spectroscopy w/ WISH?

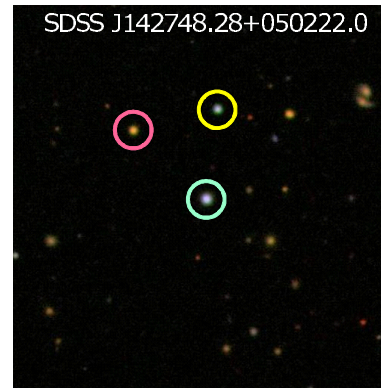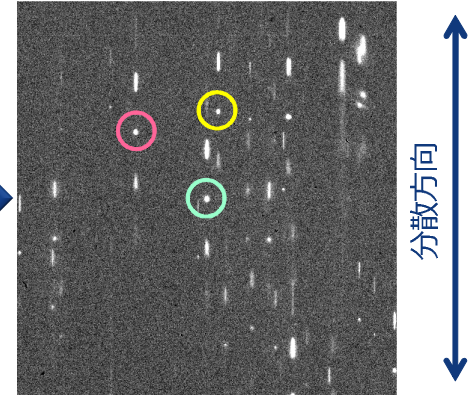# slitless spectroscopyの検討

諸隈 智貴 (NAOJ)

I

slitless spectroscopy

メリット
- ➕ 無バイアスサーベイ
- ➕ 天体数を稼げる

デメリット(スリット分光と比べて)
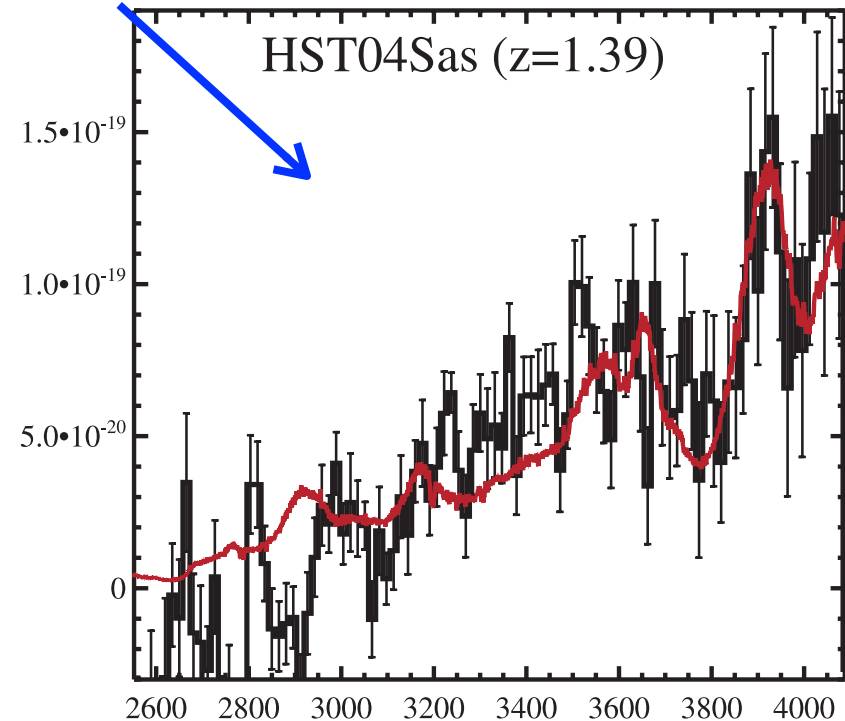- ➕ 限界等級が浅い
- ➕ 近くの天体とのスペクトルの重複が起こる
- ➕ 波長分解能をあまり高くできない
- ＋ シーイングで波長分解能が決まる

(東大天文M2大野くんの修論より)

SDSS J142748.28+050222.0

スリットレス分光

分散方向

science w/ slitless spectroscopy

- high-z supernova: type identification
- gamma-ray burst: continuum, Lyman break
- galaxies: (Lyman/Balmer) break, emission lines
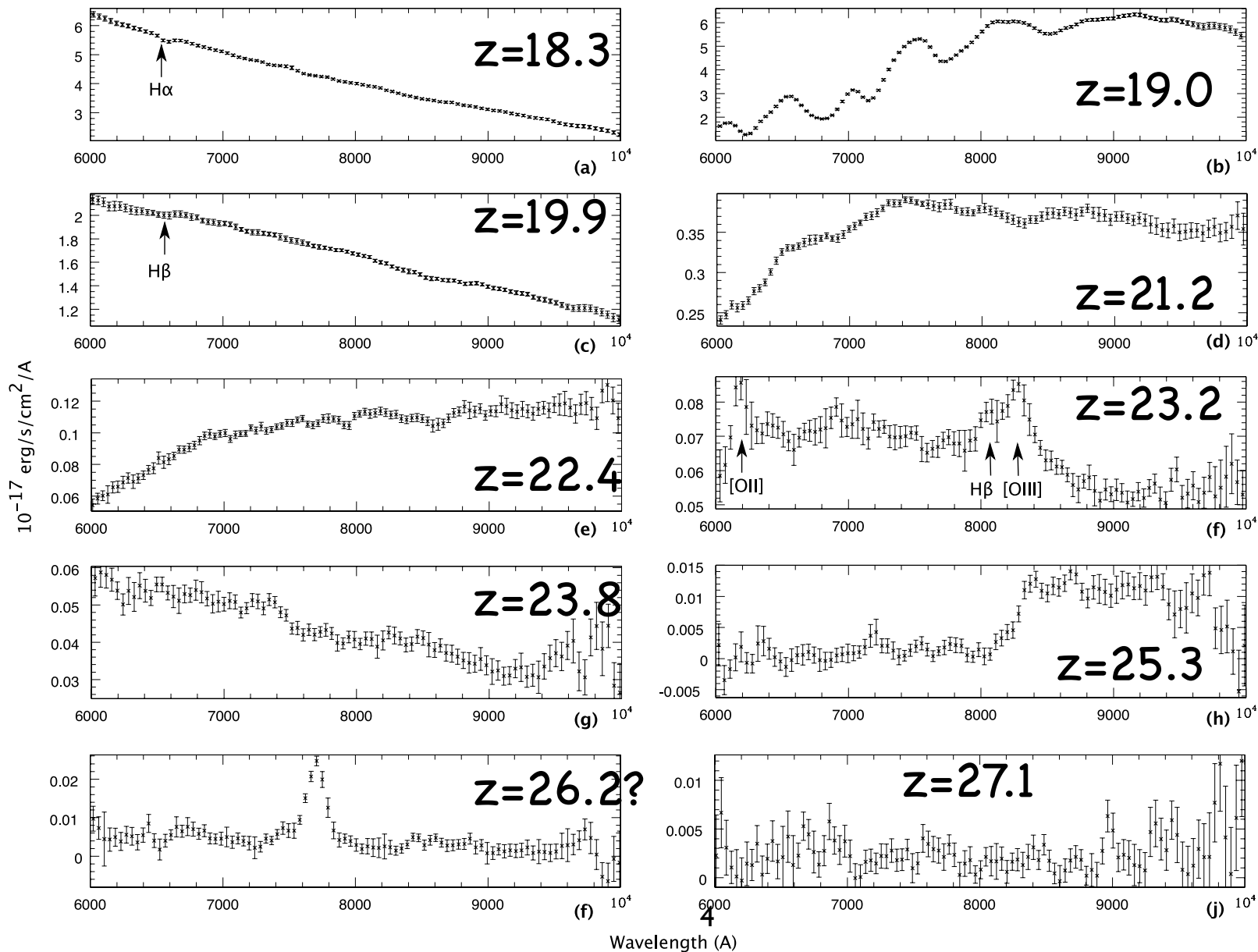
Riess+2007
highest-z spec-ID SN Ia
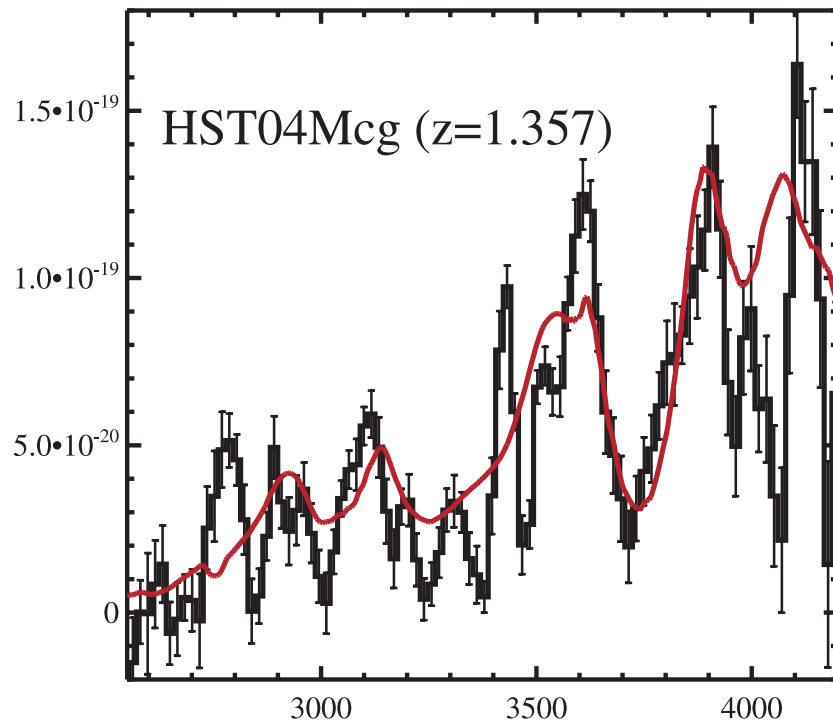
science w/ slitless spectroscopy

w/ HST/ACS G800L grism   Pirzkal+2004 (GRAPES), 92000 sec
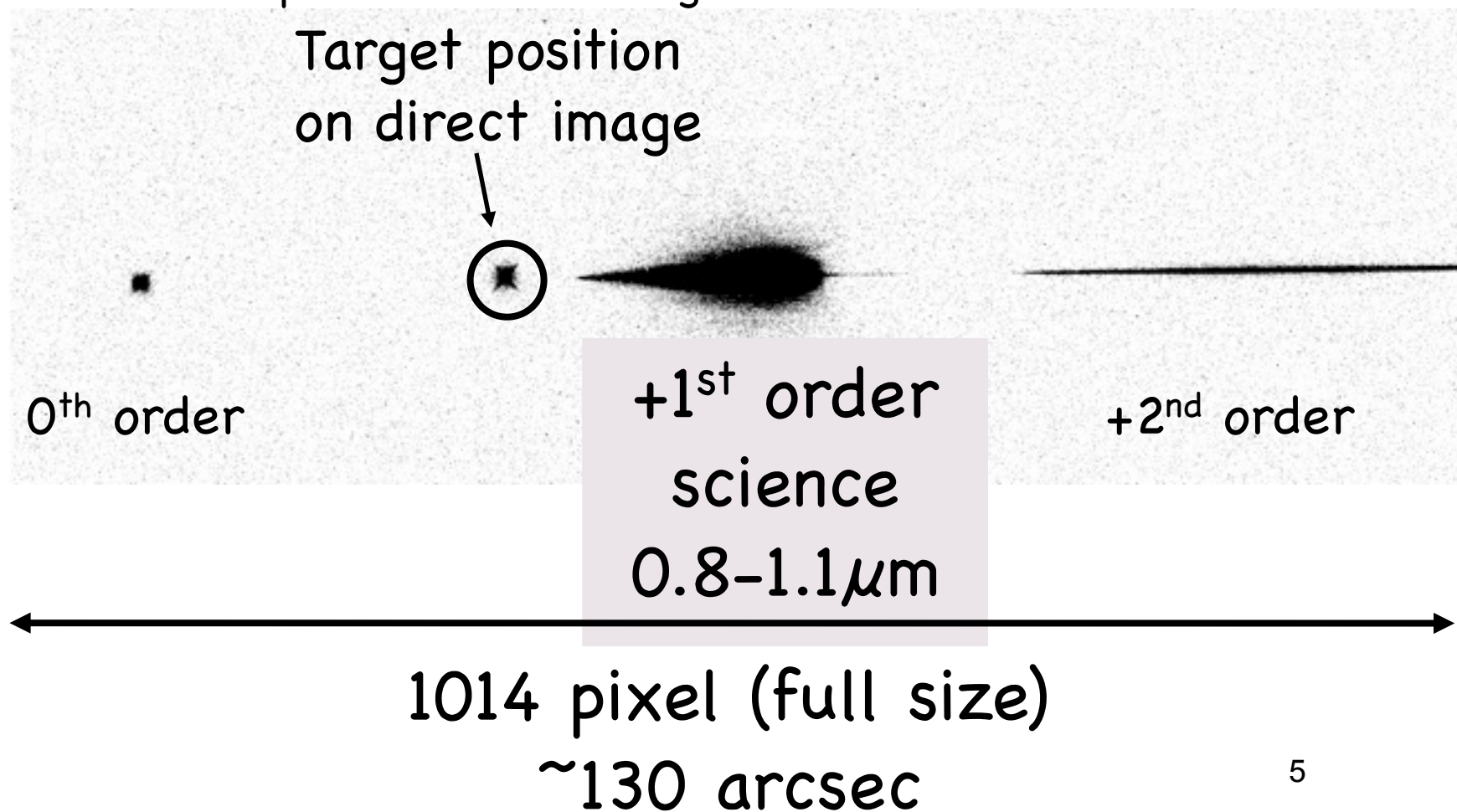
WFC3-IR G102

TV3 ground calibration; simulated point source

Combined dispersed + direct image

Target position
on direct image

0th order

+1st order
science
0.8-1.1μm

+2nd order

1014 pixel (full size)
~130 arcsec

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slitless spectroscopy on board JWST

- NIRCam
  + grismの搭載は考えられていない

    http://ircamera.as.arizona.edu/nircam/features.html

- NIRSpec
  + 当然分光を行う

  + Micro-Shutter Array (MSA, 3.4'x3.6') or IFU (3"x3")での分光

    http://www.stsci.edu/jwst/instruments/nirspec/
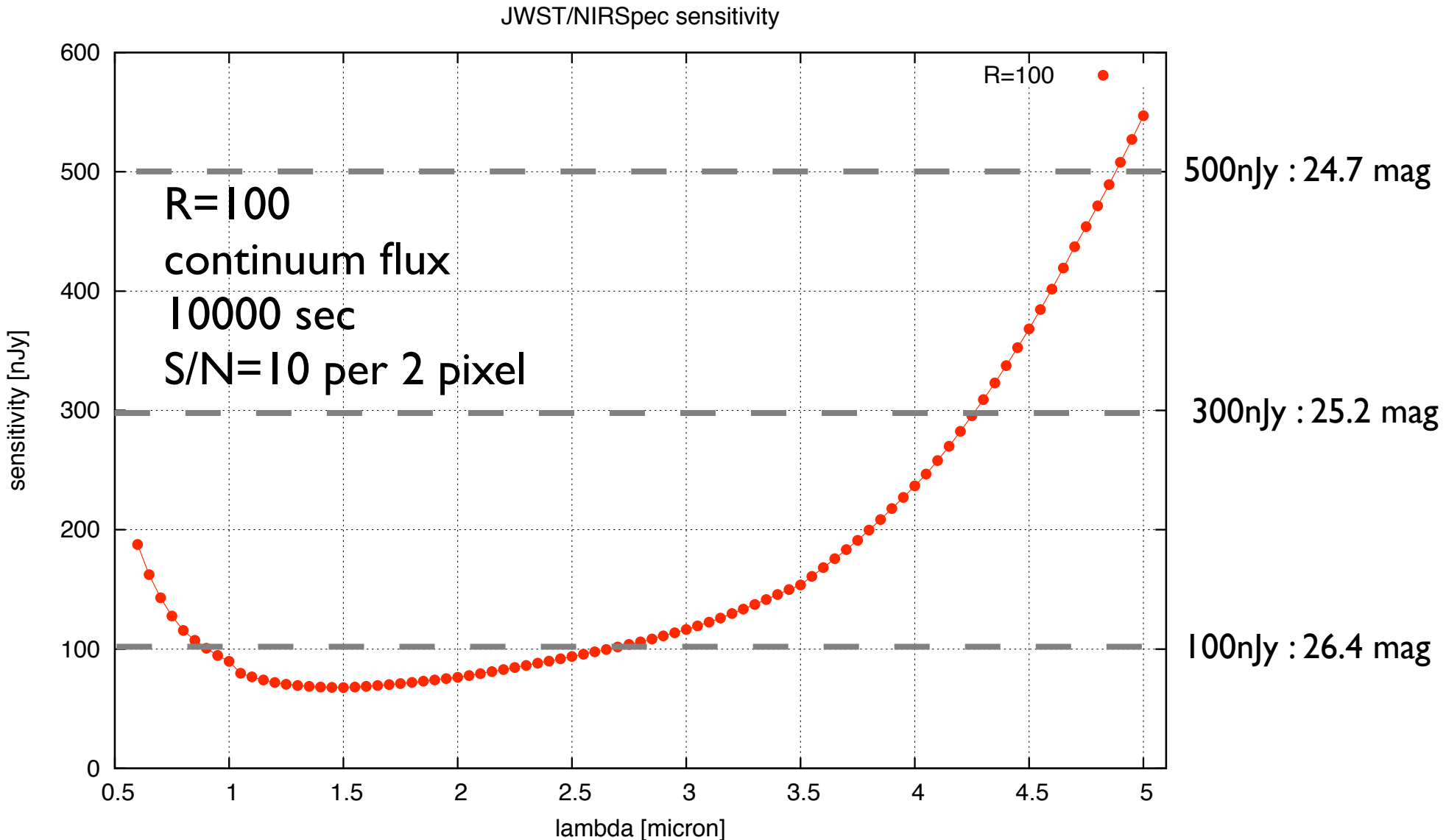   + R=100: 132 nJy, 3.0μm, S/N=10, t=10,000 sec
      + R=1000: 5.72e-19 erg/s/cm2, 2.0μm, S/N=10, t=100,000 sec
      + R=2700:

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JWST/NIRSpec spectroscopy

JWST/NIRSpec sensitivity

R=100
continuum flux
10000 sec
S/N=10 per 2 pixel

R=100

500nJy : 24.7 mag

300nJy : 25.2 mag

100nJy : 26.4 mag

sensitivity [nJy]

lambda [micron]

http://www.stsci.edu/jwst/instruments/nirspec/sensitivity/index_html

slitless spectroscopy

instruments	FoV	m_lim (exp. time, S/N)	λ [μm]	R
HST/WFC3	123″x136″	NICMOSより 少しいいくらい?	0.8–1.7	130–210
HST/ACS	202″x202″	z~27.2 (92000 sec, 5?)	0.55–1.05	100
HST/NICMOS	51″x51″	H~20 (10000 sec, 10)	0.8–2.5	200
JWST/NIRSpec	3.4′x3.6′	JHK~26 (10000 sec, 10)	0.7–5.0	100
Subaru/S-Cam	27′x10′x2	i~23.9 (EWobs~530A) (18000 sec, 5?)	0.62–0.85	30–50
WISH	1000□′	HSTくらい?	1–2?3?5?	50? 200?

GRism ACS Program for Extragalactic Science (GRAPES; Pirzkal+2004)

Probing Evolution And Reionization Spectroscopically (PEARS; Straughn+2008)

NICMOS Grism Parallel Survey (McCarthy+1999)

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spec. of WISH slitless spectroscopy

- 波長範囲

    + 1-2μmは必須に思える

    + 2-3μm以上も必要か?

- 限界等級

- 製作可能性

    + ~100mmx60mm, 厚さ5-10mm

- 視野

    + 全てのフリップ式フィルター? 部分的に?

- 分解能

    + スペクトルの長さ/重なり、confusion

slitless spectroscopy simulation

http://www.stecf.org/software/slitless_software/axesim/

The Slitless Simulation package aXeSIM

As part of the ST-ECF support for the spectroscopic modes of Wide Field Camera 3 (WFC3), the slitless spectroscopy group of the ST-ECF has developed a dedicated simulation package applicable to WFC3. Whilst the package was initiated for exploitation of WFC3 slitless grism modes, it is equally applicable to other slitless spectroscopy modes of HST, such as ACS and NICMOS.

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