Osservatorio Astronomico di Bologna
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Signature of Early BH in cosmic backgrounds?

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Plus some input from SNS-Pisa

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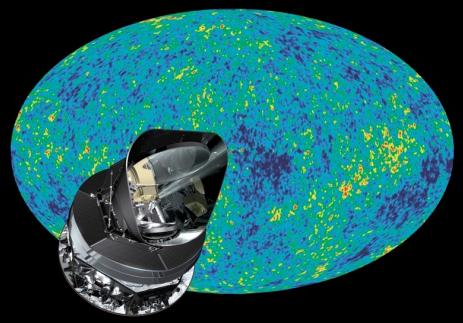
Unexplored epoch of Cosmic History



?

time

z=1000

t=0.3 Myr
CMB

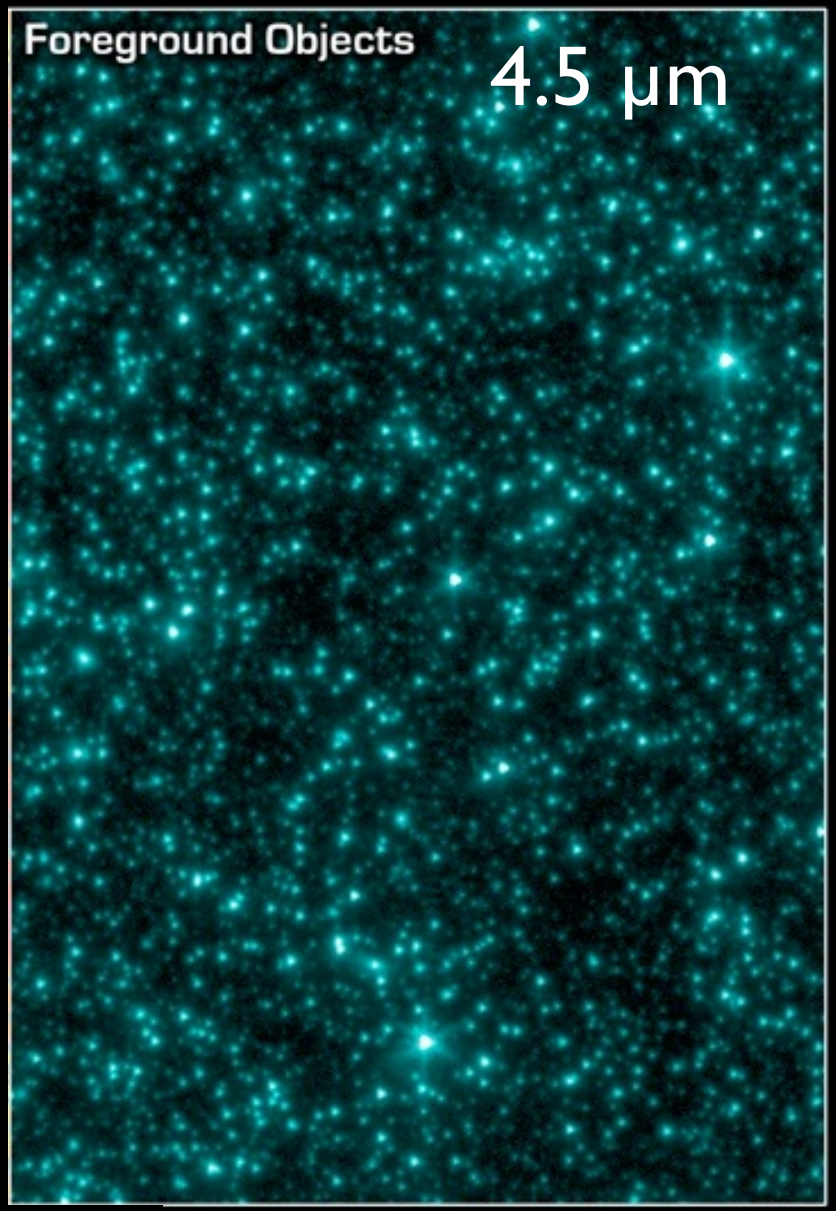
z=20

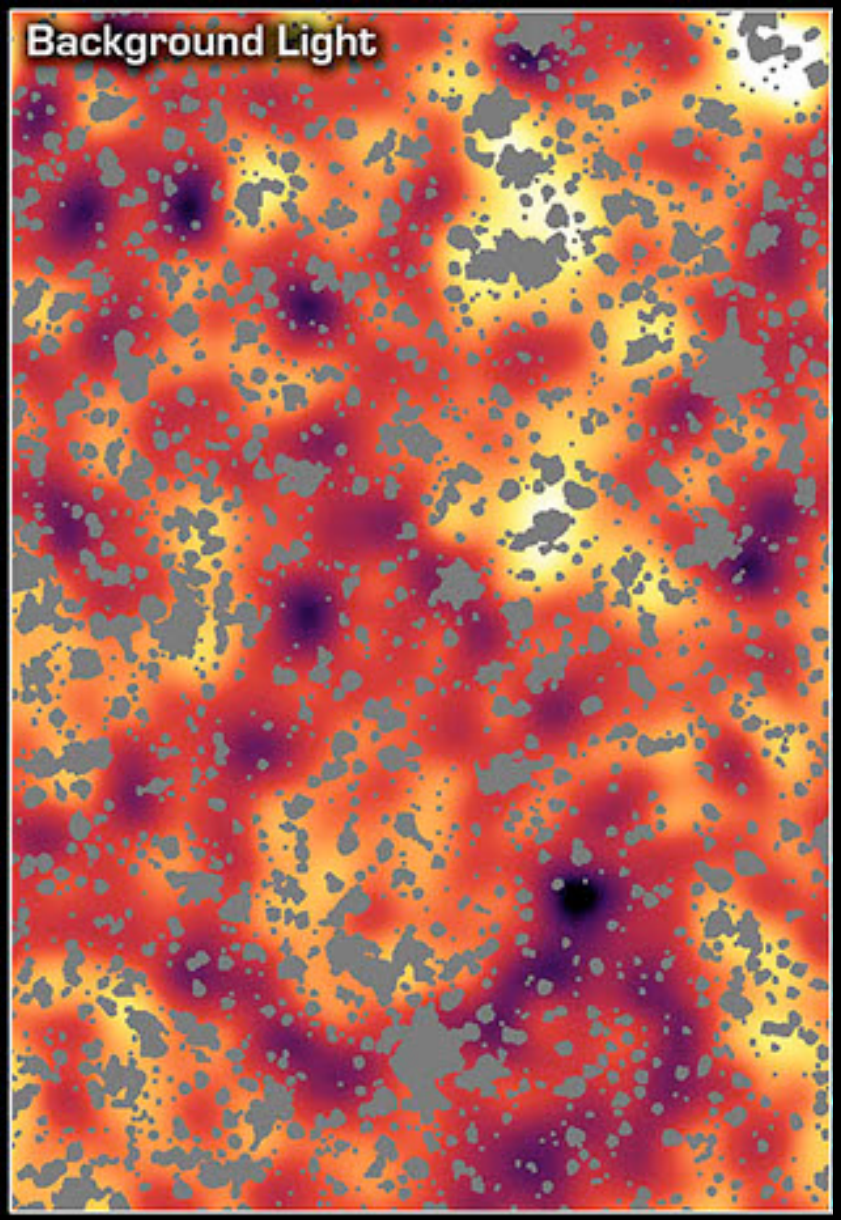
t=0.2-0.8 Gyr
Structure assembly, First Stars and Black Holes

z=7

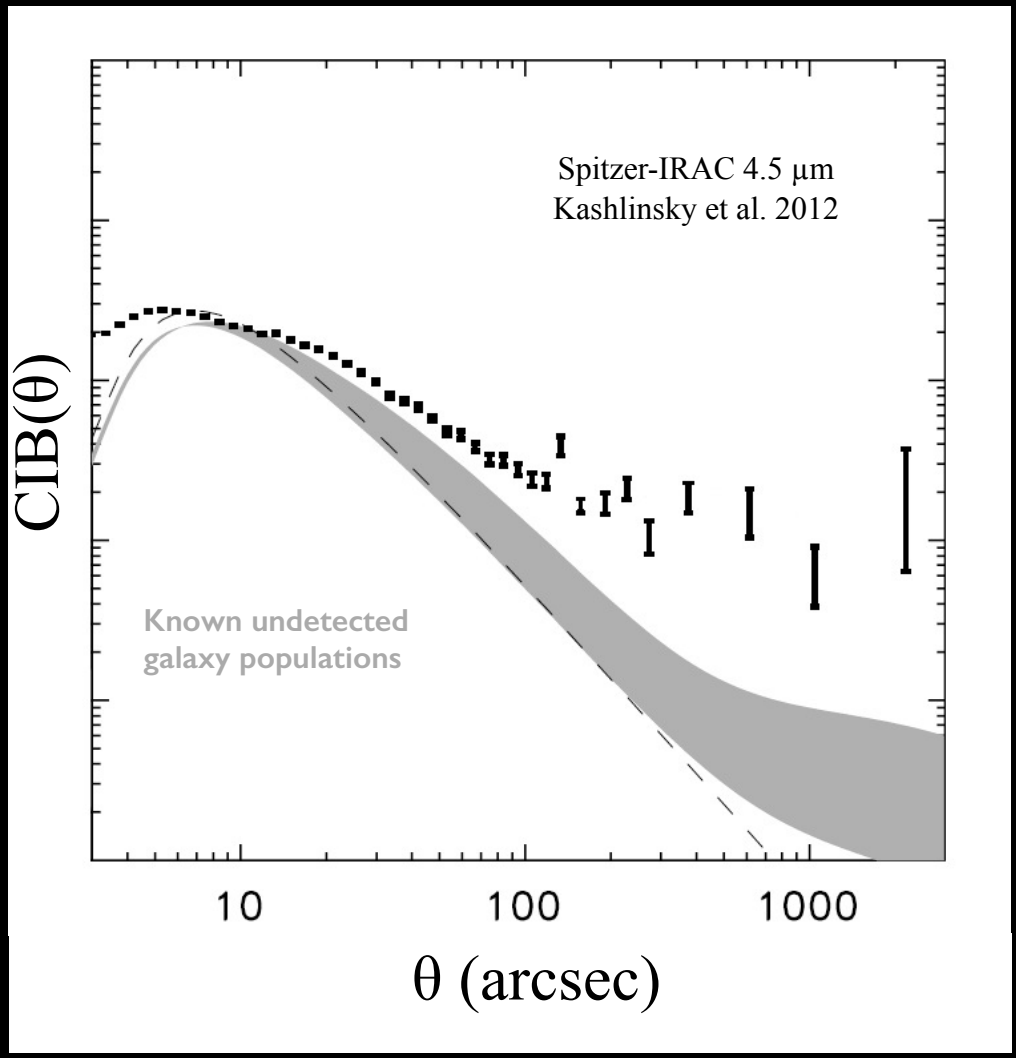
t>0.8 Gyr
Galaxy-AGN Surveys

State of the art





After removing foreground sources the CIB revealed an unexpected pattern of the fluctuations



Known Properties

Large scale excess:

- IRAC m>25
- No correlation with <1 μm
- Optical m>28
- Lyman Break ~1 μm

Large scale excess:

- Consistent with population in high-z structures
- Scales larger than 5' fundamental

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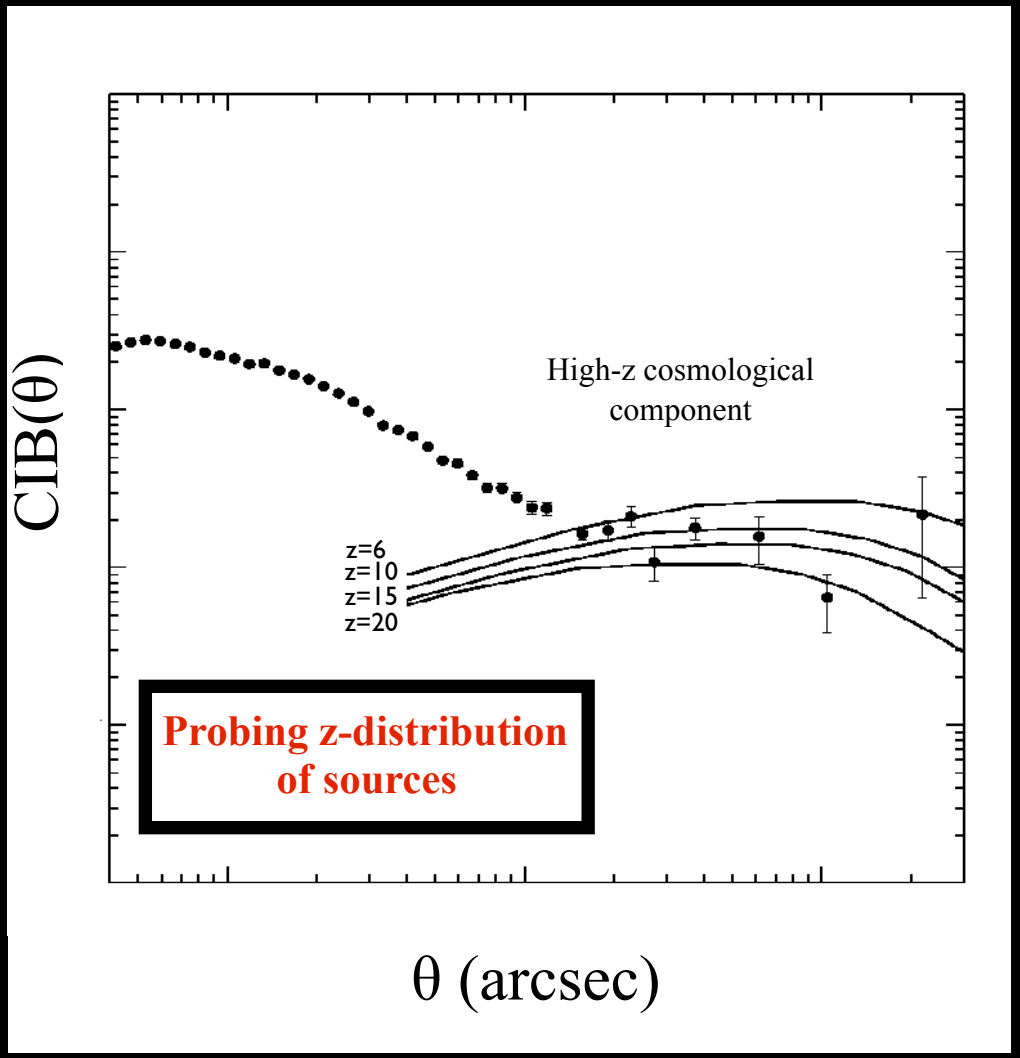

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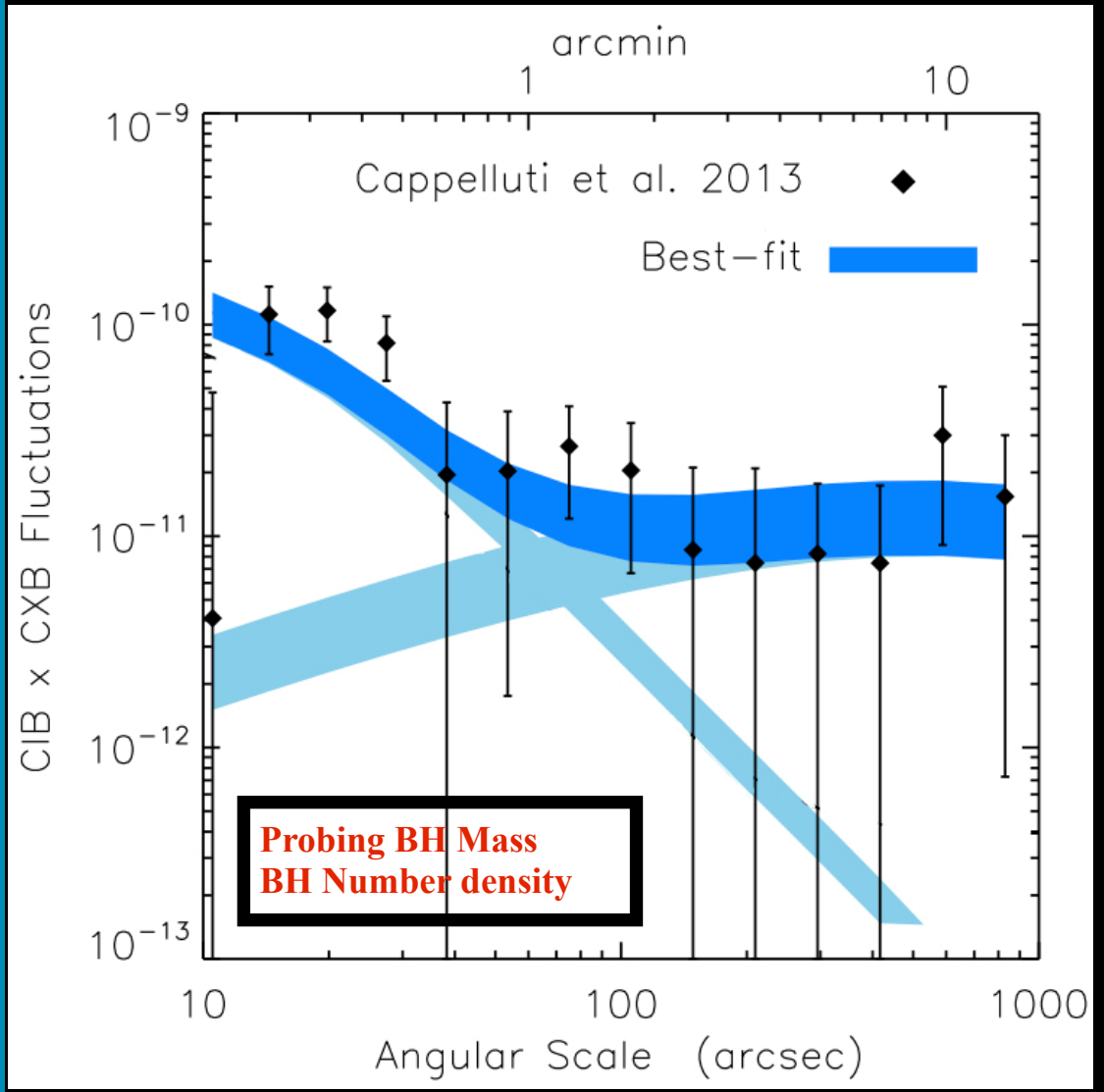
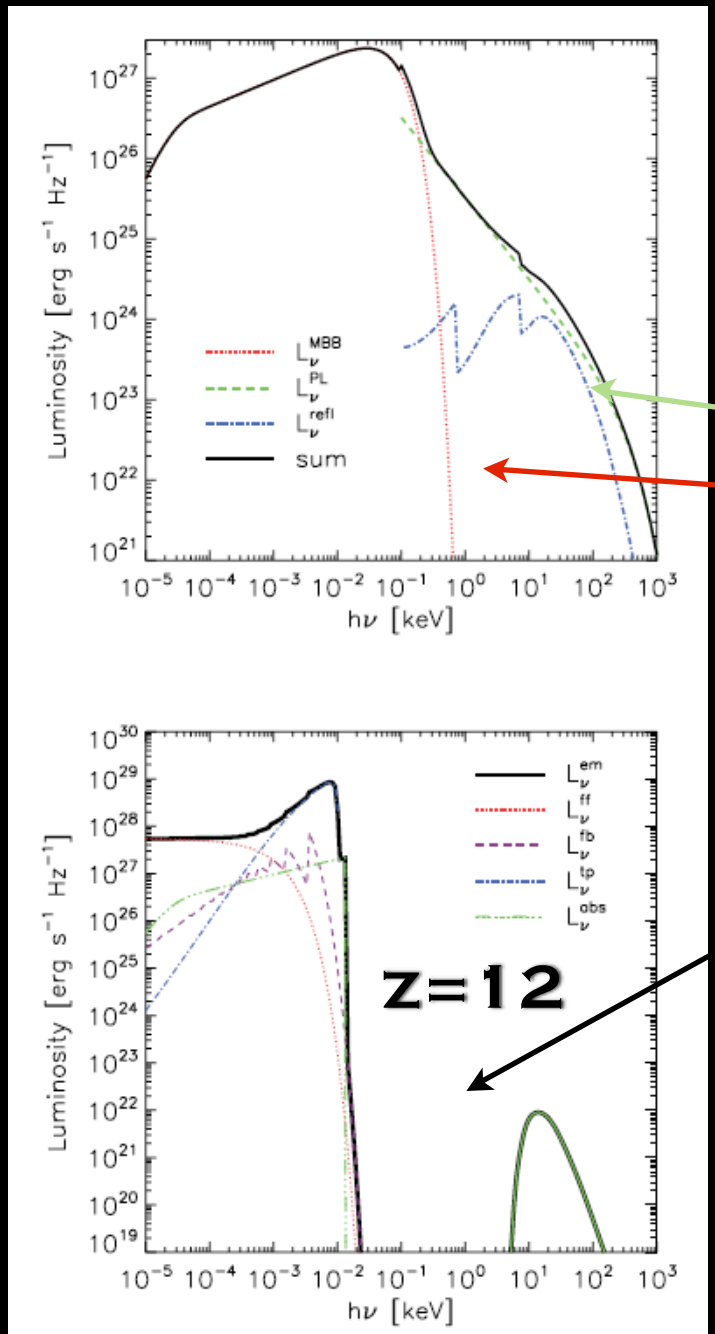
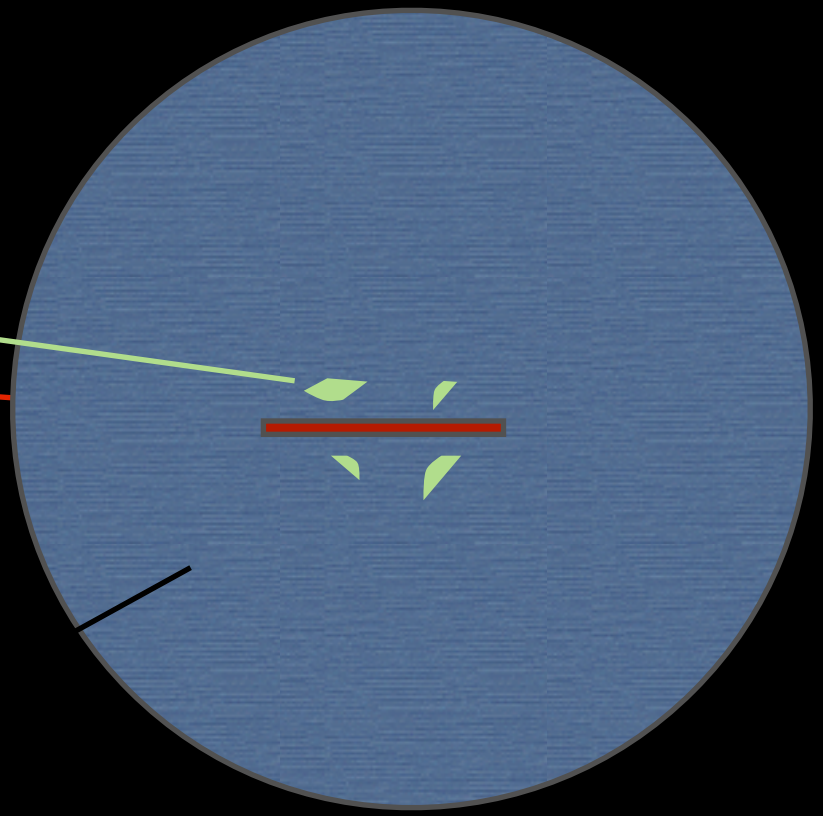
Large scale excess:

- Correlations with the CXB
- Significant BH population



SED of DCBH that explain the observed CXB-CIB correlation

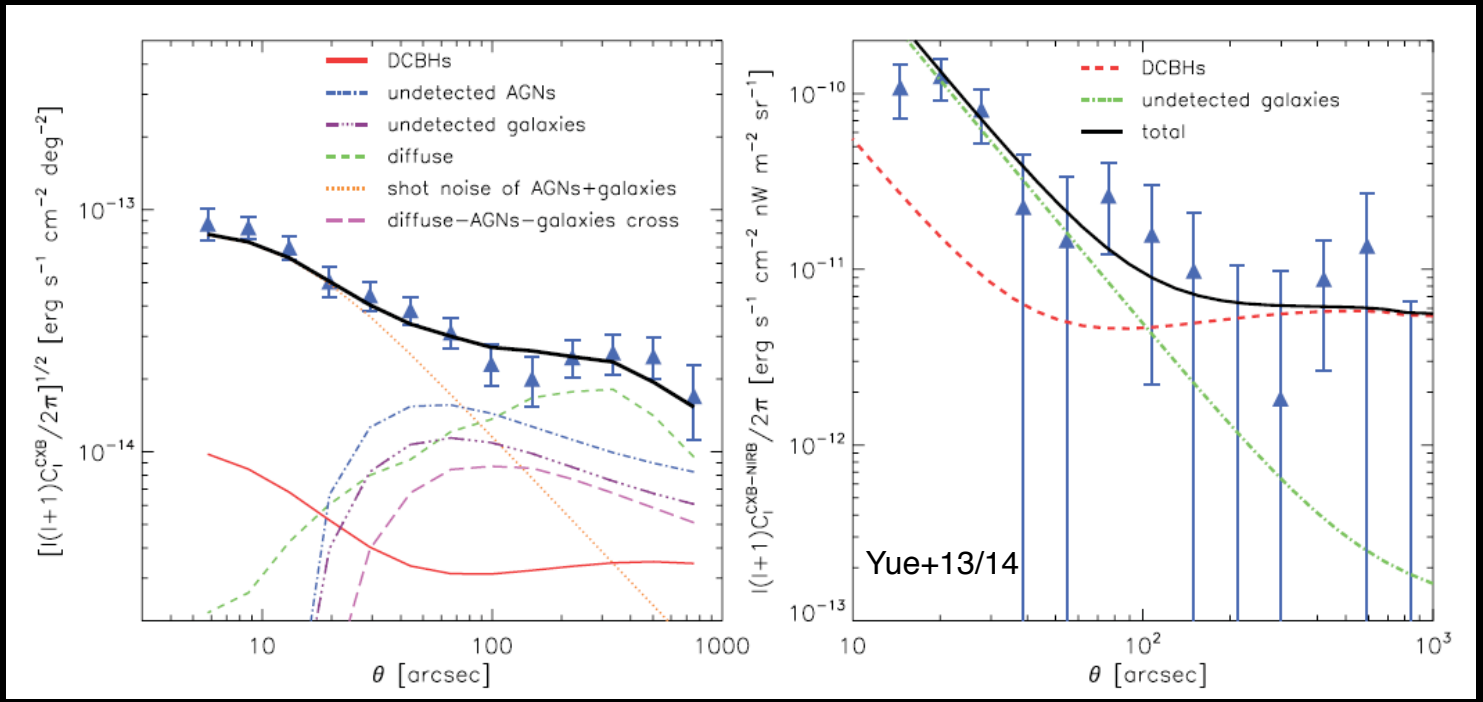




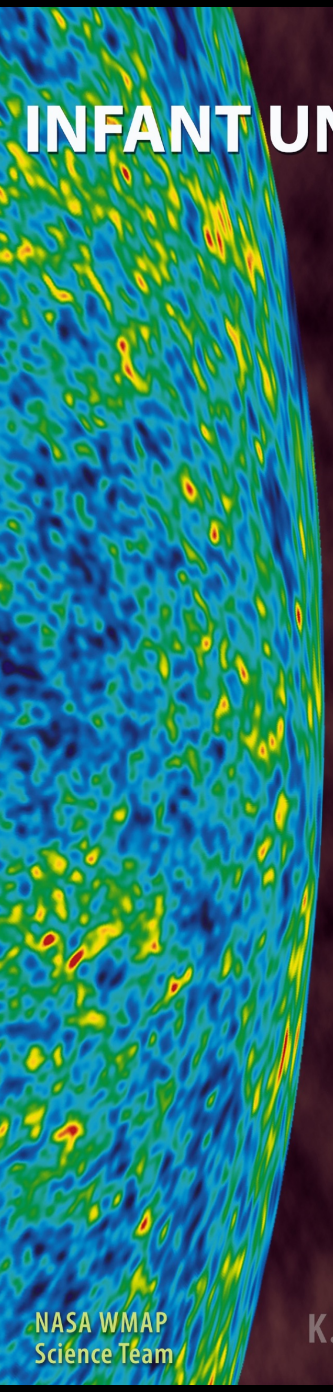
C-thick Absorption

Figure 1. Upper: the primary spectrum (solid) for a BH with $M_{BH} = 10^6\,M_\odot$ and its three components. Bottom: the emerging (thick solid line) quasar spectrum of above BH when $N_H = 1.5 \times 10^{25}\,cm^{-2}$ and the four components (thin lines).

DCBH from high-z



The model fits but there are caveats!



INFANT UNIVERSE *13.8 billion years ago*
with seeds of future galaxies

COSMIC DARK AGES
380,000 to 400 million years after the Big Bang

NASA WMAP Science Team

K. Teramura, UHIfA

Chandra | CXB

Black holes

First stars

Spitzer | CIB

FIRST STARS & QUASARS
400 million years after the Big Bang

NASA/ESA
S. Beckwith (STScI)
The HUDF Team

Summary

1. There are pieces of evidence that large scale CIB fluctuations may arise from high-z
2. CIB fluctuations correlate with CXB
3. Models explain the observations with DCBH
4. We are likely accessing for the first time BH formation epoch with observational proxies
5. Need of deep and wide field observation to construct the SED of the fluctuations
6. More to come….