南天広視野専用望遠鏡 ＋
主焦点 IFU による
広域無バイアス分光サーベイ

谷口 義明

(放送大学)

SDSS

Sloan

Digital

Sky

Survey

Bland New SDSS

Spectroscopic

Digital

Sky

Survey

従来の基本戦略

撮像サーベイ → 分光フォローアップ

Targeted

未来の基本戦略

無バイアス分光サーベイの時代へ*

* 現在進行中のIFU無バイアス分光サーベイについては
鹿熊亮太氏の講演を参照されて下さい

PRINCE on Subaru II

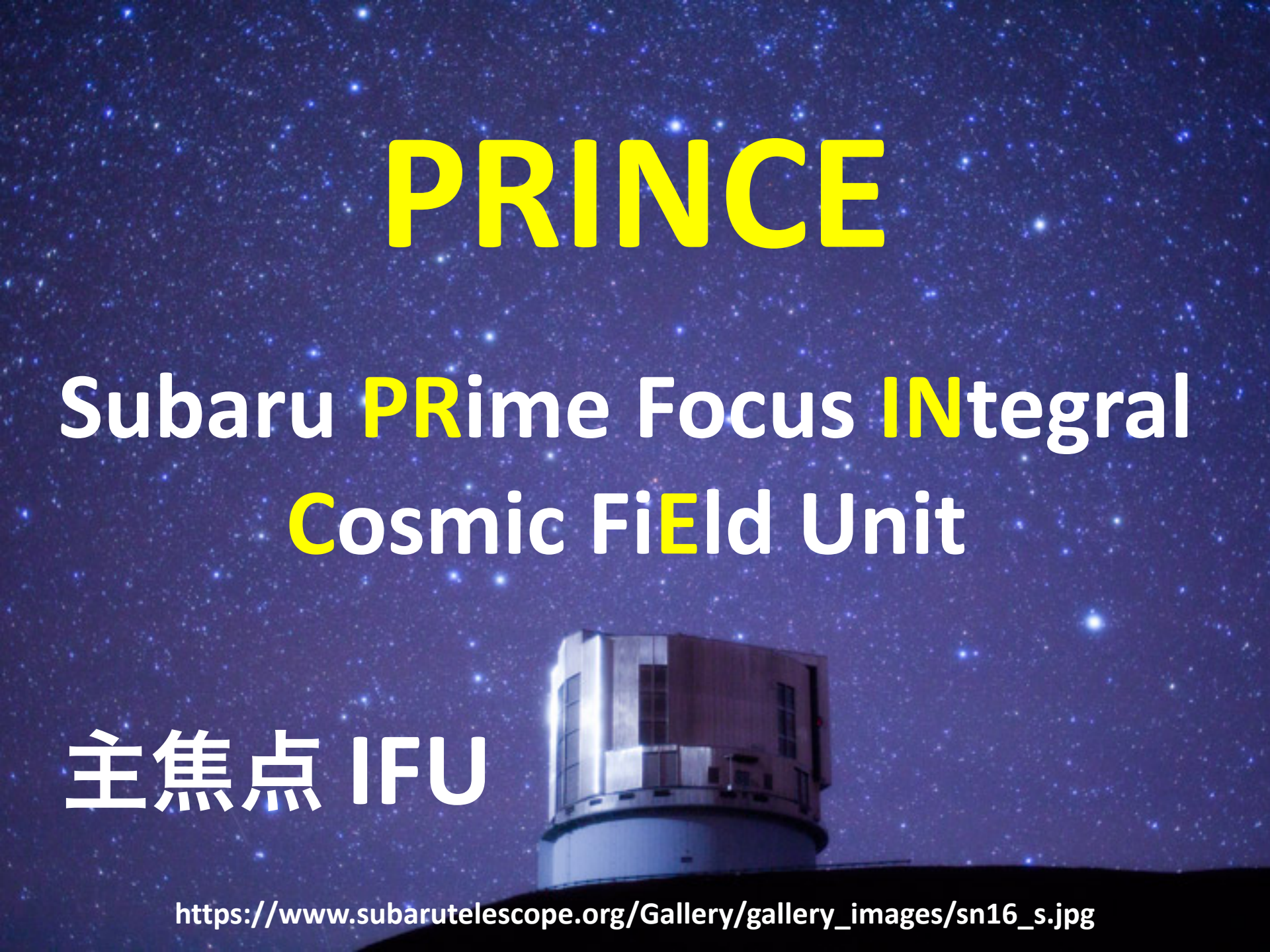
Yoshiaki Taniguchi (Open University of Japan)

https://www.subarutelescope.org/Gallery/gallery_images/sn16_s.jpg

PRINCE

Subaru PRime Focus INtegral Cosmic FiEld Unit

主焦点 IFU



https://www.subarutelescope.org/Gallery/gallery_images/sn16_s.jpg


Subaru II
@ Chile
https://www.subarutelescope.org/Gallery/gallery_images/sn16_s.jpg

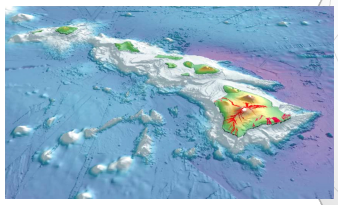
W. M. Keck Observatory

http://www.keckobservatory.org/media/maunakea-summit/

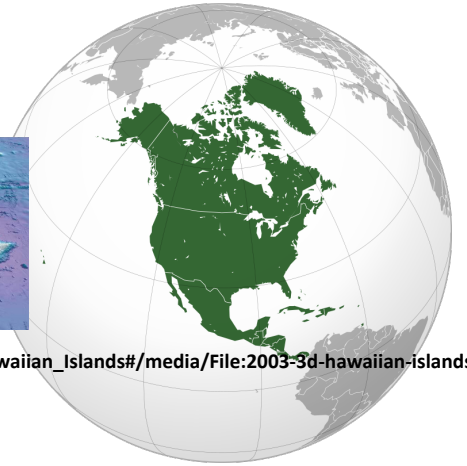
Very Large Telescope

https://ja.wikipedia.org/wiki/超大型望遠鏡VLT

Gemini Observatory



https://en.wikipedia.org/wiki/Hawaiian_Islands#/media/File:2003-3d-hawaiian-islands-usgs-i2809.jpg



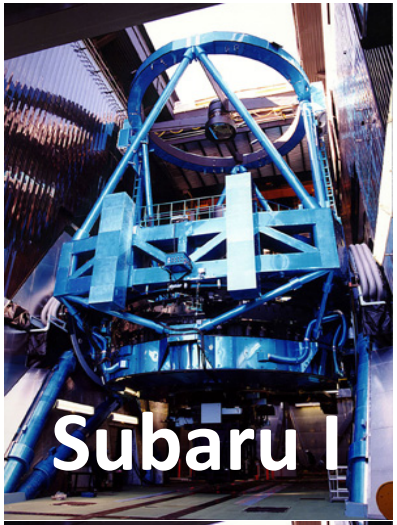
https://ja.wikipedia.org/wiki/北アメリカ

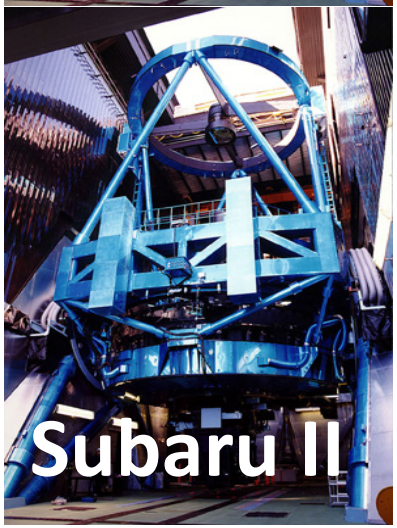
https://ja.wikipedia.org/wiki/南アメリカ

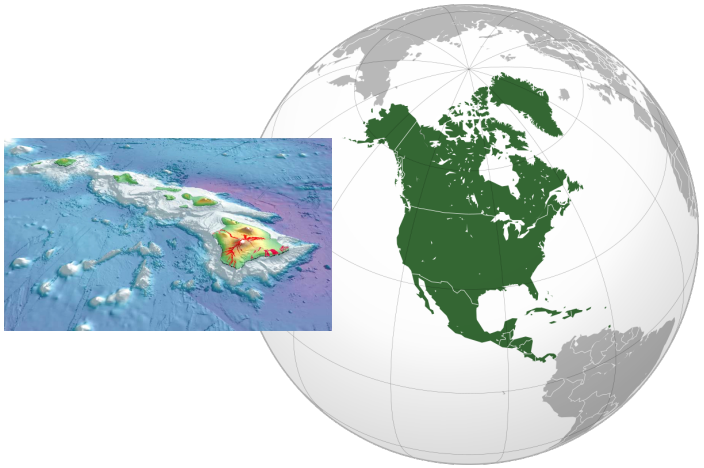
https://ja.wikipedia.org/wiki/ジェミニ天文台

Why one Subaru ?

Subaru Observatory in 2025





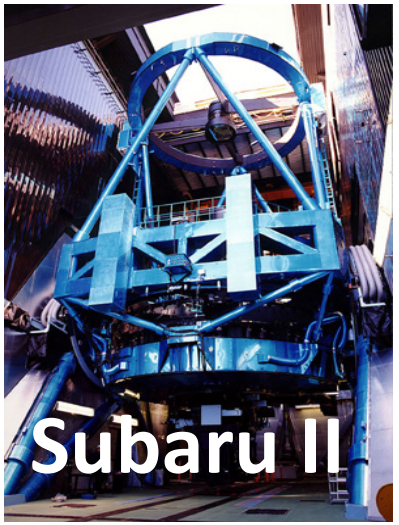


https://www.subarutelescope.org/Gallery/gallery_images/dome_full_s.jpg

Subaru II @ Chile

Prime Focus only (F = 2)

PRINCE only



Subaru II site

https://www.eso.org/public/teles-instr/elt/

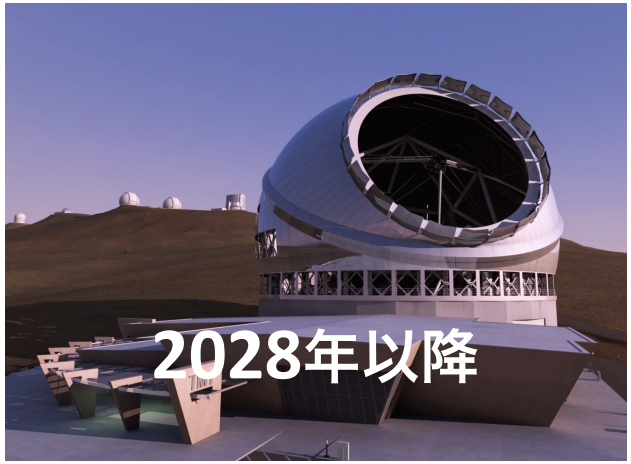
今日の発想

すばるのサイトにTMTを！

明日の発想

E-ELTのサイトにすばるIIを！

口径 30-40m 望遠鏡時代



TMT 30 m

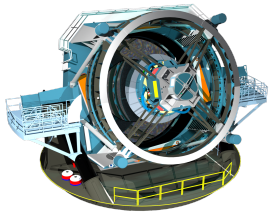
E-ELT 39 m

GMT 22m

すばる主焦点で培った
スピリットで
未来を切り開け！

Synergy with

LSST

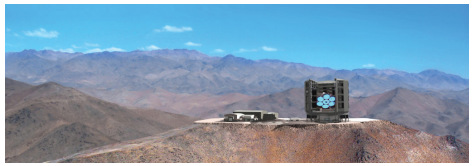


https://en.wikipedia.org/wiki/Large_Synoptic_Survey_Telescope

E-ELT

https://www.eso.org/public/teles-instr/elt/

GMT



https://www.gmto.org/overview/

TAO (MIR)

http://www.ioa.s.u-tokyo.ac.jp/TAO/en/

https://alma-telescope.jp/gallerytag/aos#mt-20_1

ALMA (submm, mm)

PRINCE

e.g., FoV = 1°×1°

Fiber diameter = 2 arcsec ϕ

1800 x 1800 = 3.24 x 10^6 fibers

3240 dispersers

3240 CCDs

PRINCE

For simplicity, imagine the followings

Fiber = 1000 x 1000 = 10^6 fibers

Detector = 2000 with 2k x 2k pixels

$\lambda/\Delta\lambda$ = 2000

Spectrograph = 2000

If one spectrograph costs 0.1 billion JPY
we need 200 billion JPY for only spectrographs …..*

* 分光器はそれほど高額ではないというご意見が
海老塚昇氏、本原顕太郎氏から寄せられた

Note that …

Data storage of PRINCE ~ 1000 × that of HSC

pointed out by Kurita san

PRINCE

How much ?

I don’t know…

But try less than 170 billion JPY

1700億円

??????

Subaru II

How much ?

I don’t know…

But try less than 30 billion JPY

300億円

PRINCE + Subaru II

Try less than 200 billion JPY
2000億円

comparable to the initial cost of HST

but much cheeper than that of JWST (1000 billion JPY)

Many action items

Options for Telescope

4 m, 8 m, or larger ?

monolithic or mosaic mirror ?

Options for PRINCE

FoV = 1°× 1°

or 0.5°× 0.5° = 900 MUSE FoV

or ?

Options for PRINCE

HSC CCD
or CMOS
or ?

Options for PRINCE

Fiber Diameter

1 arcsec ϕ

or 2 arcsec ϕ, or …

needs micro lens array ?

• • •

or slicer ?

国際プロジェクトで推進

Necessity is the mother of invention

必要は発明の母

Something will happen

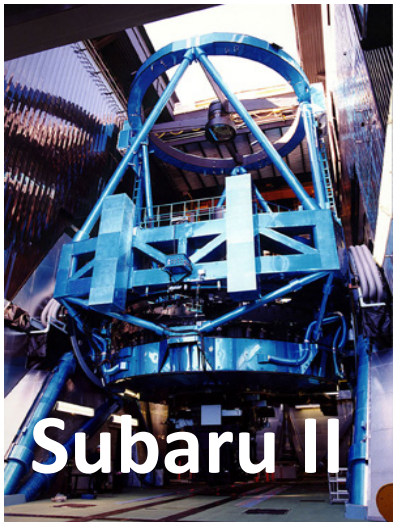
何とかなるさ

PRINCE Survey

5 hours / pointing

1000 sq degree field → 1000 pointings

5000 hrs → 3 years for the 1st cool



Science with PRINCE

UNBIASED Deep Spectroscopic Survey

- Targets -

galaxies, AGNs, IGM

any

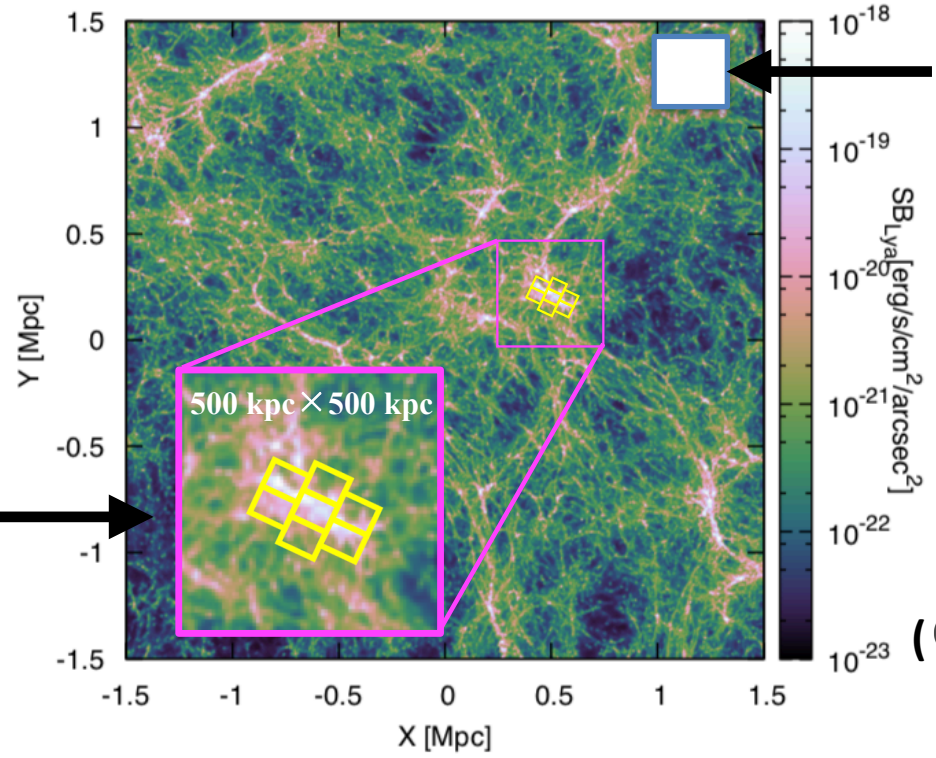
Science with PRINCE

[ex] Probing the origin of the most distant DLA @ z = 6.4

Ogura et al. (Subaru S20A with FOCAS IFU)

10 arcmin

7 pointings with FOCAS IFU



FoV of VLT MUSE

(© Hidenobu Yajima)

origin of high-z DLA

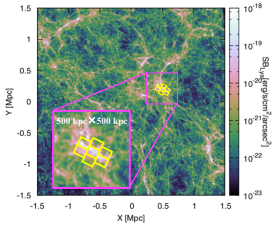
evolution of large-scale filaments

If we have PRINCE

PRINCE FoV

= 3600 × FoV of VLT MUSE

1 degree



What shall we see using PRINCE on Subaru II ?

Science goals of PRINCE on Subaru II

Early evolution of large scale structures
Cosmic reionization history
Coevolution among galaxies, AGNs, & IGM

Science goals of PRINCE on Subaru II

Time domain astronomy

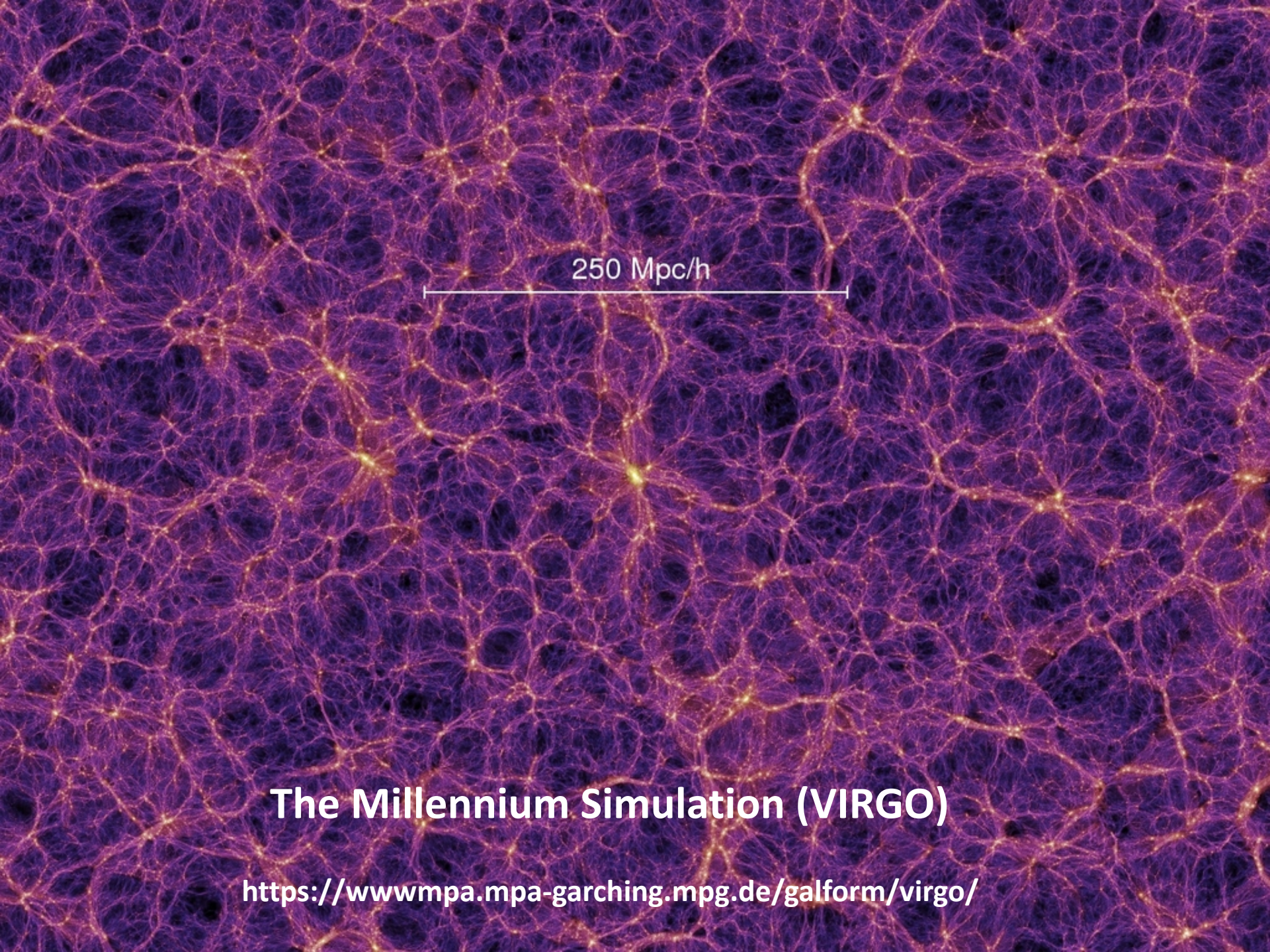
ToO is welcome !!!

Wide FoV of PRINCE is very useful for quick ID of targets

PRINCE will provide a new powerful tool for multi-messenger astronomy

Science goals of PRINCE on Subaru II

Early evolution of large scale structures
Cosmic reionization history
Coevolution among galaxies, AGNs, & IGM



The Millennium Simulation (VIRGO)

https://wwwmpa.mpa-garching.mpg.de/galform/virgo/


1 Gpc/h
Here we go !
The Millennium Simulation (VIRGO)
https://wwwmpa.mpa-garching.mpg.de/galform/virgo/

PRINCE on Subaru II

やれば20年レガシー

@ Chile

https://www.subarutelescope.org/Gallery/gallery_images/sn16_s.jpg

Acknowledgement

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