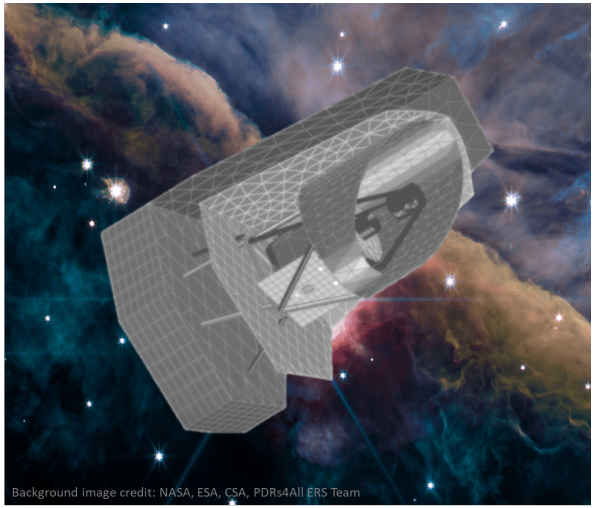


GREX-PLUS

Galaxy Reionization EXplorer and PLanetary Universe Spectrometer

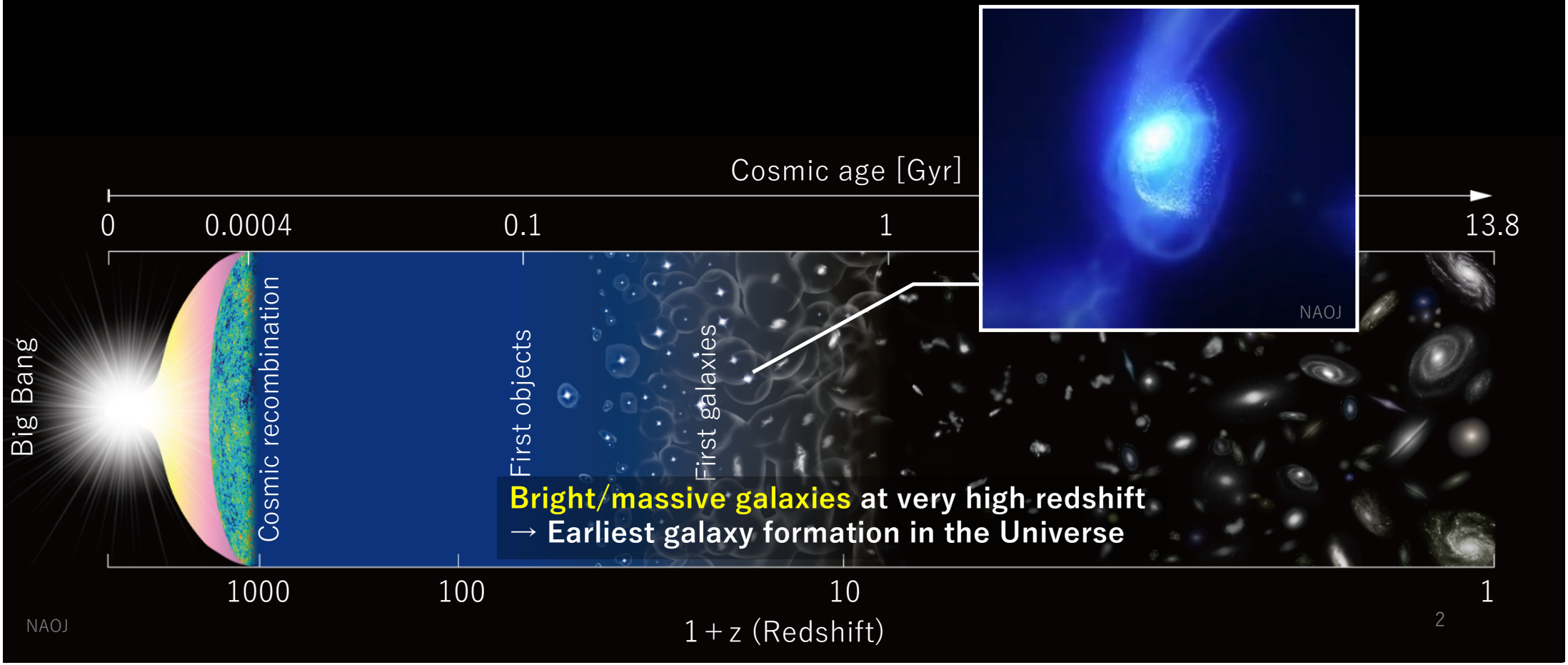
Akio K. INOUE (Waseda U.)

Hideko Nomura/Masami Ouchi (NAOJ Div. of Science)

GREX-PLUS team

Galaxy Reionization EXplorer and PLanetary Universe Spectrometer (GREX-PLUS)

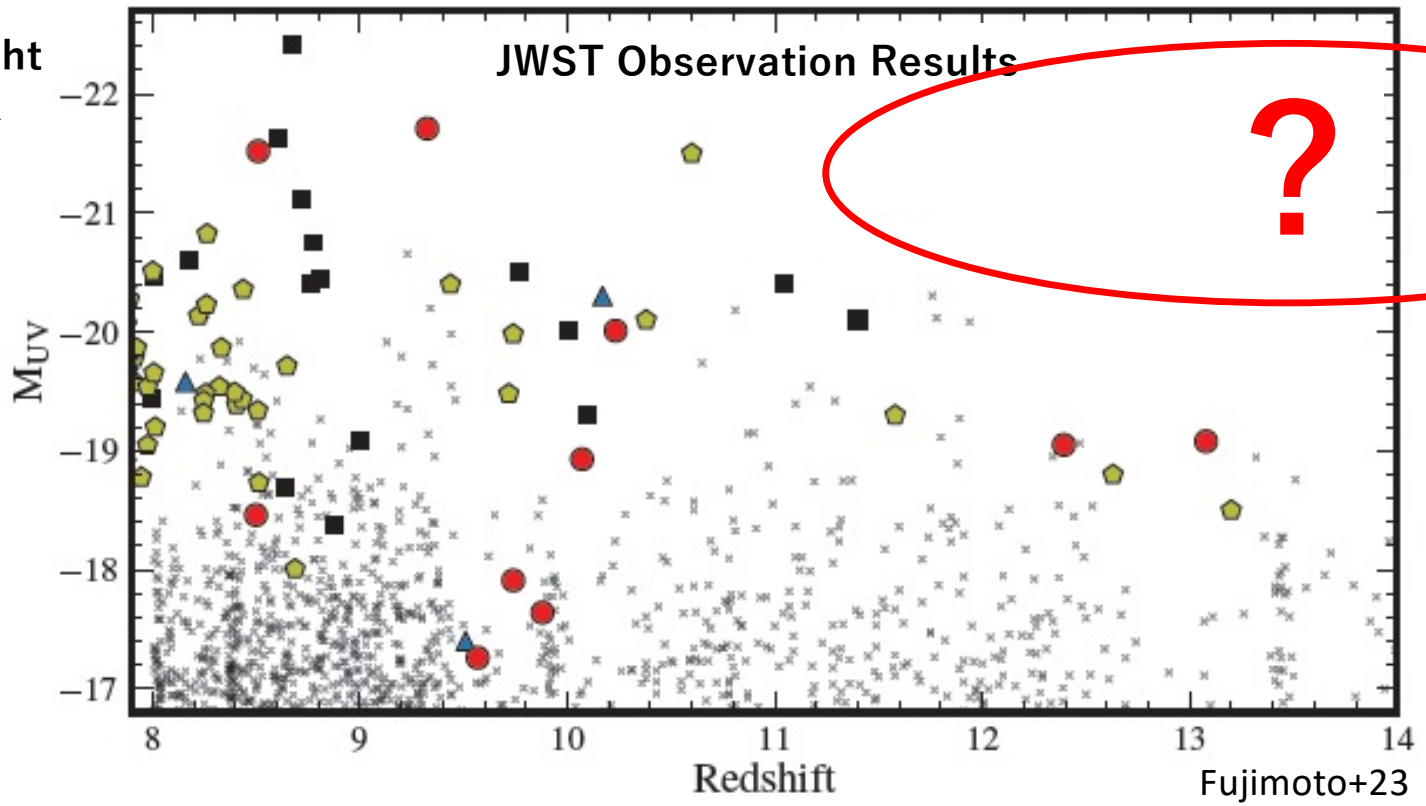
To know how the first galaxies formed.



Uncovering the First Galaxy Formation

Narrow
Deep C

bright



VST/MIRI

Wide-Fiel
Shallow C

-PLUS
C/MIR

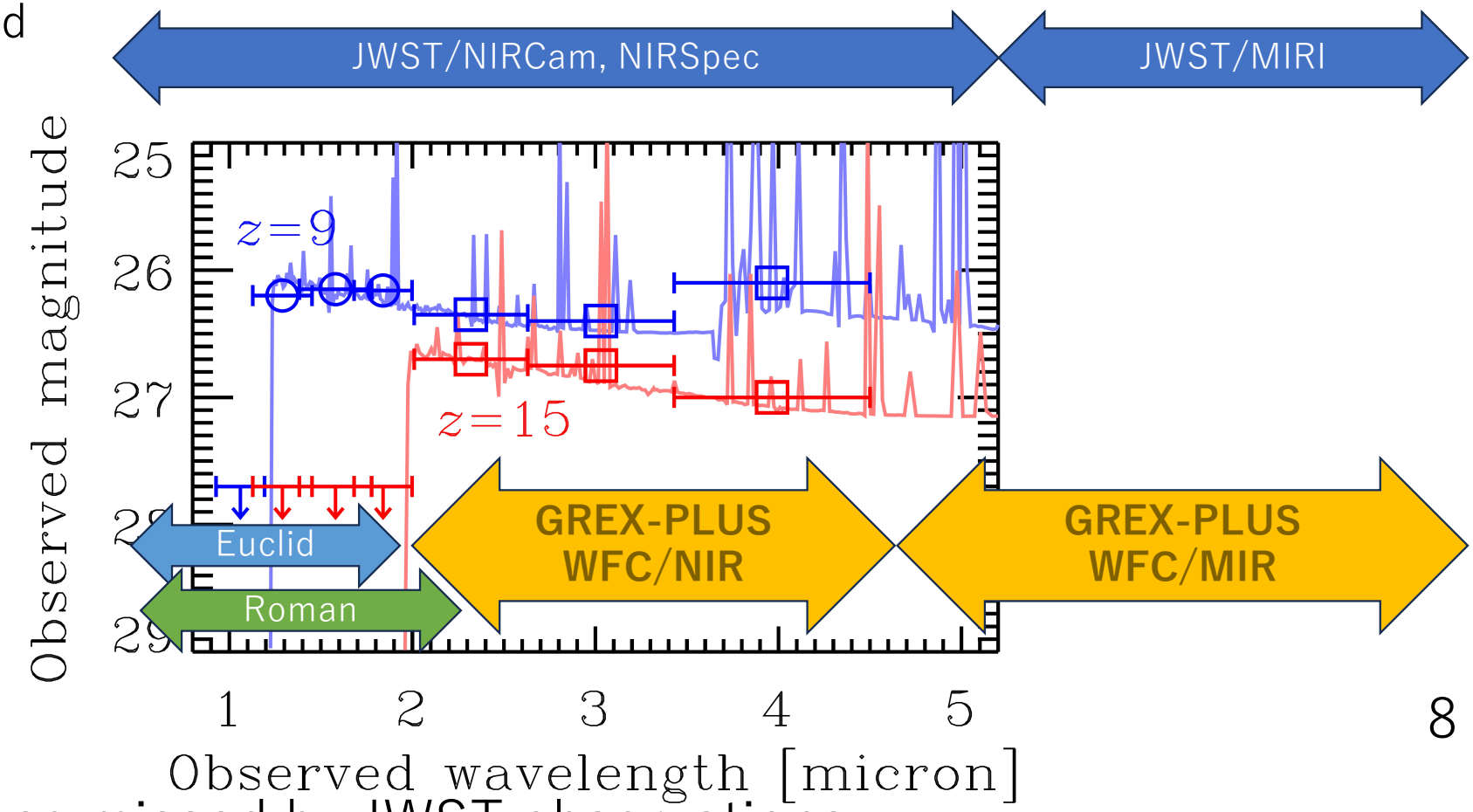
Observed wavelength [micron]

- Parameter space missed by JWST observations
- Complementary to Euclid and Roman survey observations

→Cont'd to the second goal

Uncovering the First Galaxy Formation

Narrow Field
Deep Obs.



Wide-Field
Shallow Obs.

- Parameter space missed by JWST observations
- Complementary to Euclid and Roman survey observations

→Cont'd to the second goal

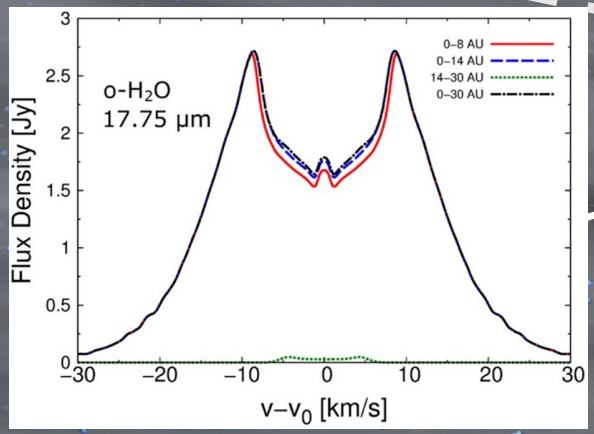
Galaxy Reionization EXplorer and PLanetary Universe Spectrometer (GREX-PLUS)

To know the origins of planets, ocean, and life.

Snow line

Water vaper

Water ice



ESA/Hubble, M. Kornmesser

A. Inoue & M. Honda

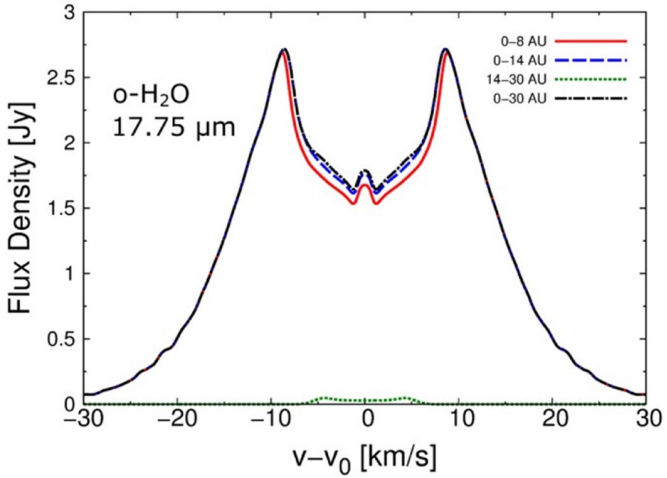
Need high spec. resolution

- To resolve water snowline spatially is too difficult. e.g., Tobin et al. (2023), ALMA, H_2O
- Let's resolve the position in velocity.
  - Kepler motion is ~30 km/s
  - Need ΔV~10 km/s → R=30,000!

  x10 higher velocity resolution than JWST

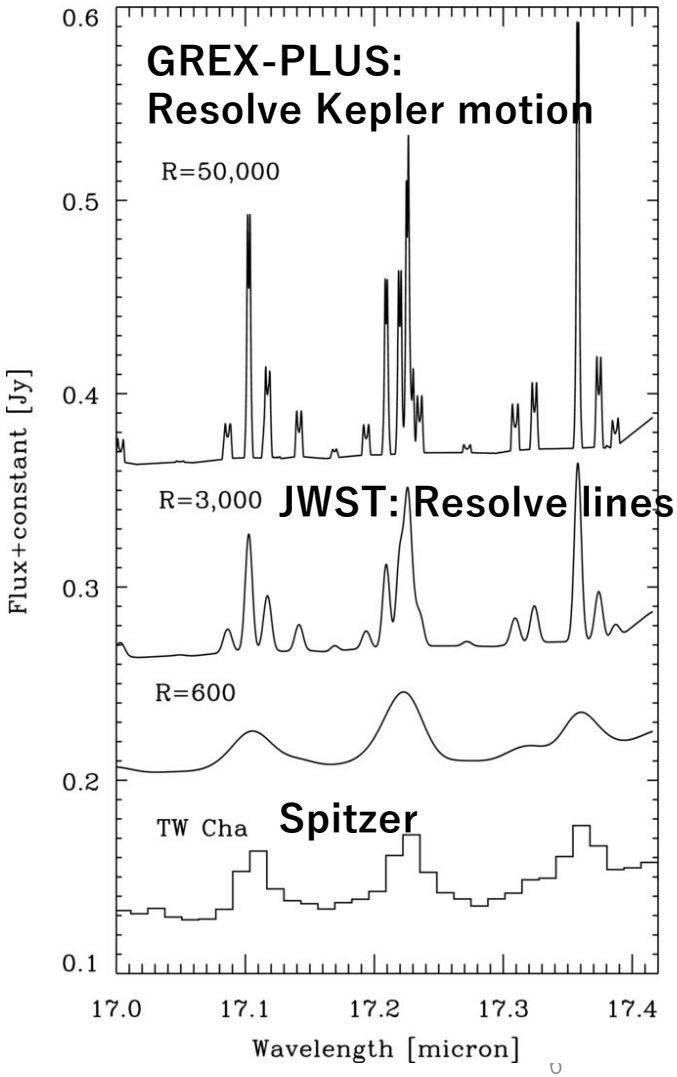
  - JWST R~3,000
    ΔV~100 km/s

e.g., Banzatti et al. (2023), JWST, H_2O



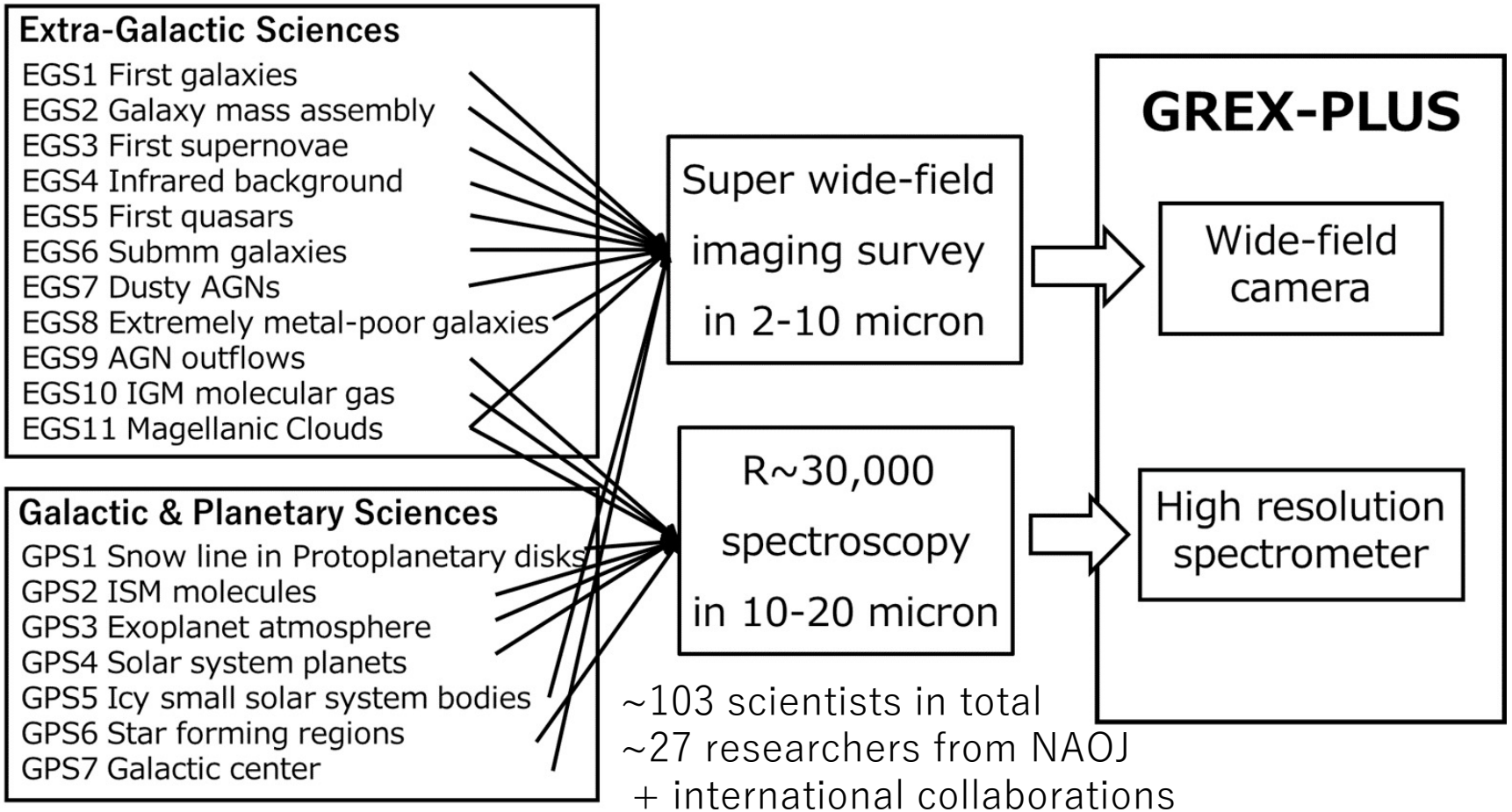
Notsu et al. (2017)

Pontoppidan+10: H_2O



GREX-PLUS
Science Goals, Required Observations and Instruments

GREX-PLUS Science Book arXiv:2304.08104



~103 scientists in total
~27 researchers from NAOJ
+ international collaborations

GREX-PLUS: A JAXA L-class mission concept

- Cryogenic space telescope (<**50K**)
  - Primary mirror diameter: **1.2m**
  - Detector temperature: 7-50 K
  - Cooling system from SPICA
- Wide-Field Camera
  - Field-of-view：**1,260 arcmin2**
  - Division into 5 bands
    - 3 bands in 2-5 micron
    - 2 bands in 5-8 micron
- High Resolution Spectrometer
  - **R=30,000** (Δ v=10 km/s) in 10-18 micron

- Nominal lifetime: 5 years
  - +5 years (goal)
- Cost: <40B JPY
  - ISAS/JAXA Strategic L-class
- Launch: mid-2030s

- “Time-limited” Working Group for a JAXA L-class mission
  - Reform of the scheme to create L-class missions.

Timeline

- 2022/December, “Time-limited” Working Group
- **2024/February**, Mission convergence in Astrophysics Division/ISAS
- **2024/July-August**, Mission adoption
- 2025, MDR?
- 2033/34, Launch?

Expected NAOJ Contribution

- Technical development support by ATC
- Data reduction and archive by ADC
- Science production by DS