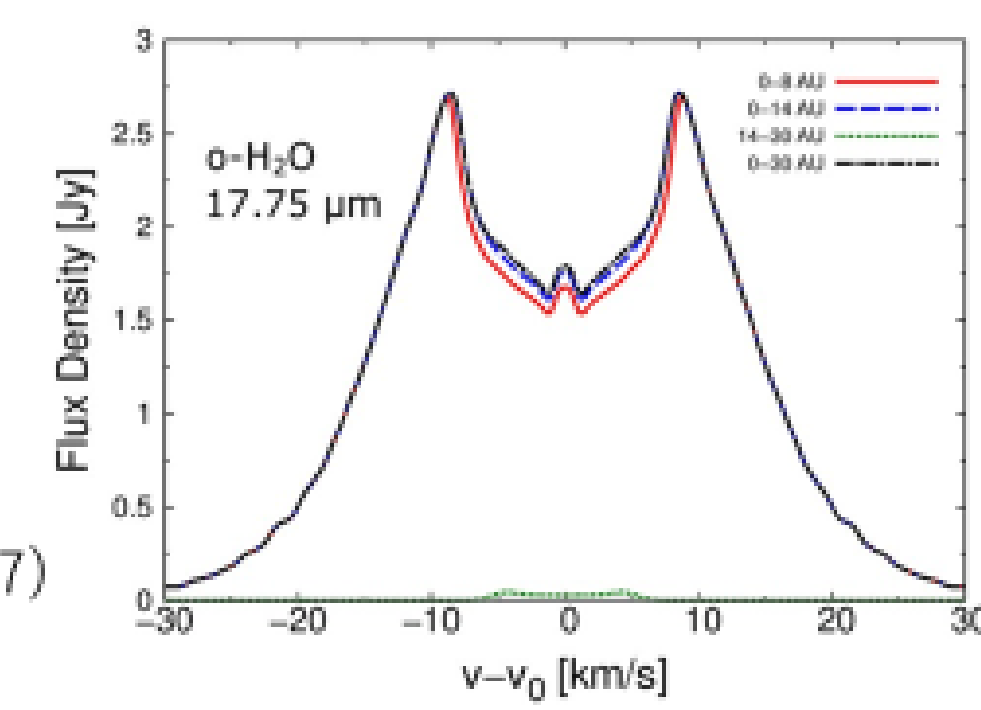


Need high spec. resolution

- To resolve water snowline spatially is too difficult.
 - Let's resolve the position in velocity.
 - Kepler motion is $\sim 30 \text{ km/s}$
 - Need $\Delta V \sim 10 \text{ km/s} \rightarrow R = 30,000!$
- x10 higher velocity resolution than JWST**

- JWST $R \sim 3,000$
- $\Delta V \sim 100 \text{ km/s}$

Notsu et al. (2017)



Extra-Galactic Sciences

- EGS1 First galaxies
- EGS2 Galaxy mass assembly
- EGS3 First supernovae
- EGS4 Infrared background
- EGS5 First quasars
- EGS6 Submm galaxies
- EGS7 Dusty AGNs
- EGS8 Extremely metal-poor galaxies
- EGS9 AGN outflows
- EGS10 IGM molecular gas
- EGS11 Magellanic Clouds

Galactic & Planetary Sciences

- GPS1 Snow line in Protoplanetary disks
- GPS2 ISM molecules
- GPS3 Exoplanet atmosphere
- GPS4 Solar system planets
- GPS5 Icy small solar system bodies
- GPS6 Star forming regions
- GPS7 Galactic center

Super wide-field
imaging survey
in 2-10 micron

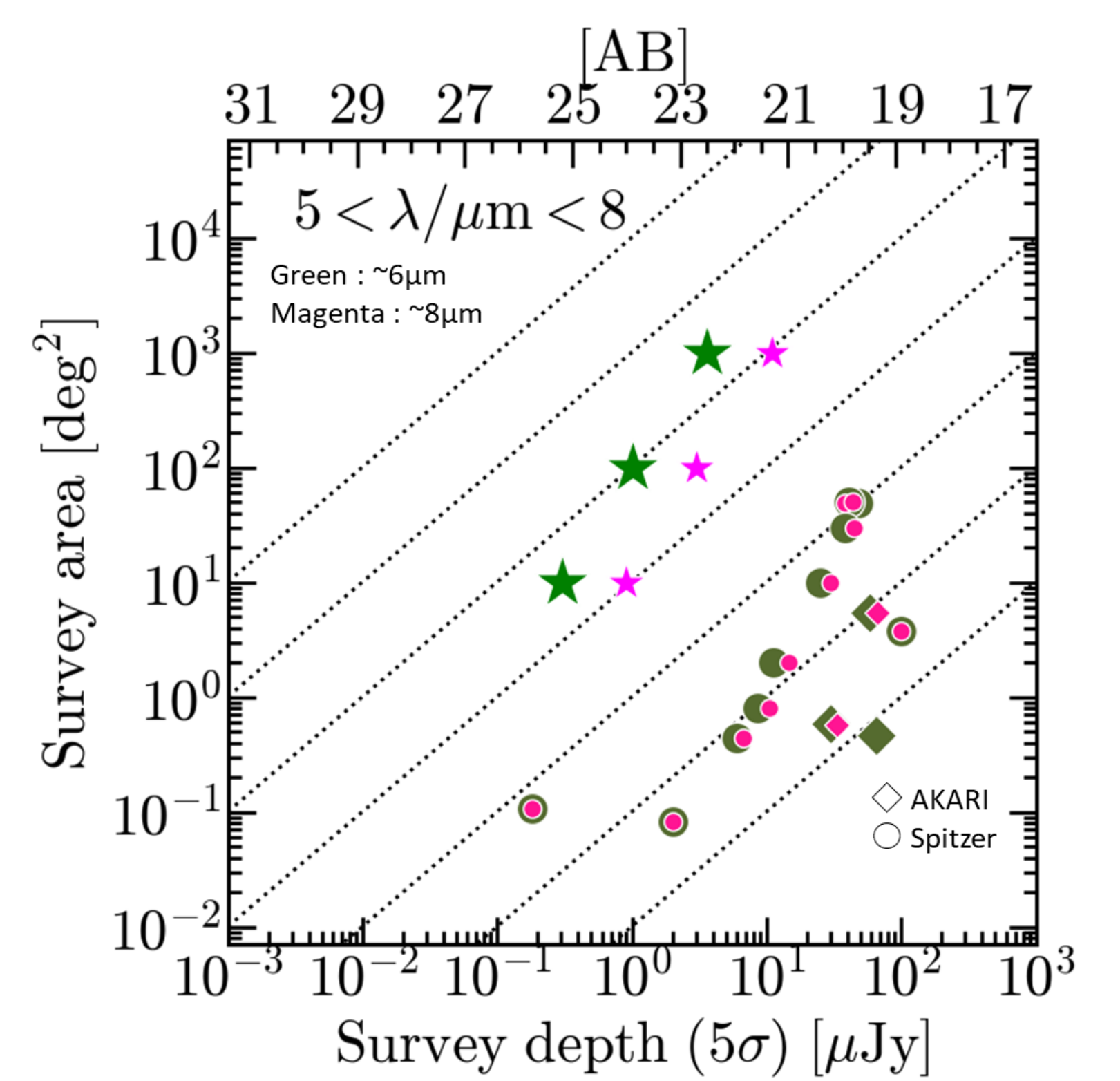
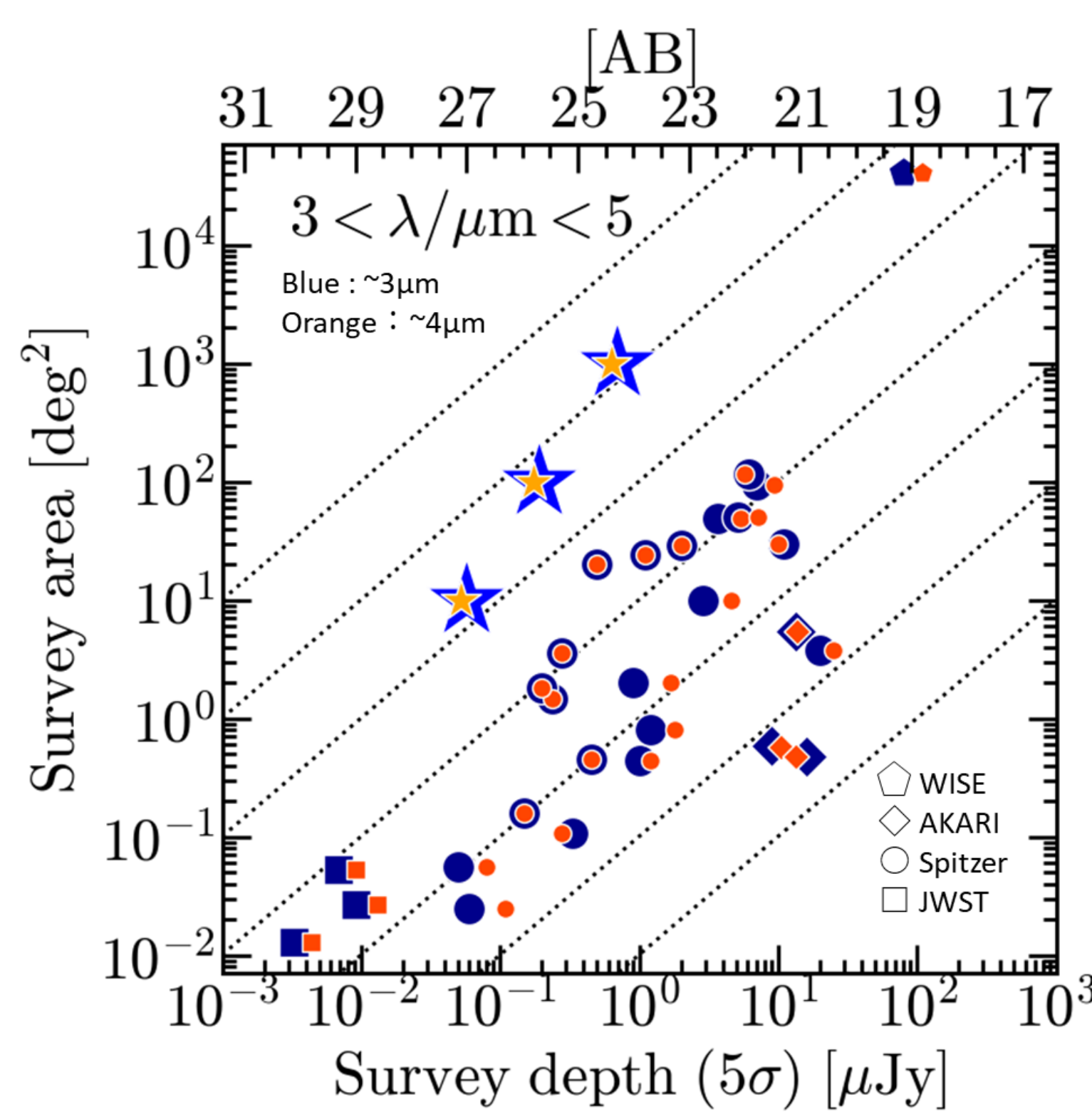
$R \sim 30,000$
spectroscopy
in 10-20 micron

GREX-PLUS

Wide-field
camera

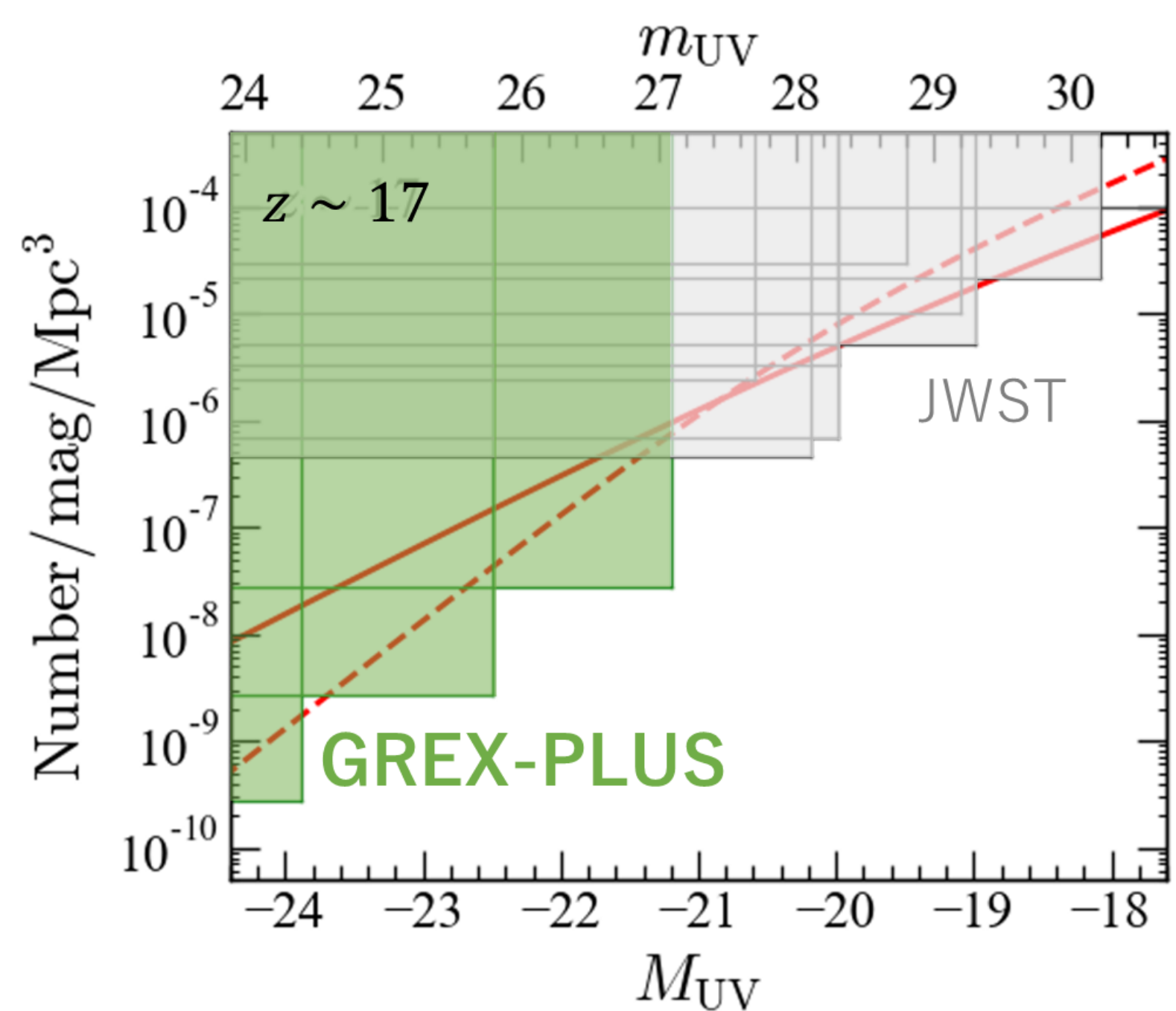
High resolution
spectrometer

GREX-PLUS WFC Survey Parameters



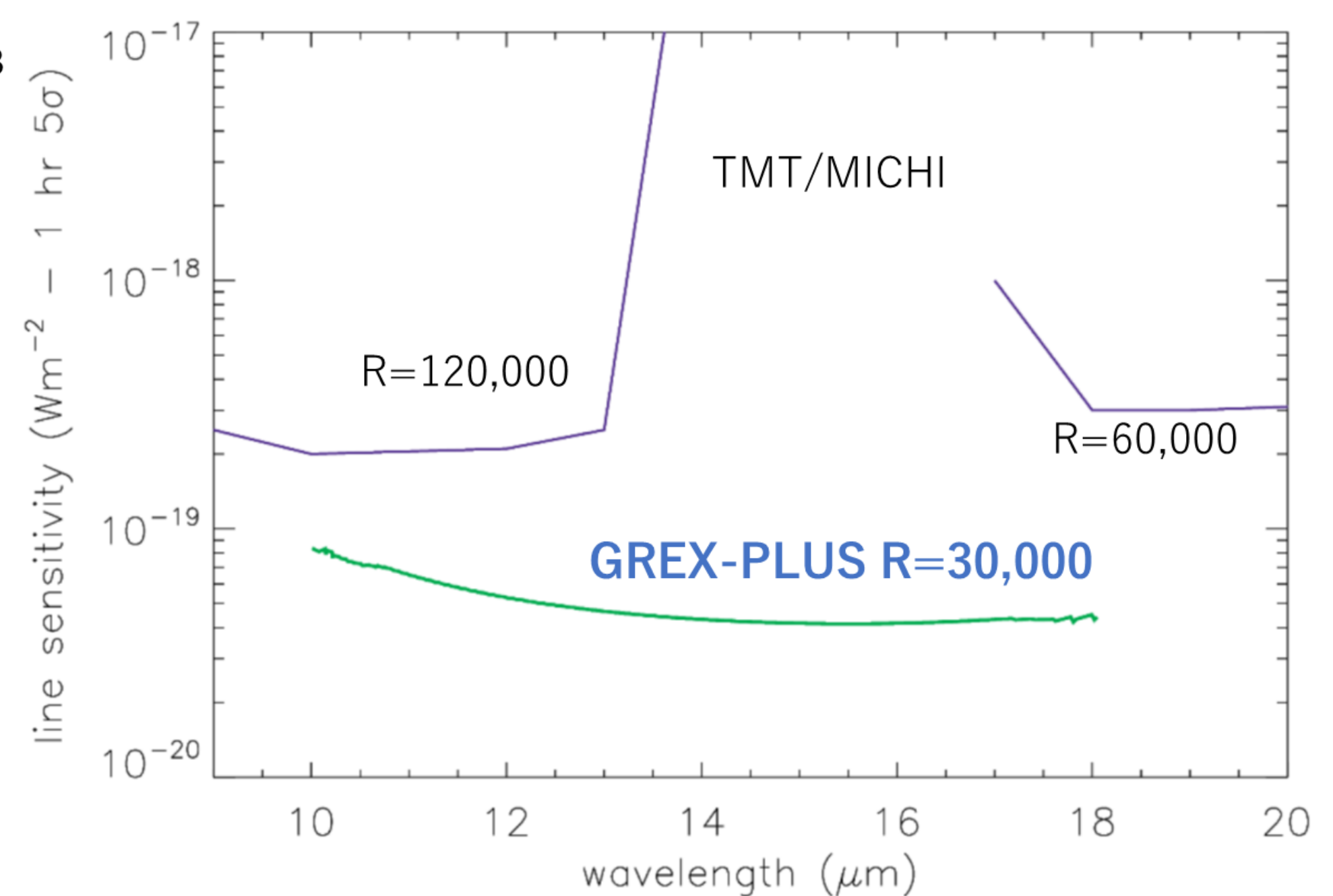
Baseline specifications

- Cryogenic space telescope ($< 50\text{K}$)
- Primary mirror diameter: **1.2m**
- Detector temperature: 7-50 K
- Cooling system from SPICA
- Wide-Field Camera**
 - Field-of-view : **1,260 arcmin²**
 - 7 HgCdTe detectors
 - Division into 5 bands
 - 3 bands in 2-5 micron
 - 2 bands in 5-8 micron
 - No filter exchange system
- High Resolution Spectrometer**
 - $R = 30,000$** ($\Delta v = 10 \text{ km/s}$) in 10-18 micron
 - CdZnTe Immersion Grating
 - Nominal lifetime: 5 years + 2+ years (goal)
 - Cost: $< 40\text{B JPY}$
 - ISAS/JAXA Strategic L-class
 - Launch: **mid-2030s**



Donnan+23
Harikane+23

GREX-PLUS HRS Sensitivity



Timeline

2022/December, Official WG started.
2024/Early, Mission convergence in Astrophysics Division/ISAS
2024/November, Mission adoption
 2025, MDR?
 2033/34, Launch?

International collaborations

US: U. Arizona & CfA Harvard for construction of WFC and supply of HRS detector
 How about EU?