



***Cosmology and Extragalactic  
Observational Projects at ASIAA***

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# 1. Cosmology/Extragalactic Observational Projects at ASIAA



- **3.6m Canada-France-Hawaii Telescope (CFHT)**, Mauna-Kea
  - Instrumentation development
    - Largest near infrared camera, **WIRC** (2006), with 20 arcmin field of view
    - SPIRou (NIR spectropolarimeter) detector package (~2014?)
  - [Taiwan's access to all instruments on CFHT](#): ~10 nights per year
  - See Wei-Hao's talk for more scientific details
- **Japan's 8.3m Subaru telescope**, Mauna Kea
  - Instrumentation
    - Next generation camera, **Hyper Suprime-Cam (HSC)**, with 1.5deg field of view
  - [Taiwan's full access to Subaru HSC surveys in collaboration with Japan/Princeton scientists](#)
  - Now in science proposal preparation phase; HSC survey will start in 2012.
- **Taiwan's AMiBA CMB interferometer**, Mauna Loa
  - In collaboration with NTU Physics and EE Departments.
  - [First Taiwanese astronomical project, designed, constructed, and led by Taiwan](#)
  - Seven-element operations (-2008) focused on galaxy cluster Sunyaev-Zel'dovich effect sciences (10 papers published in The Astrophysical Journal)
  - [13-element science operations started in February 2010](#)

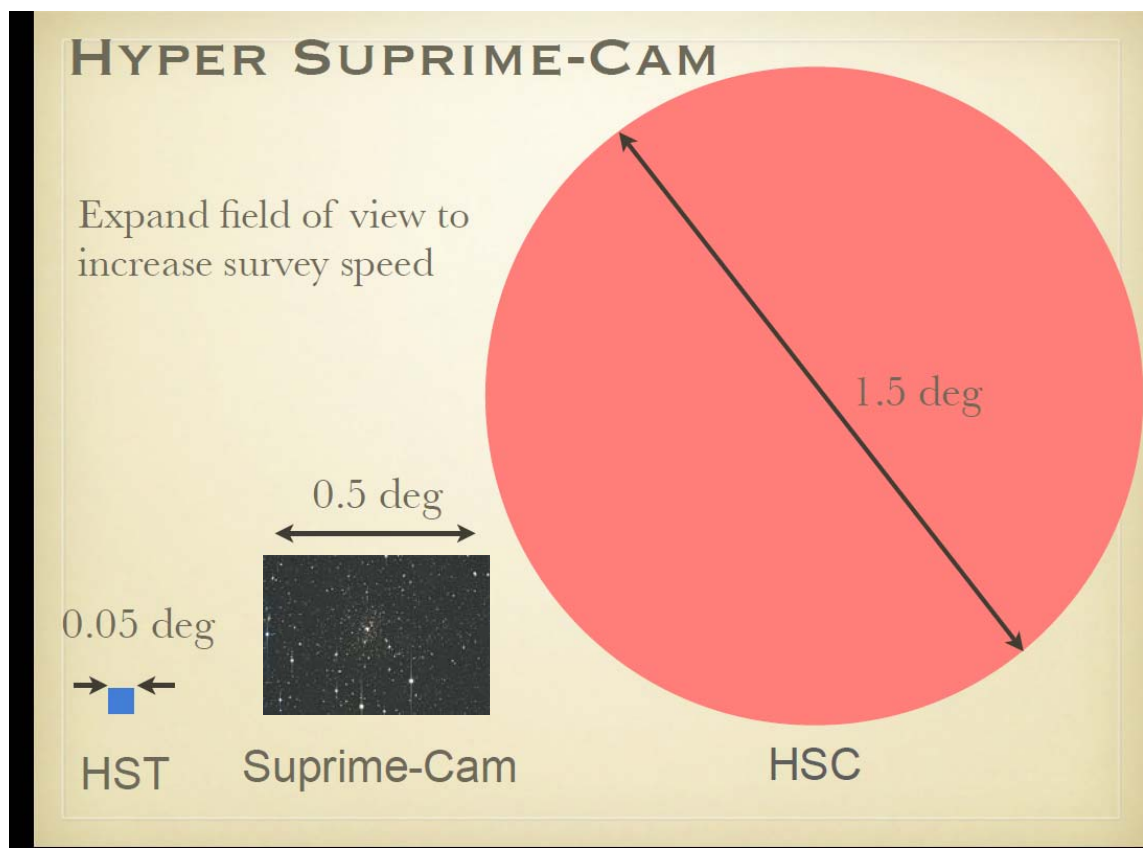
## 2. Subaru Telescope **Hyper-Suprime-Cam** Sky Survey

Large sky surveys (2012-2017?) with Japan's new wide-field prime-focus camera, **Hyper-Suprime Camera (HSC)**, on the **8.3m Subaru telescope** by Japan, Taiwan, & Princeton collaboration:

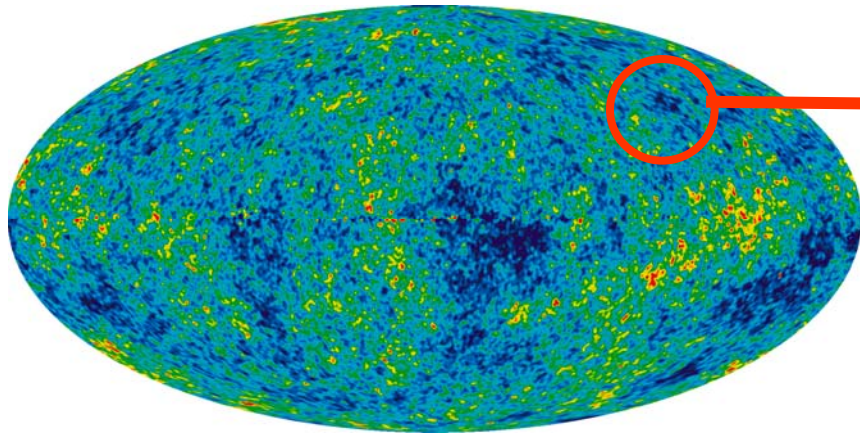
***Taiwan (AS + universities) is a major international partner of HSC!!***

### Science cases:

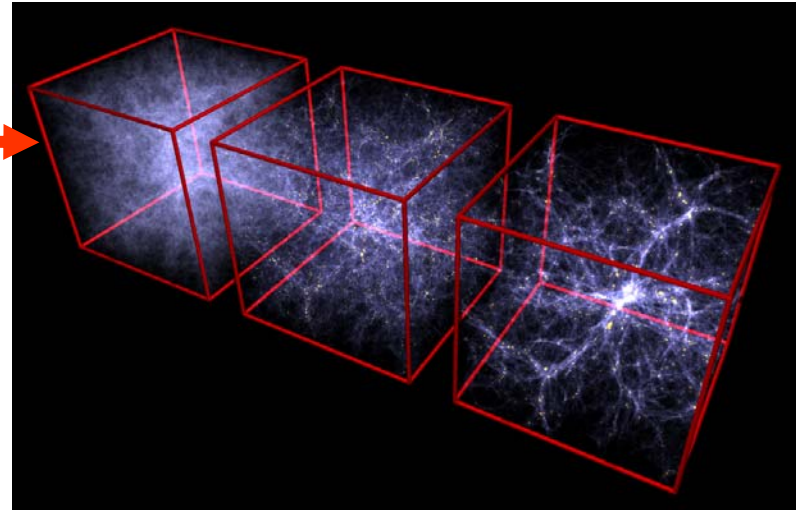
- Dark Energy properties by weak lensing tomography
- Galaxy clusters and large scale structure
- High-z galaxy search
- GRB orphan afterglow
- Core collapse supernovae
- AGN



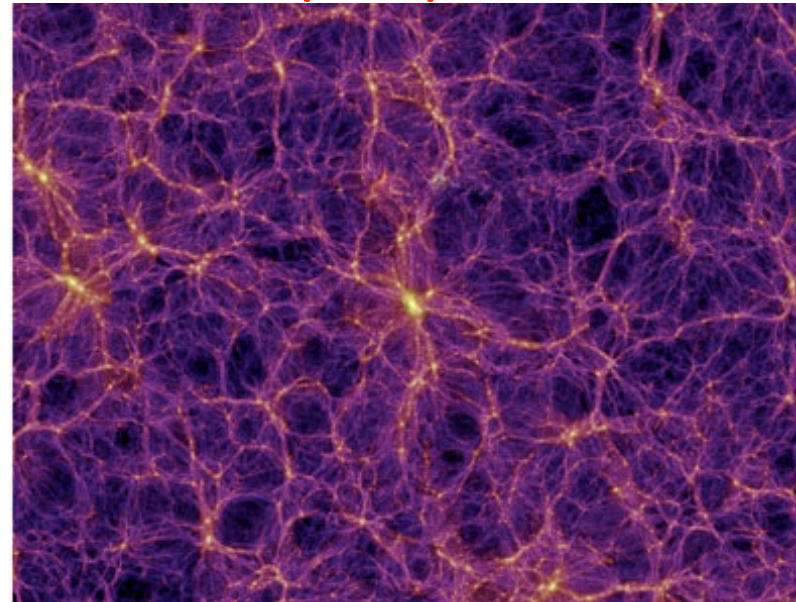
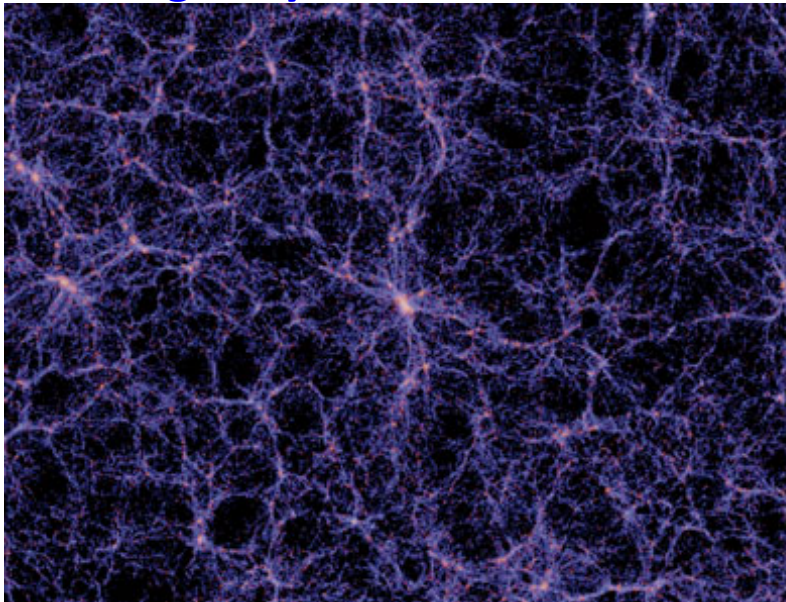
# Mapping Large Scale Structure by HSC



Visible galaxy distribution



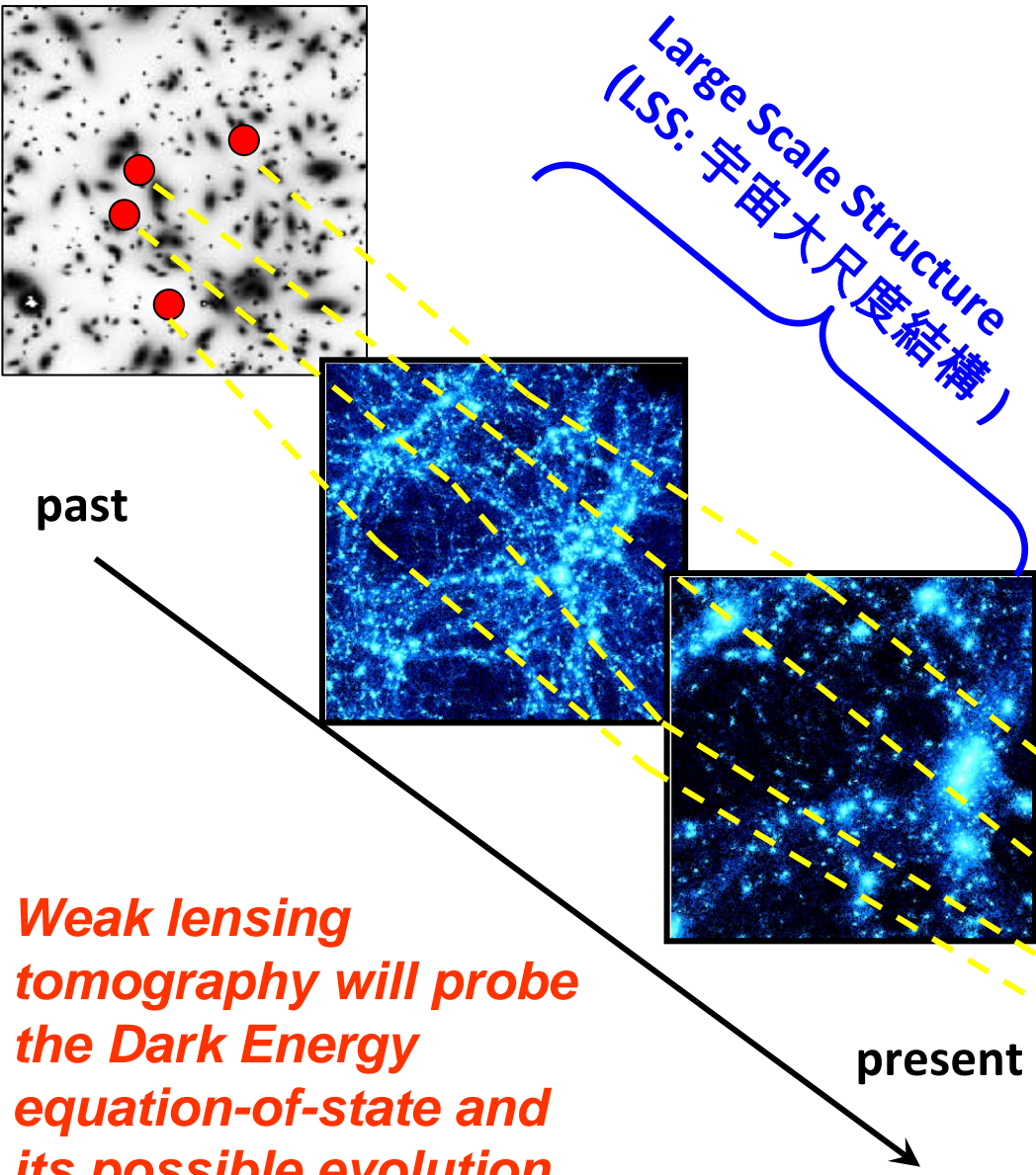
Dark matter (mass) distribution



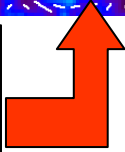
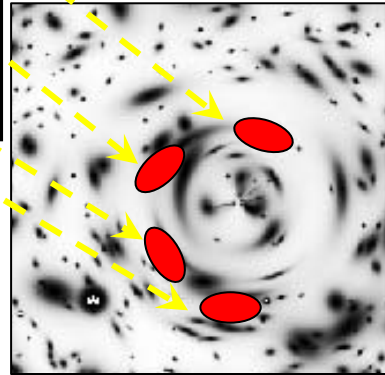
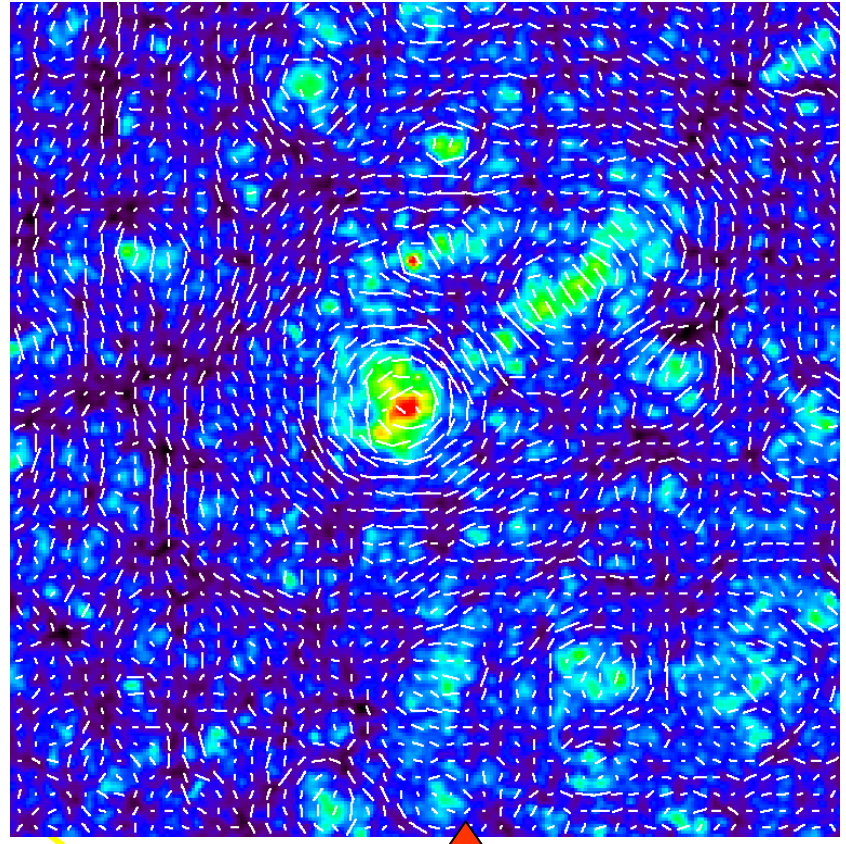
*Millennium simulation (Springel et al. 2005)*

# Cosmic evolution of DM large scale structure by Subaru HSC weak lensing

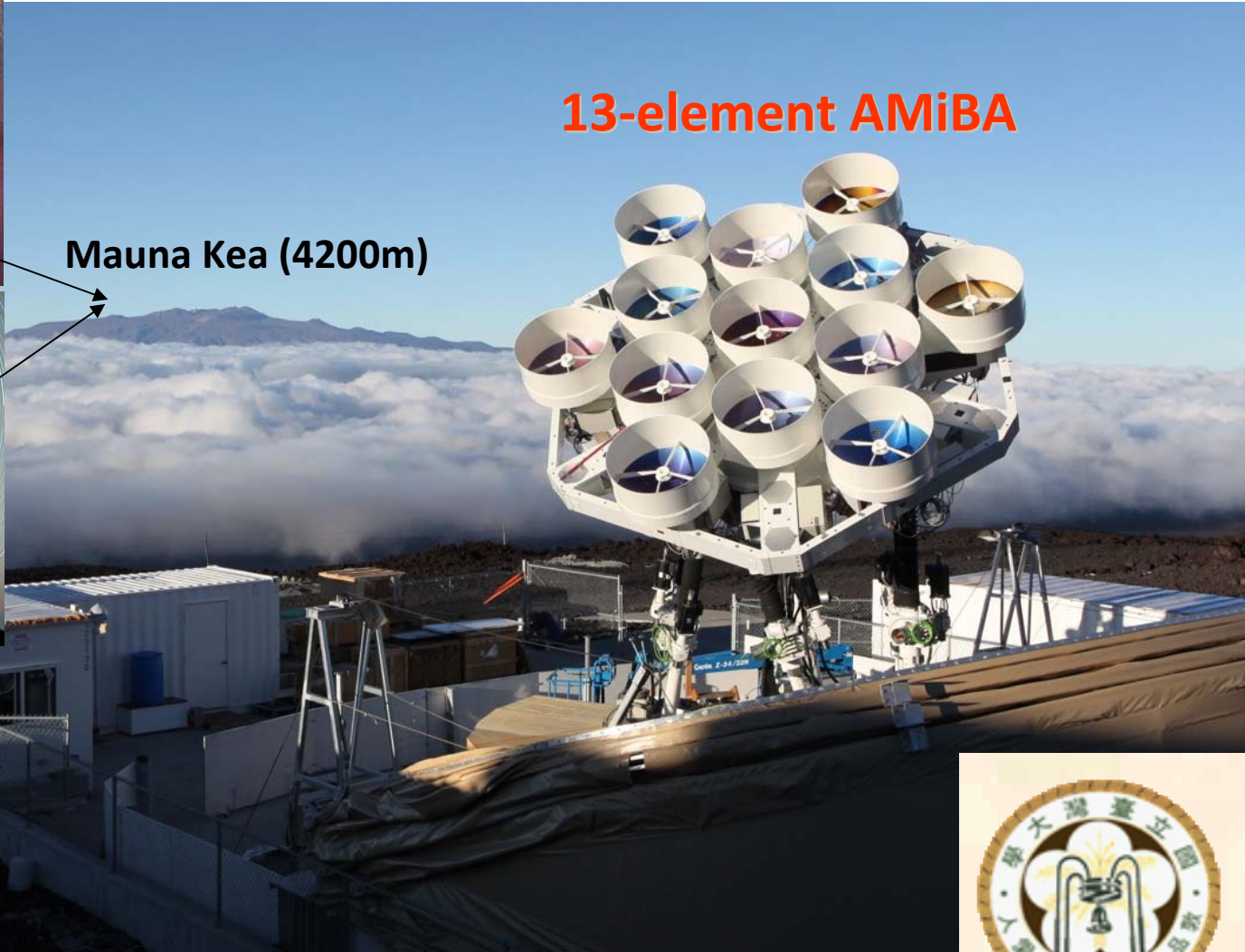
Simulated weak lensing sky map of LSS (2deg x 2deg)



*Weak lensing tomography will probe the Dark Energy equation-of-state and its possible evolution*



# 3. Y.T. Lee **A**rray for **M**icrowave **B**ackground **A**nisotropy (AMiBA)



Mauna Kea (4200m)

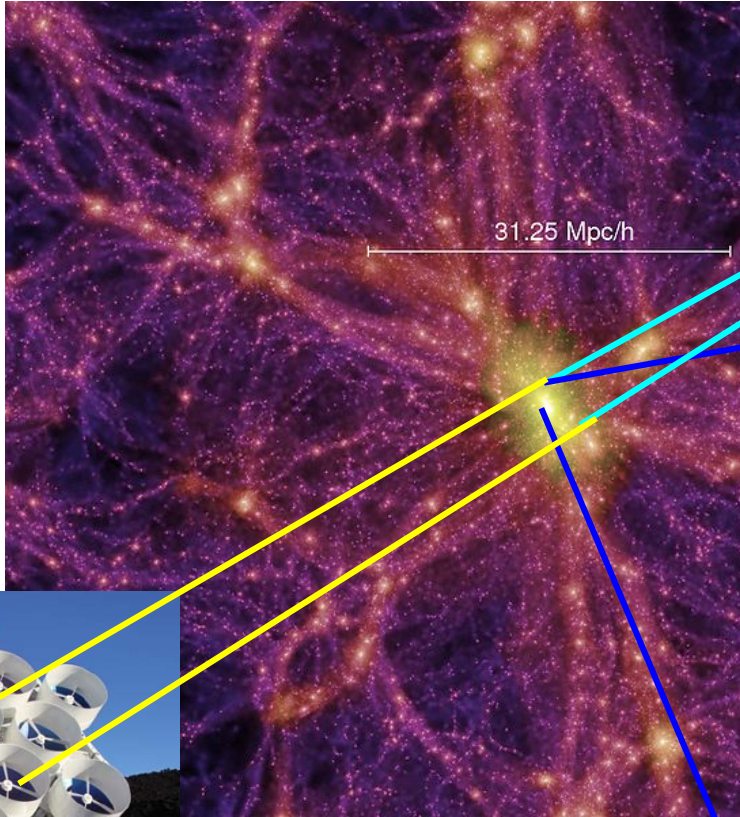
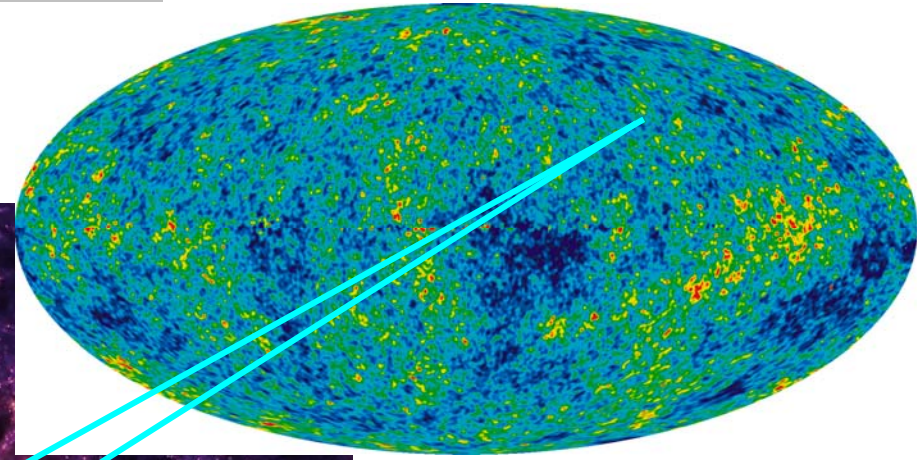


AMiBA at Mauna-Loa Observatory (3300m), Hawaii

# Study and search for galaxy clusters via the Sunyaev-Zel'dovich Effect (SZE)

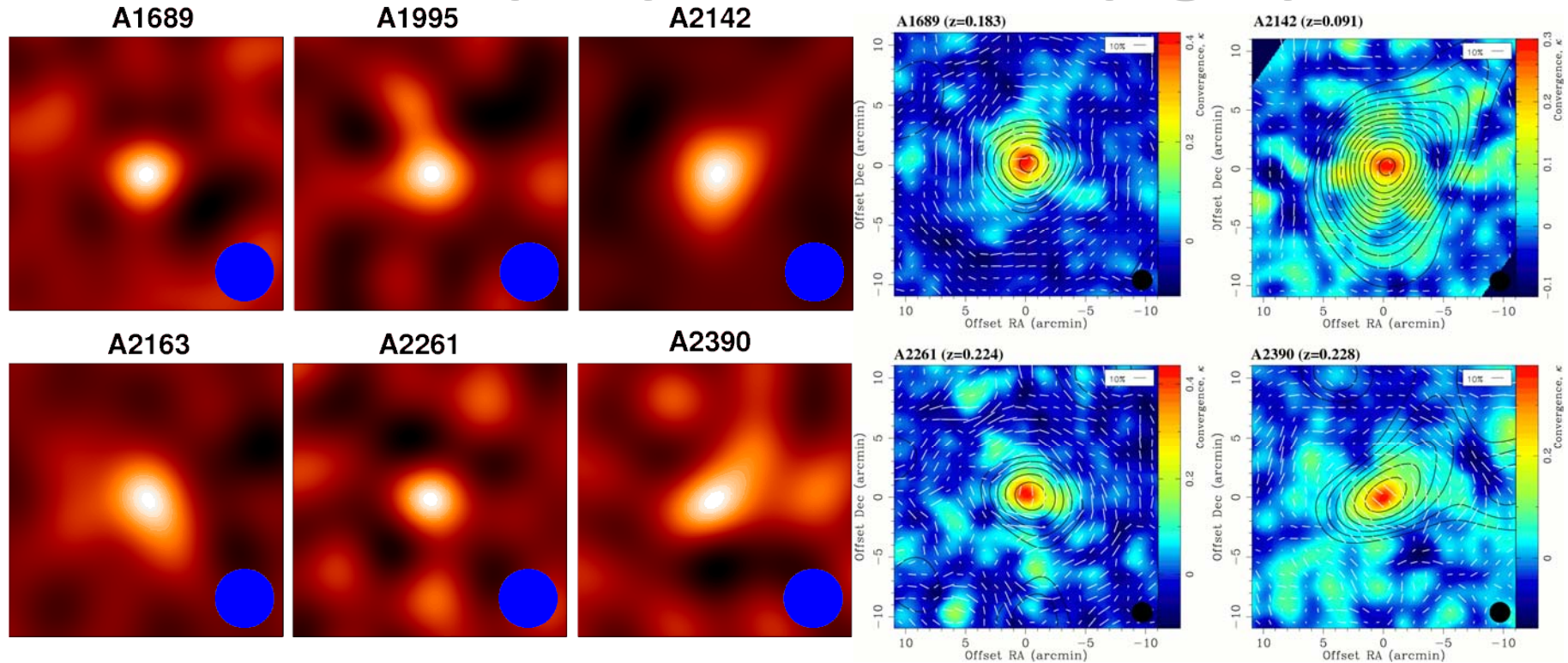
宇宙微波背景輻射 (CMB)

宇宙大尺度結構 (large scale structure)



李遠哲陣列望遠鏡  
(AMiBA)

# Galaxy Clusters as “seen” by AMiBA (left) and Subaru (right)

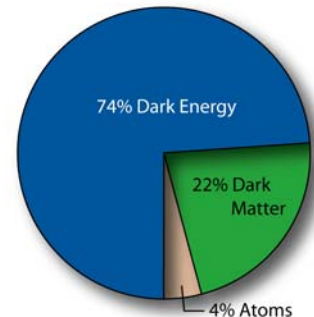


## Hot baryons as imaged by AMiBA SZE

■ Hot baryon fraction ( $\sim B/DM$  mass ratio) =  $13 \pm 3\%$  from the AMiBA SZE vs. Subaru WL comparison.

■  $22 \pm 16\%$  of the baryons missing from the hot plasma phase (WMAP cosmic baryon fraction  $\sim 17\%$ )

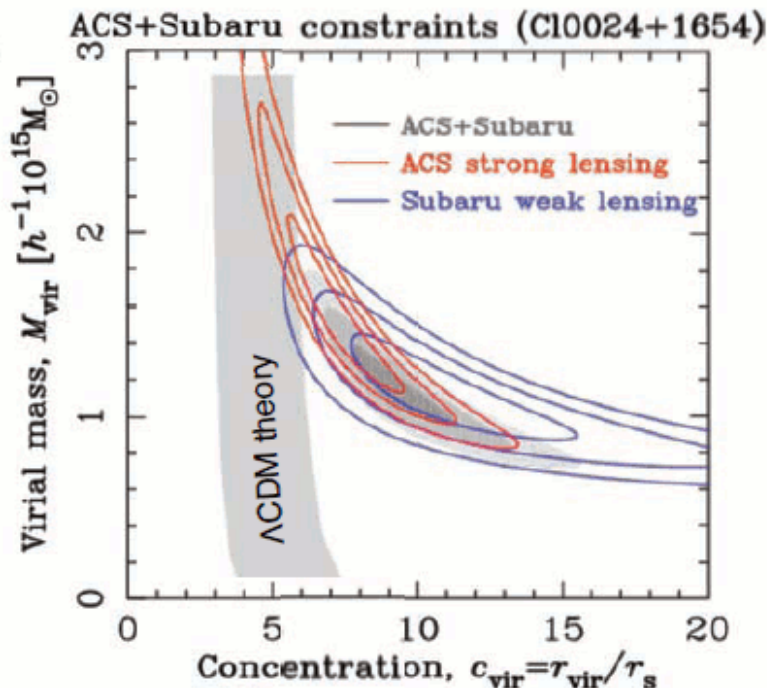
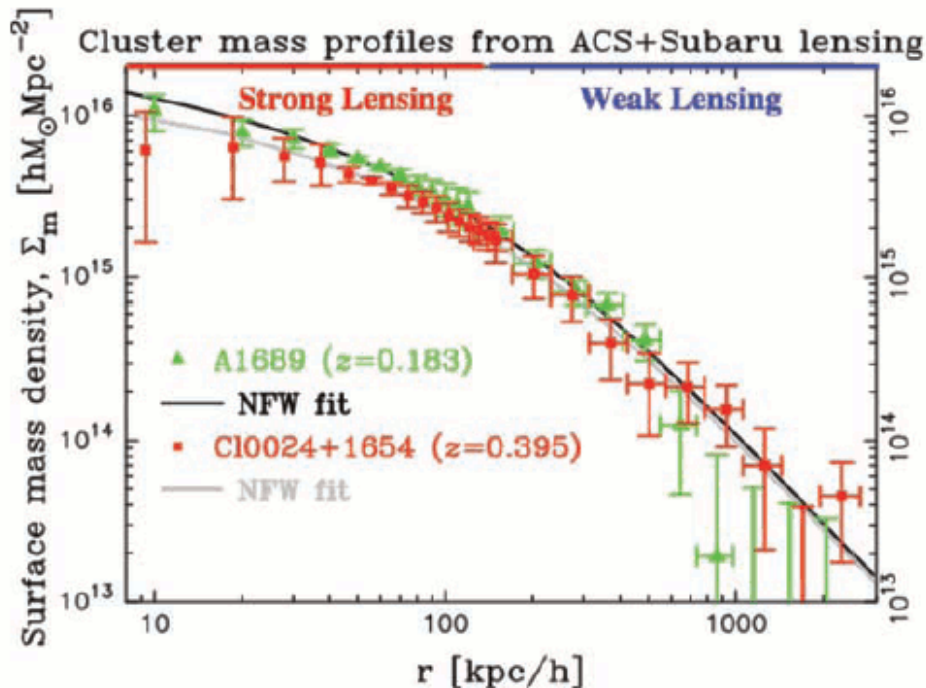
## Dark matter structure as revealed by Subaru weak lensing (WL)



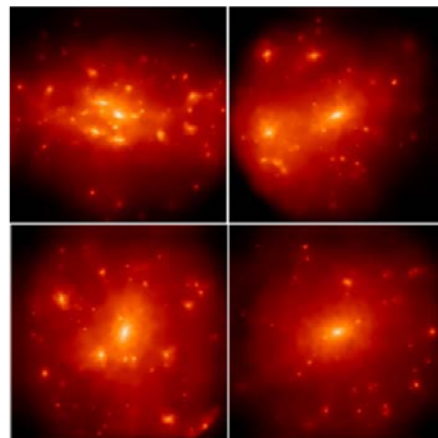
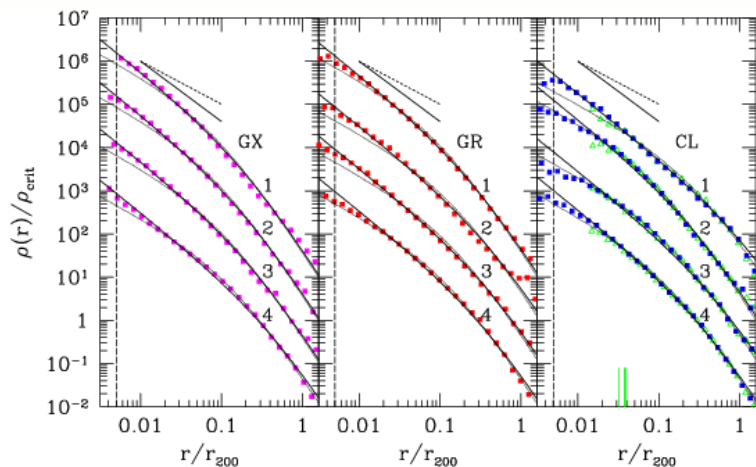


# 4. My Current Research Focus: Probing the DM nature by cluster lensing

Subaru + HST data



$\Lambda\text{CDM theory}$



Cosmological N-body simulation