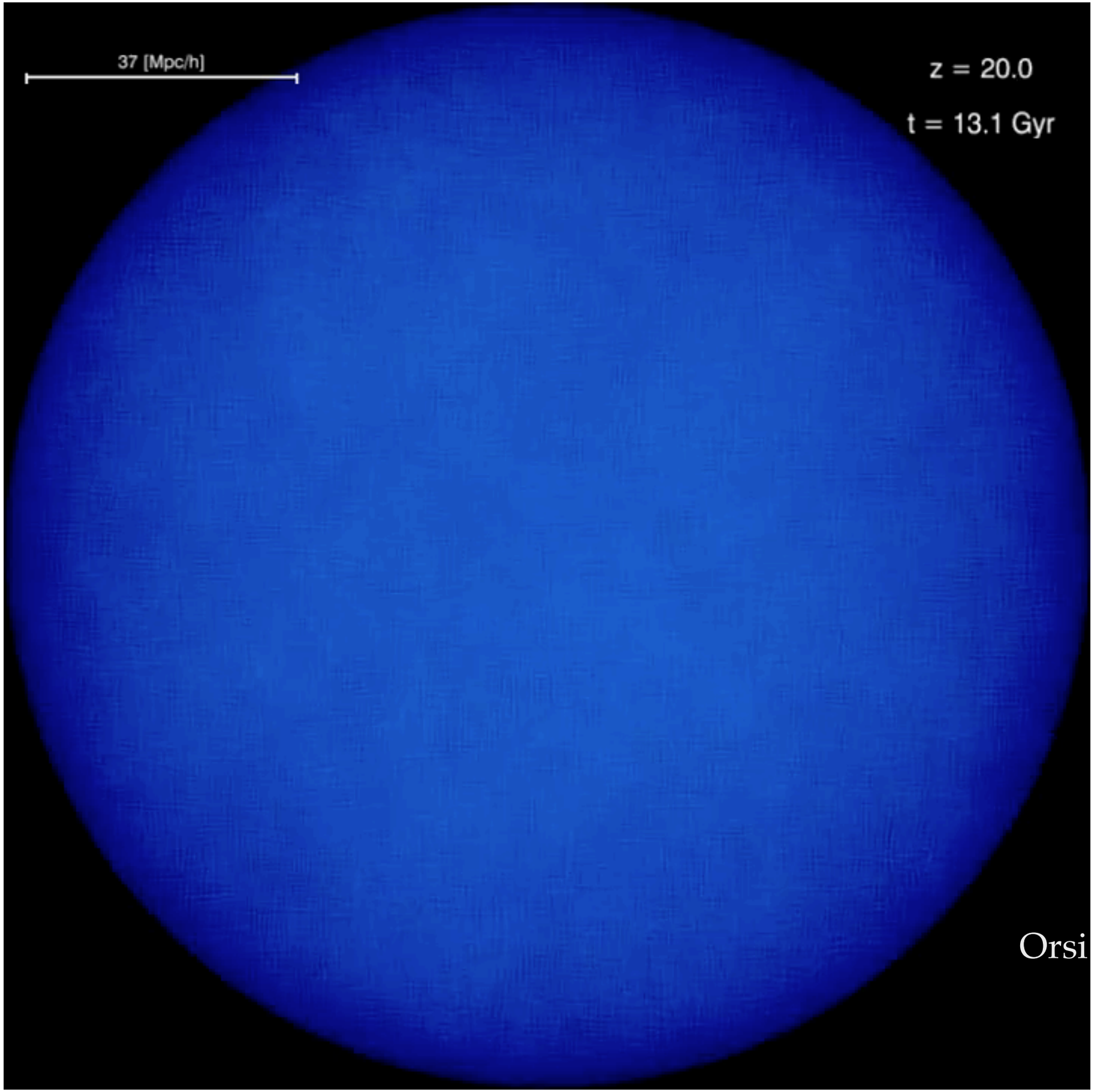
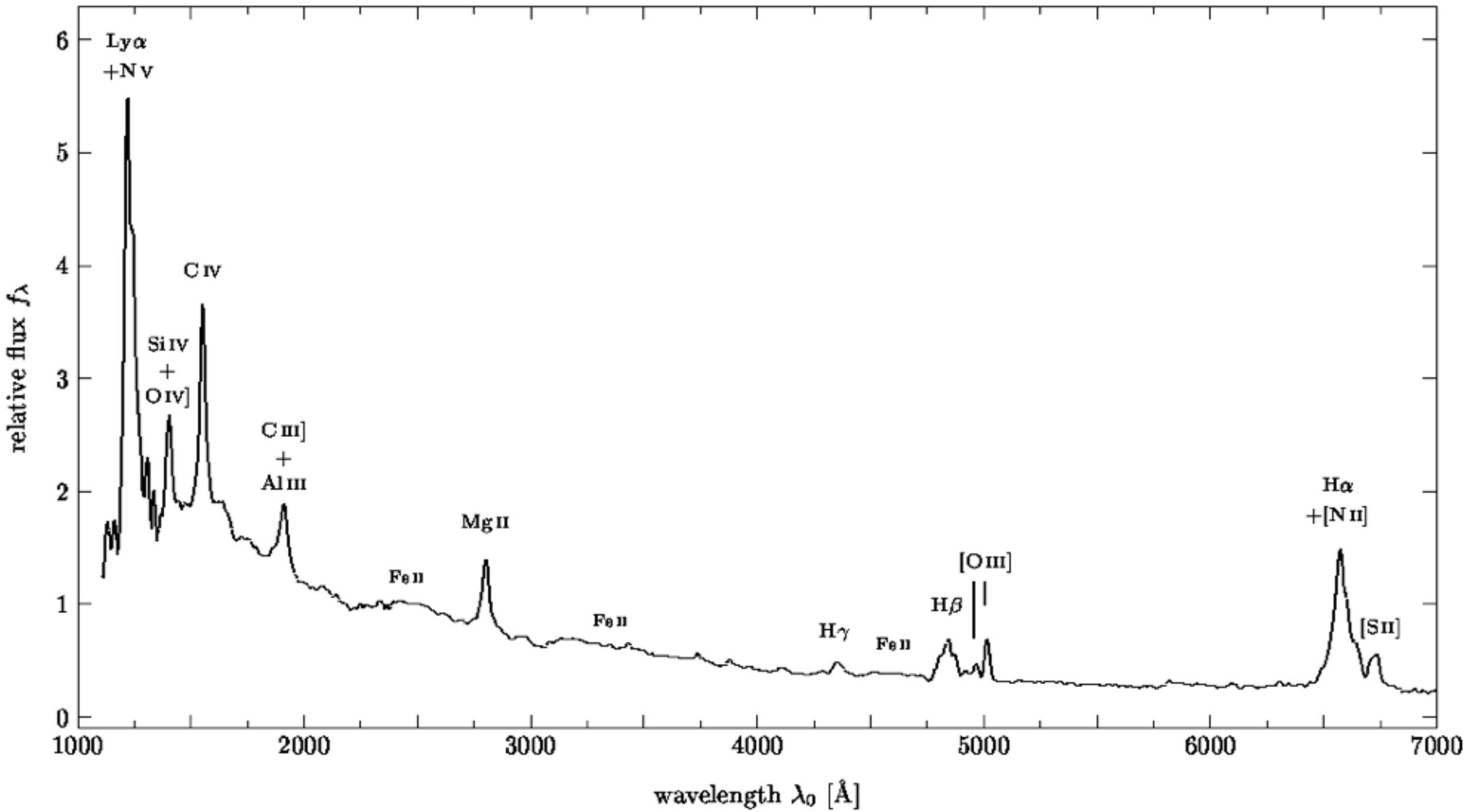
Siddhartha Gurung López

Estructura A Gran Escala Del Universo A Alto Desplazamiento Al Rojo En La Era De Los Cartografiados Cosmológicos De Galaxias

Supervisors

Alvaro Orsi, Silvia Bonoli

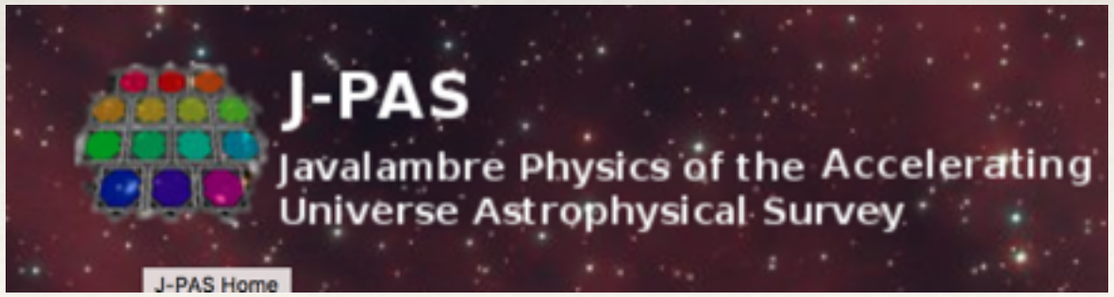

37 [Mpc/h]
z = 20.0
t = 13.1 Gyr
Orsi



Helmut Meusinger

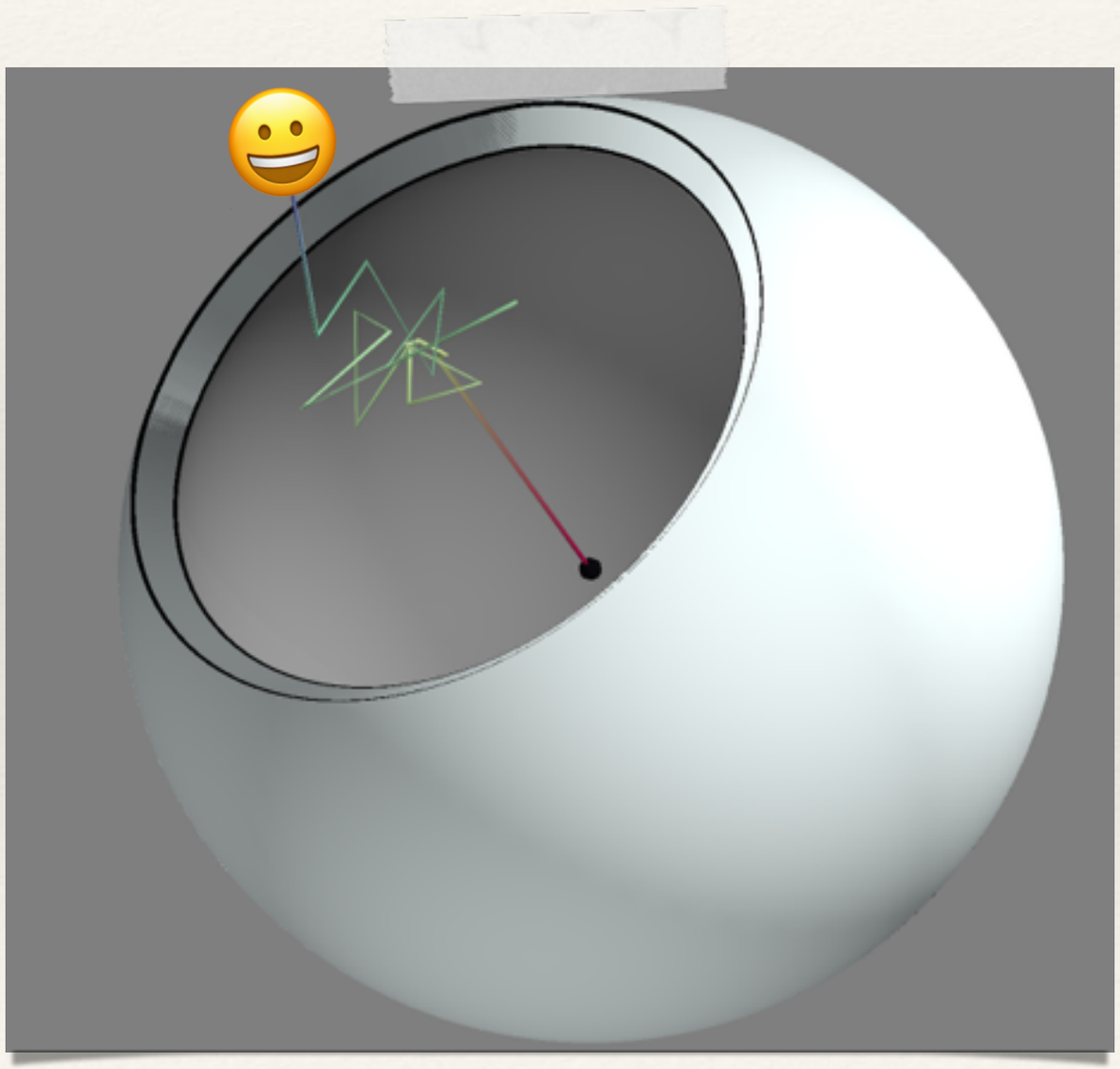
Some future surveys will use Lyα emitters to constrain cosmology

Lyα will be easily detected in many future surveys



Lyα Radiative Transfer in Galaxies

Expanding homogenous thin shell



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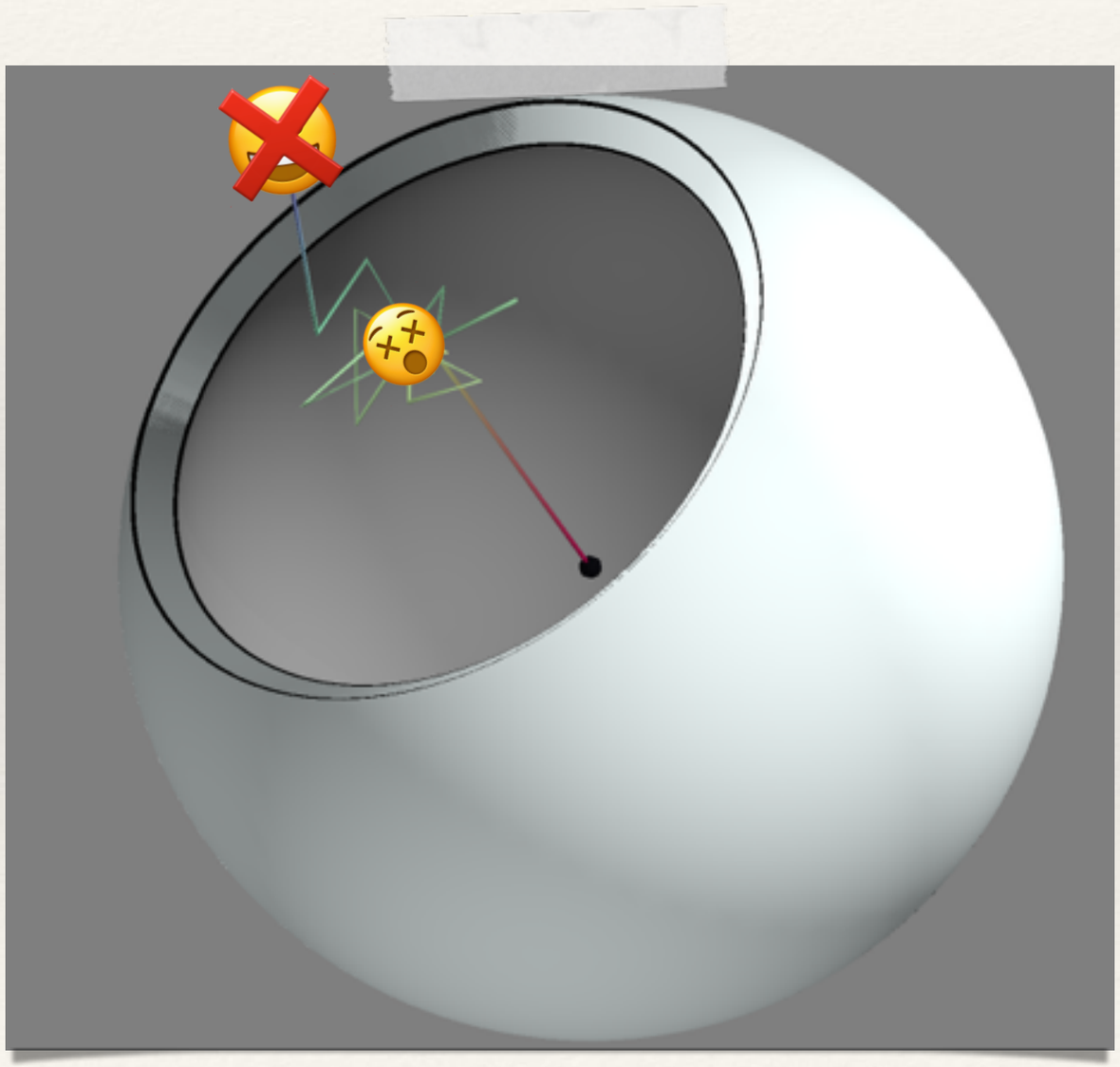
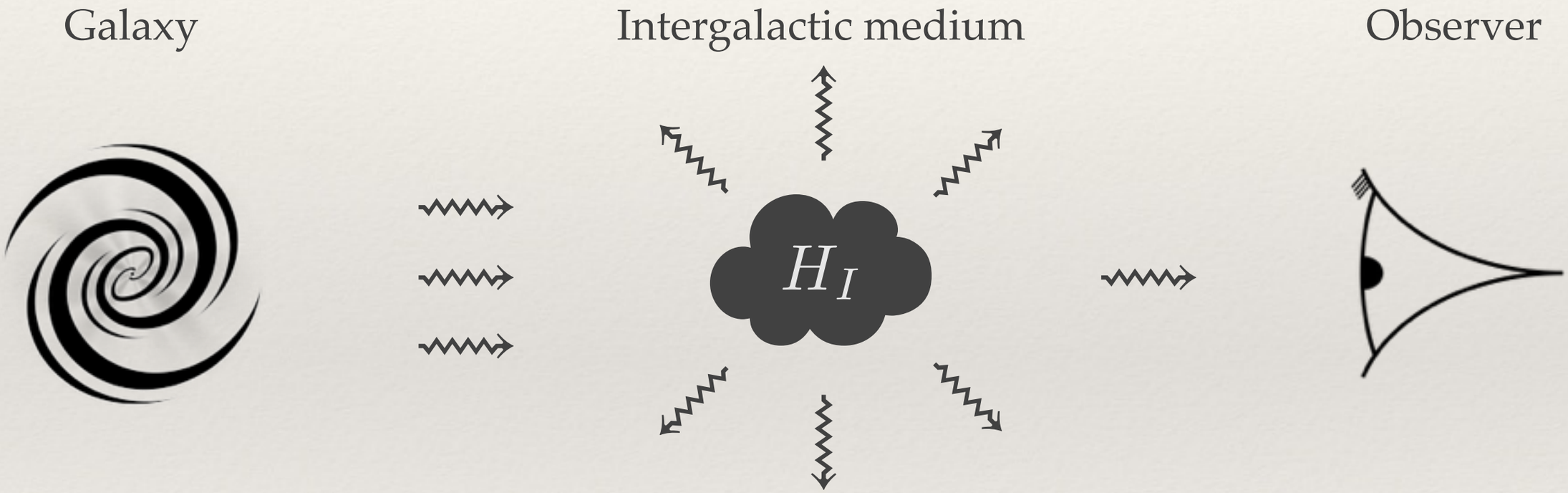
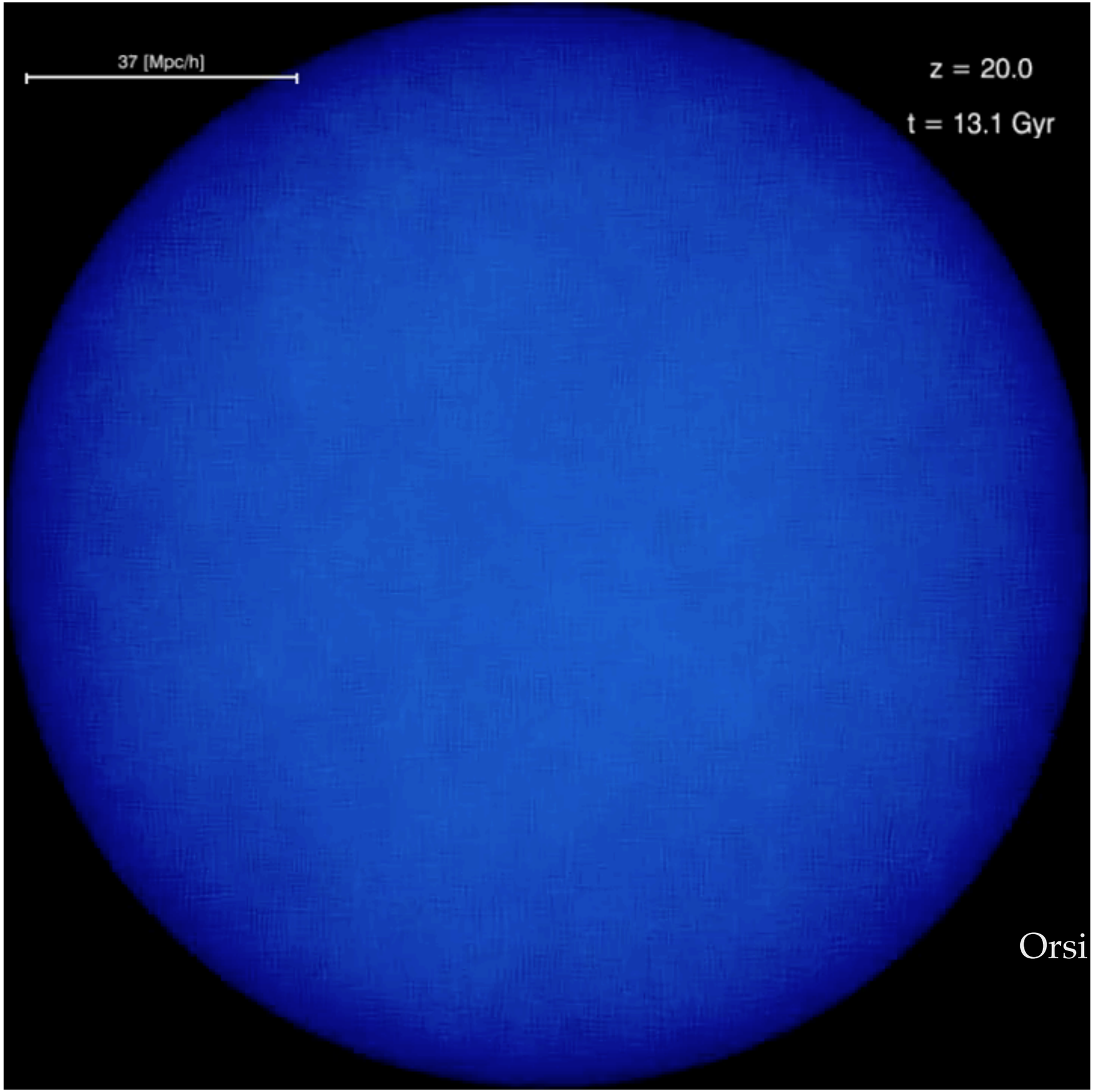


Lyα Radiative Transfer in the IGM



$$L_0^{Ly\alpha} \times f_{esc}^{galaxy} \times f_{esc}^{IGM} = L_{obs}^{Ly\alpha}$$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Semi - analytical model

GALFORM

M_{cold}
Cold Gas

$\dot{M}_{star}$
SFR

$L_0^{Ly\alpha}$
Intrinsic luminosity

$R_{disk,bulge}$
Disk/bulge radius

M_{vir}
Virial mass

Z
Metallicity

Monte Carlo Radiative Transfer Code

Geometry
Column density
Expansion velocity
Dust content
Number of photons

→ Monte Carlo radiative transfer code →

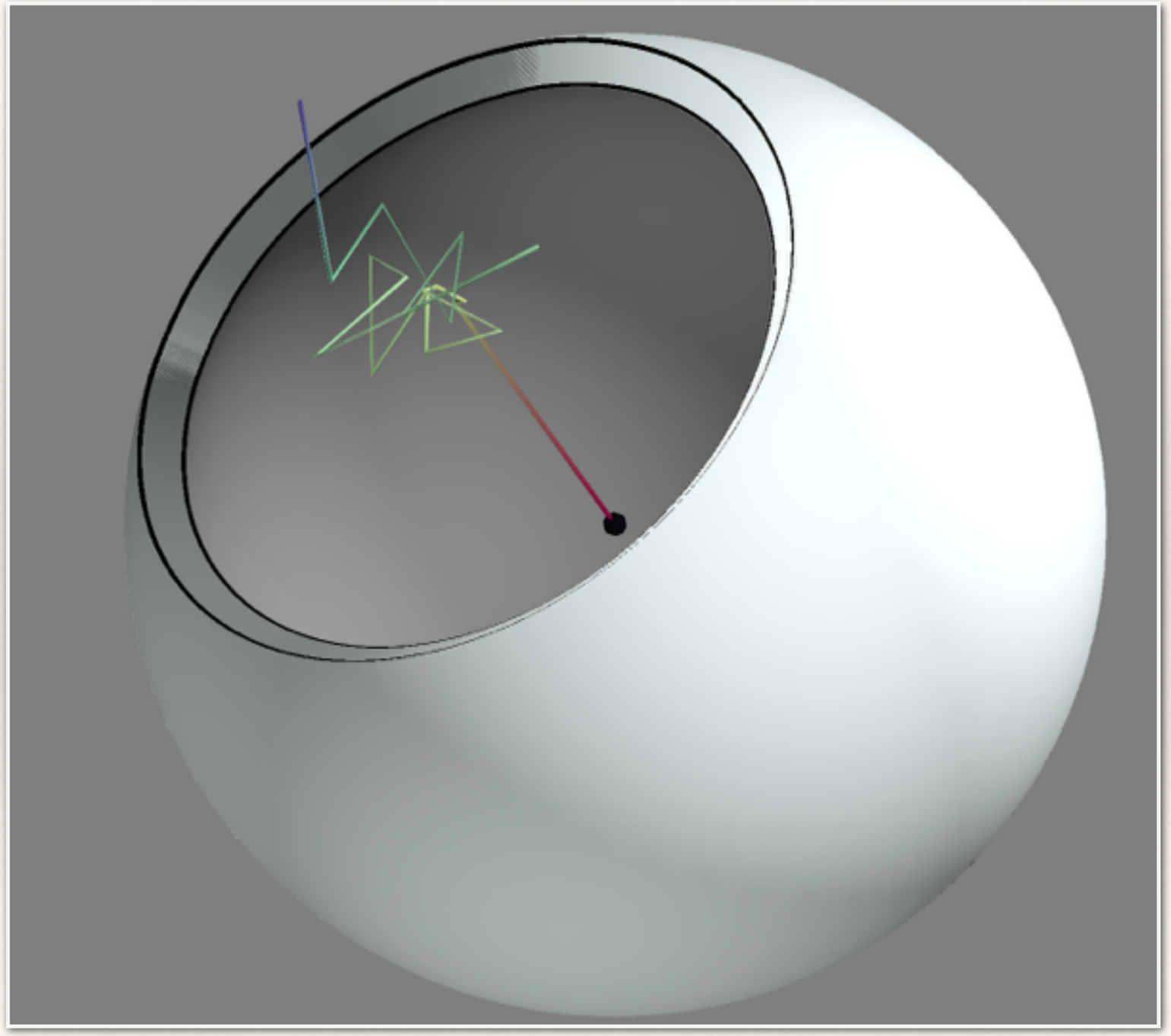
Escape fraction
Line profile

$$time = 1h/galaxy \times 3 \cdot 10^6 galaxies = 3 \cdot 10^6 h$$

Input parameter grid → MCMC → Analytic expression → $time \sim 1s$

GEOMETRIES

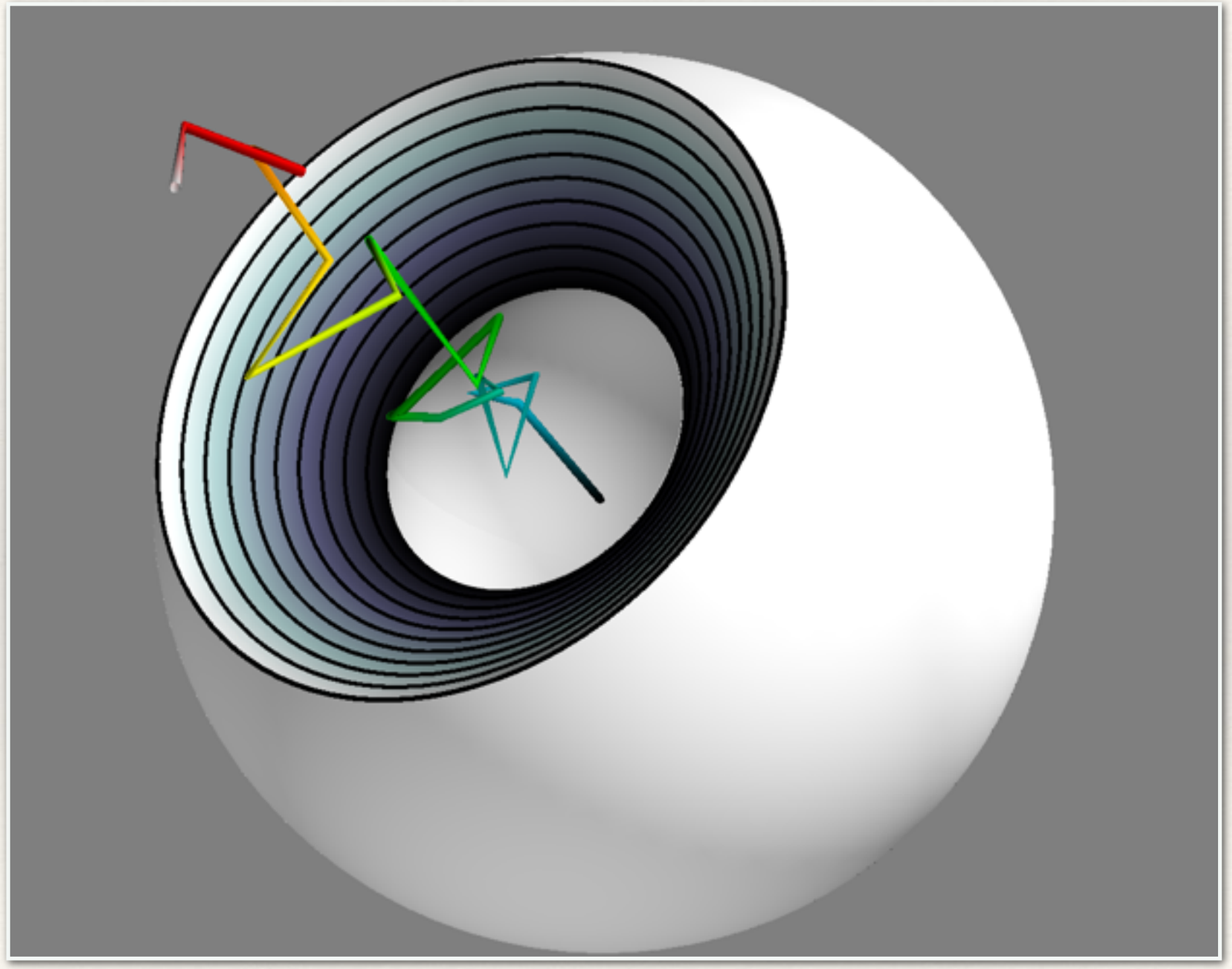
Thin Shell



GEOMETRIES

Wind

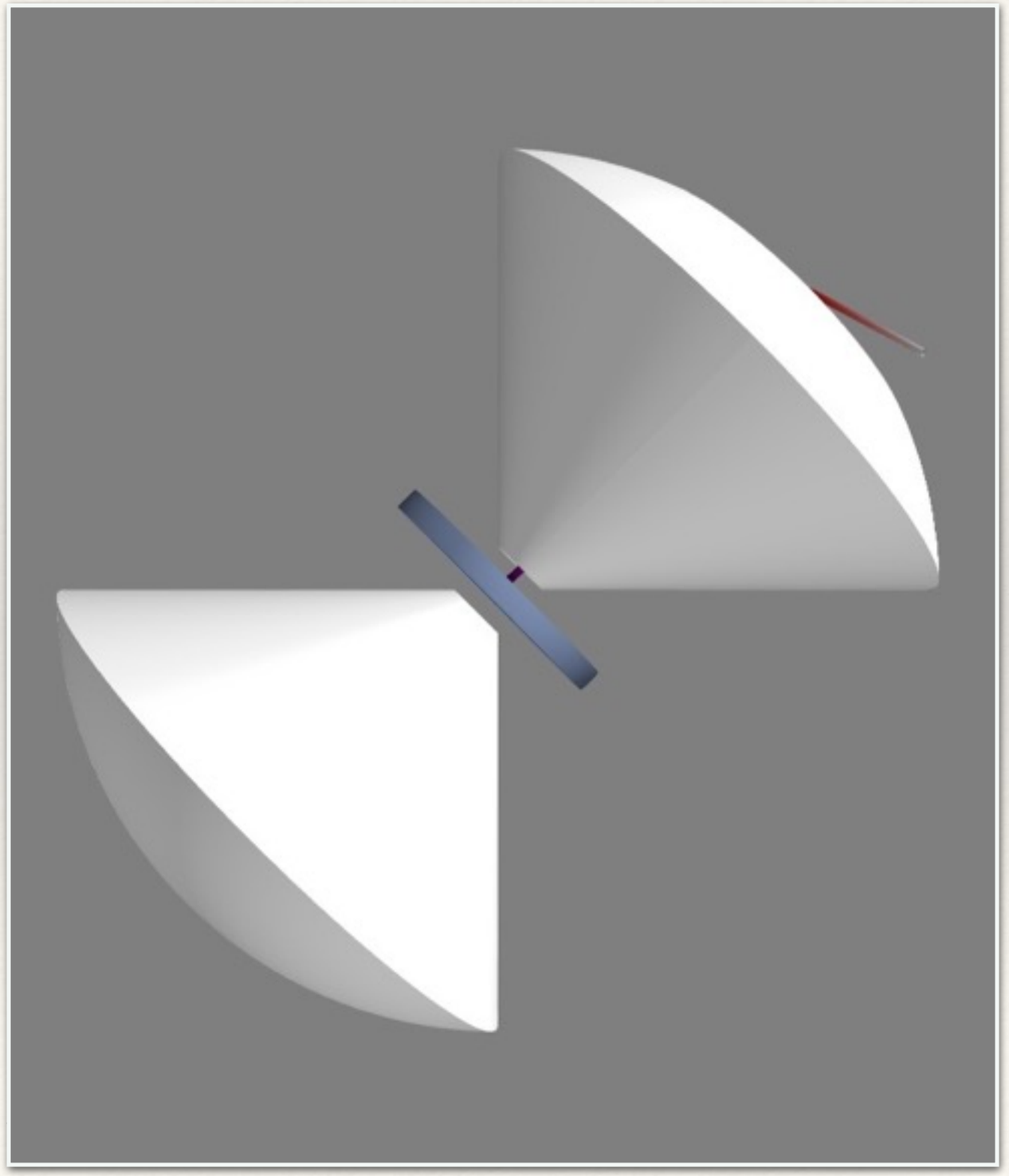
$$n_{H_I}(r)=\begin{cases} 0 & r<R_{inner} \\ 1/r^2 & r>R_{inner} \end{cases}$$



GEOMETRIES

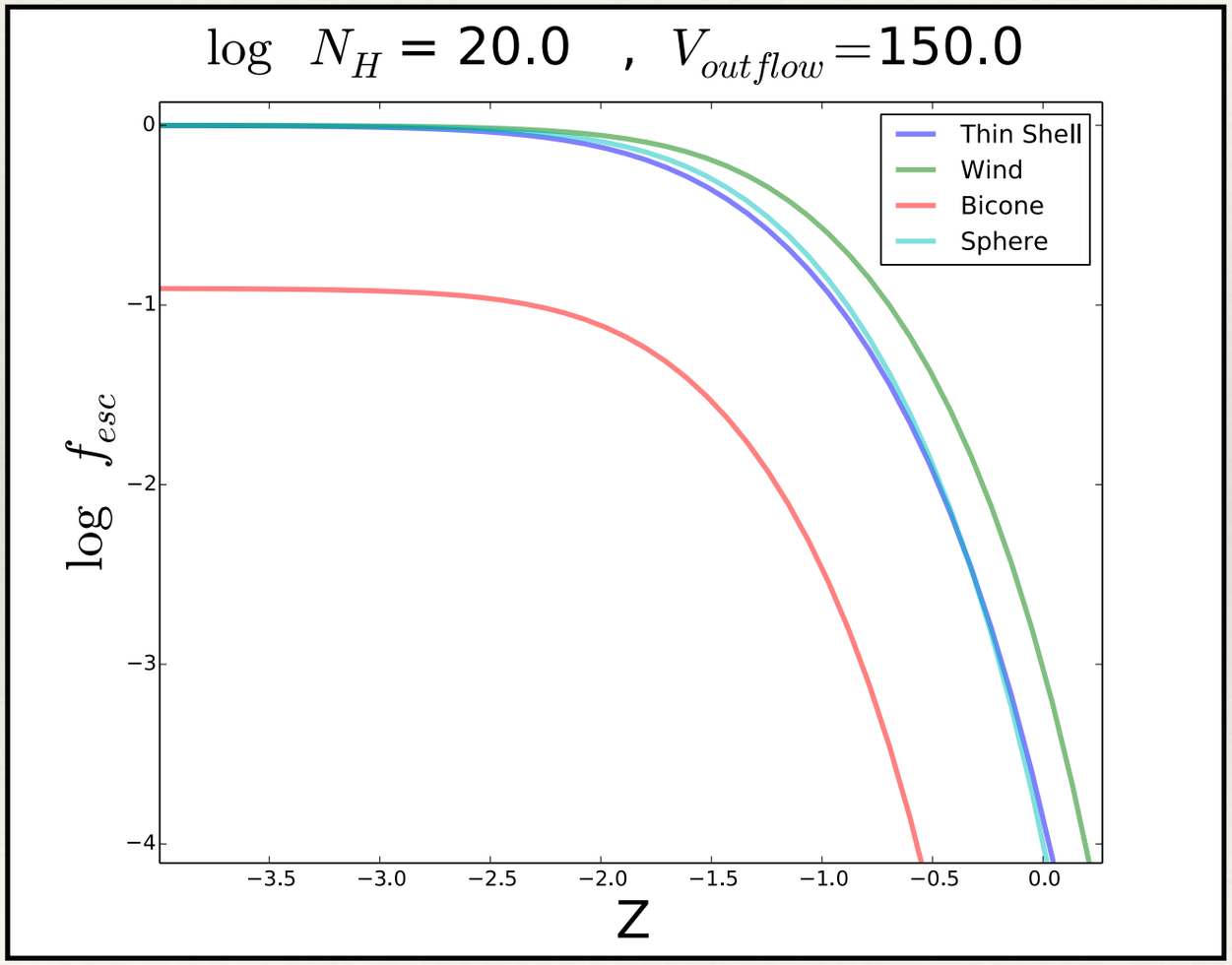
Biconical Wind

$$n_{H_I}(r) = \begin{cases} 0 & r < R_{inner} \\ 1/r^2 & r > R_{inner} \end{cases}$$

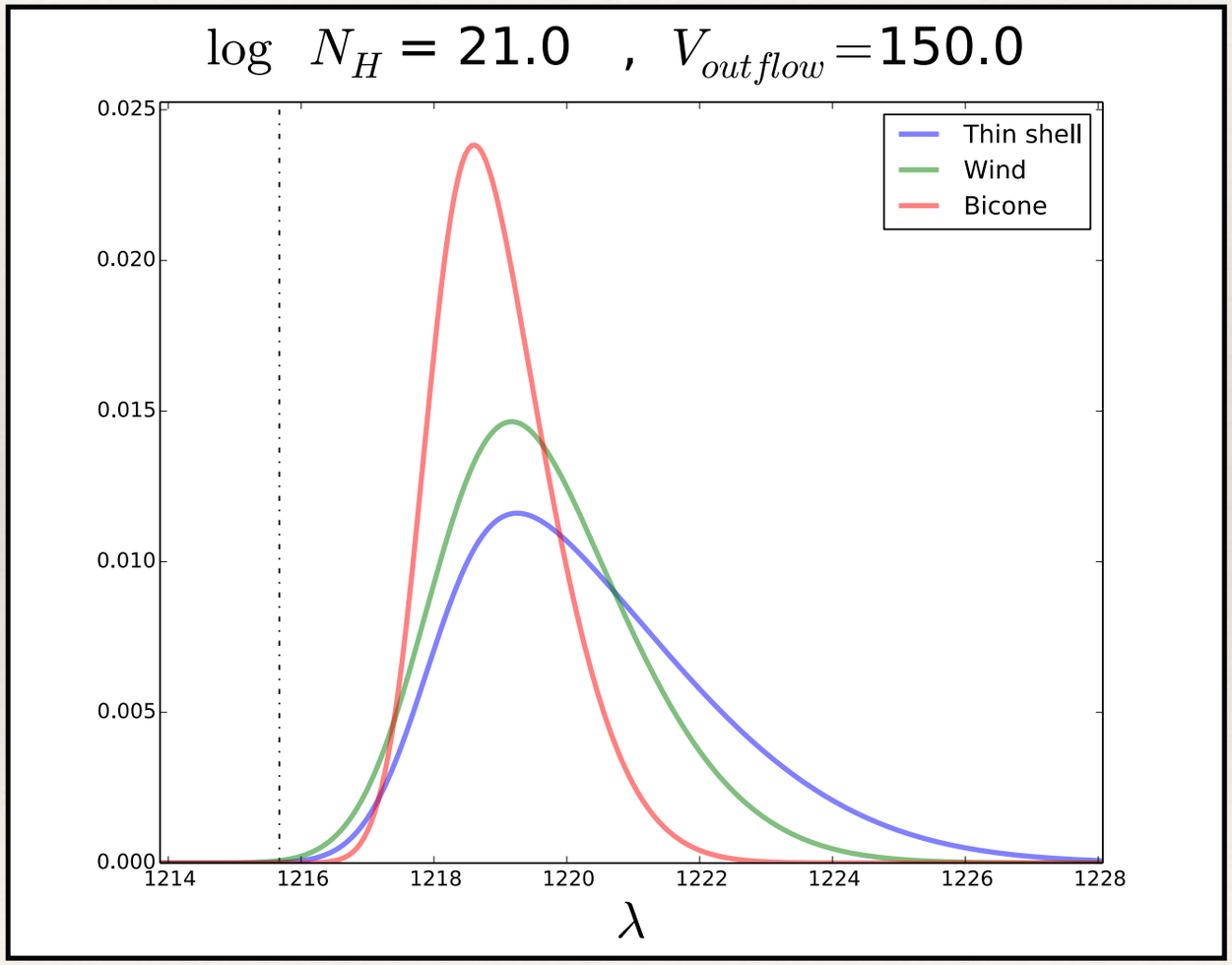


Lyα Radiative Transfer

Escape fraction



Line shape



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Intrinsic luminosity

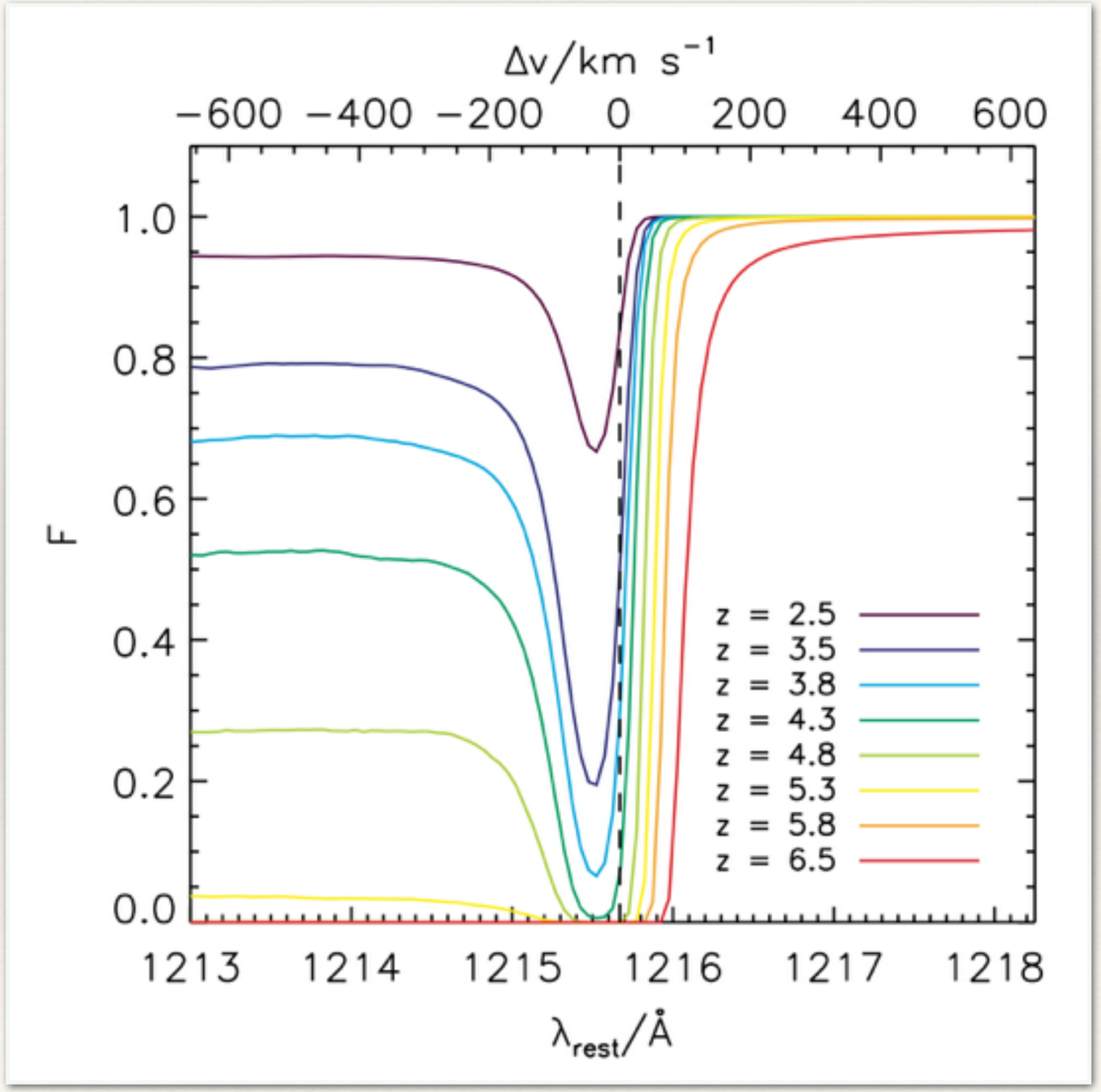
$R_{disk,bulge}$
Disk/bulge radius

M_{vir}
Virial mass

Z
Metallicity

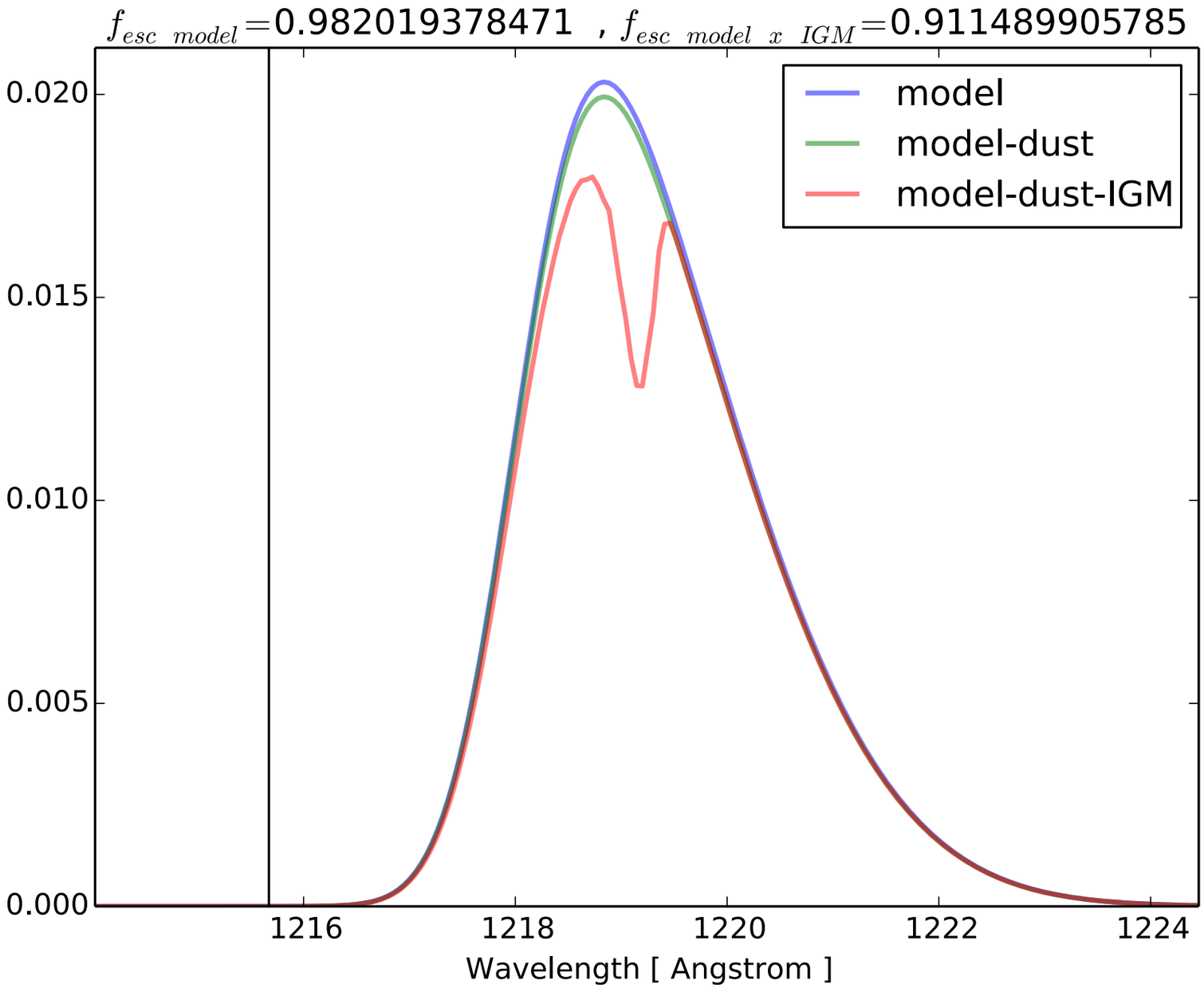
$$N_{H_I} = \kappa_N \frac{Mcold}{R^2_{disk/bulge}} \qquad V_{exp} = \kappa_V \frac{\dot{M}_{star}}{M_{vir}} R_{vir}$$

Intergalactic medium

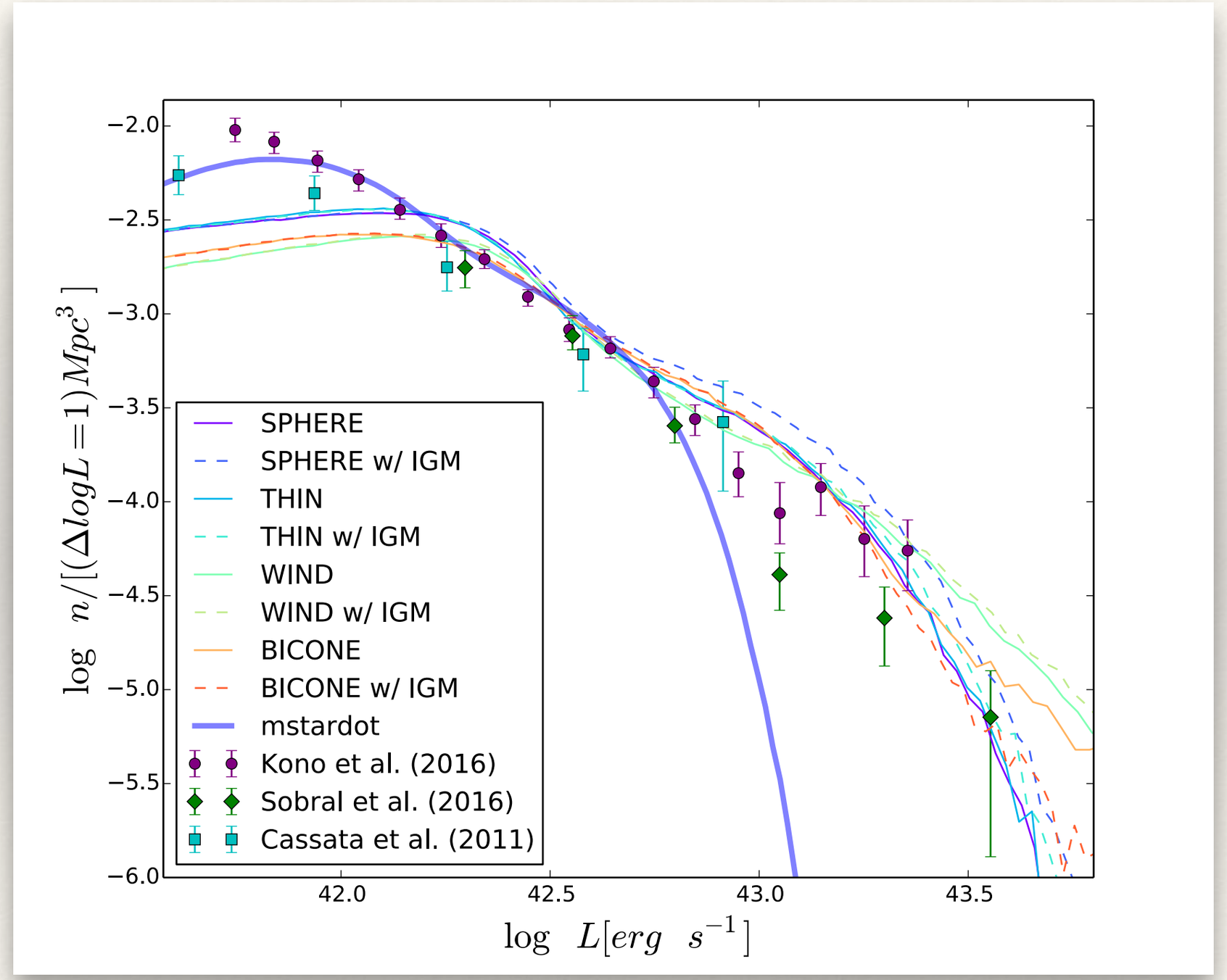


Laursen et. al. 2011

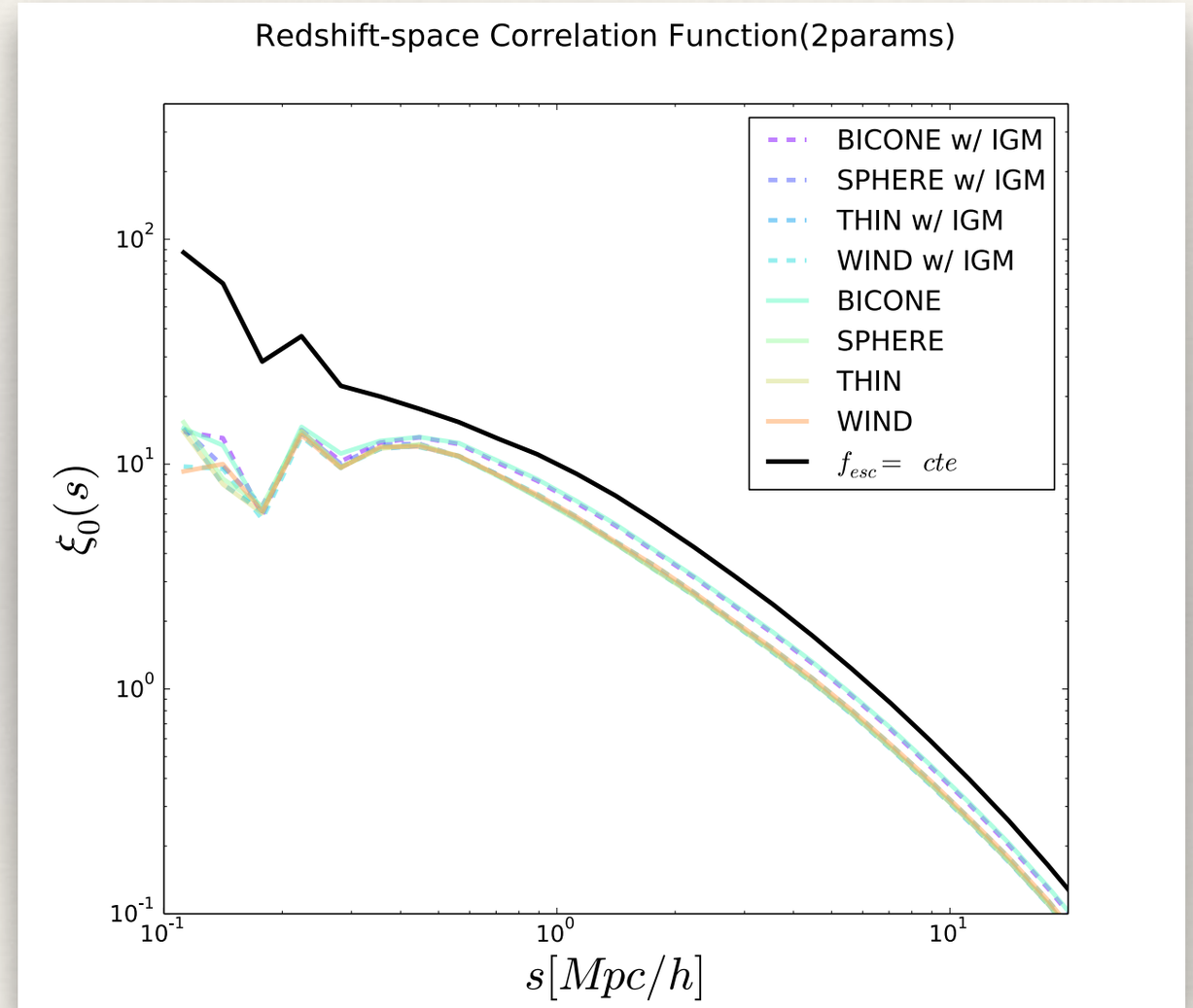
Intergalactic medium

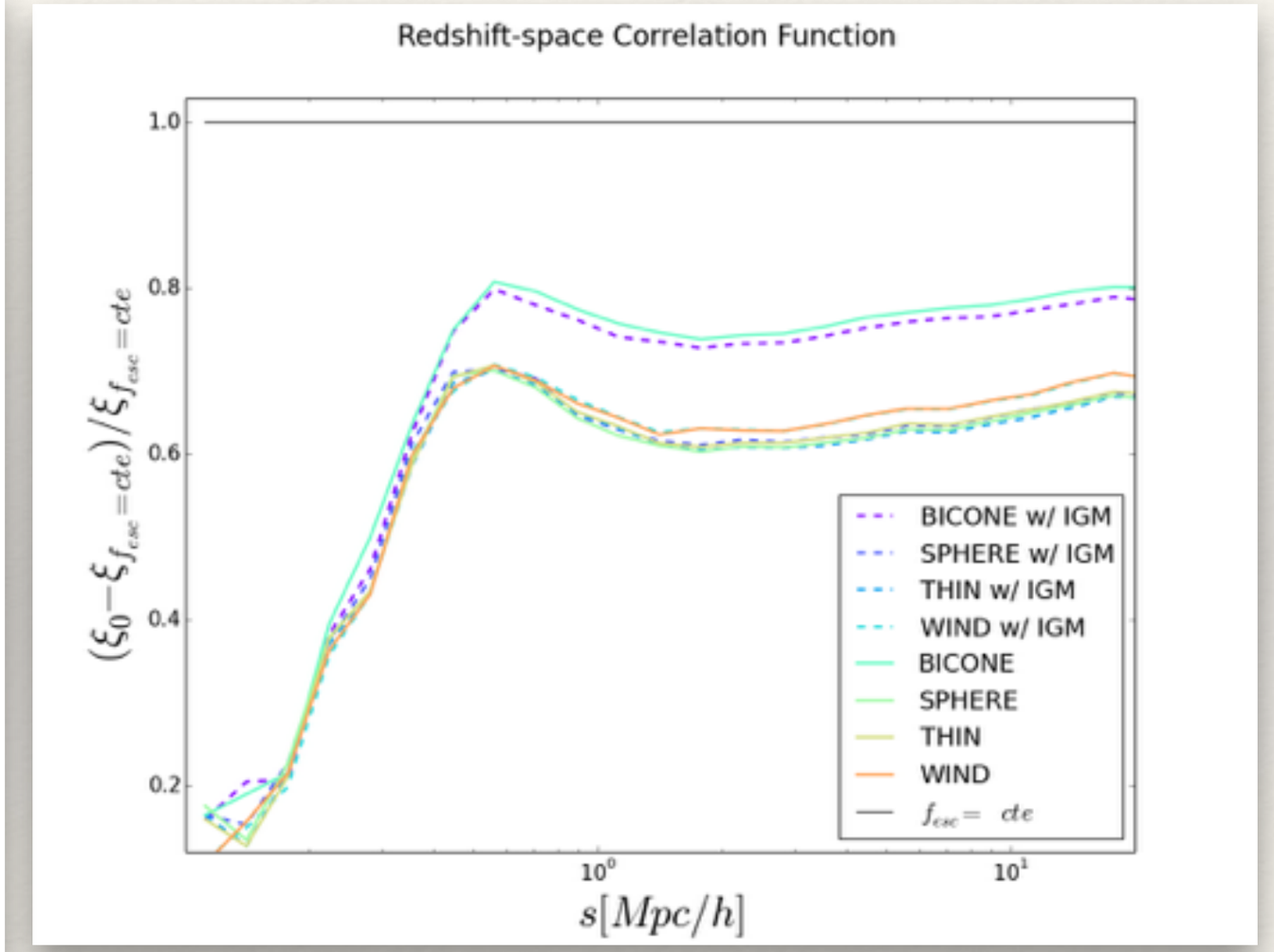


Luminosity Function



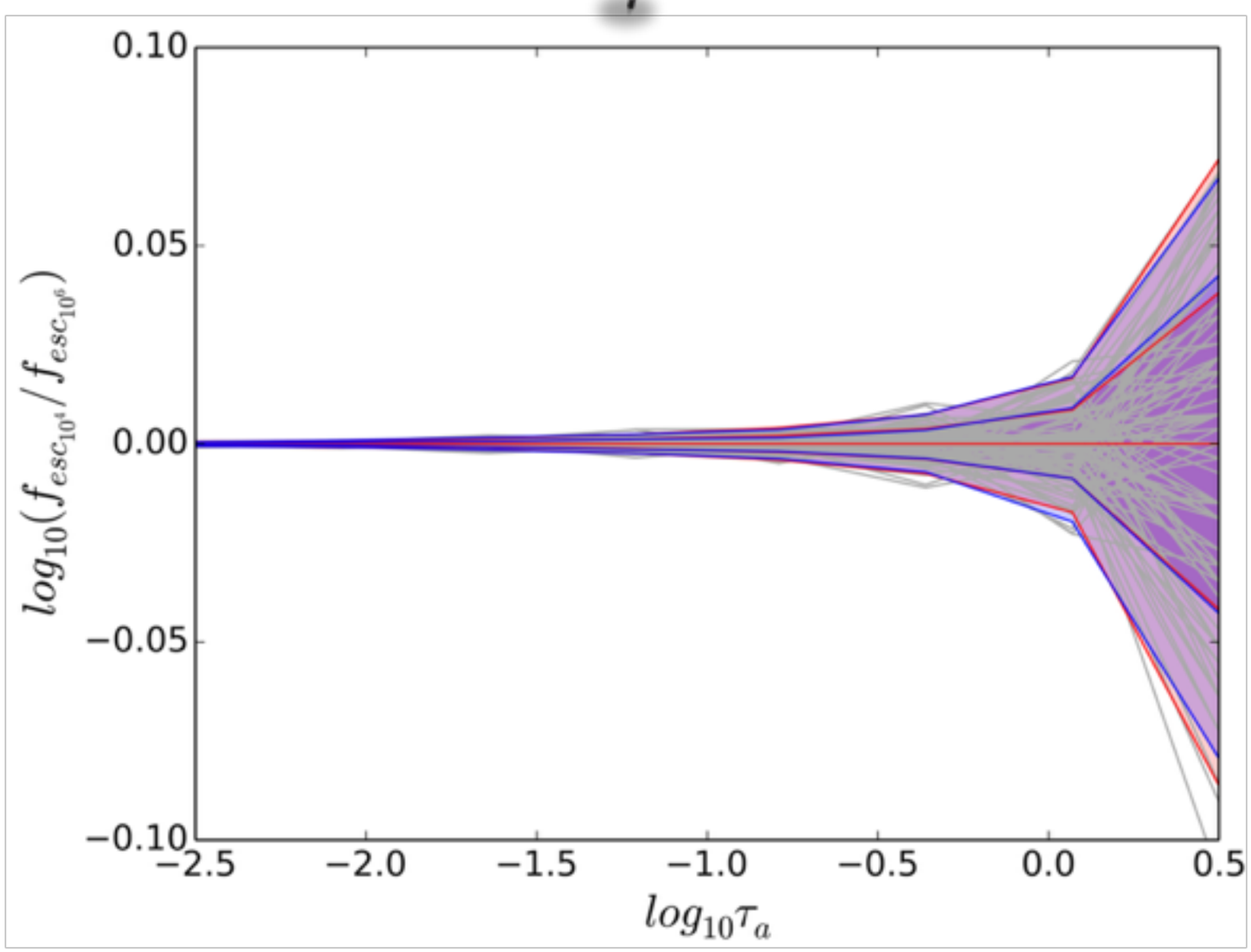
Correlation Function





GRACIAS !! 😀

Escape Fraction Uncertainties

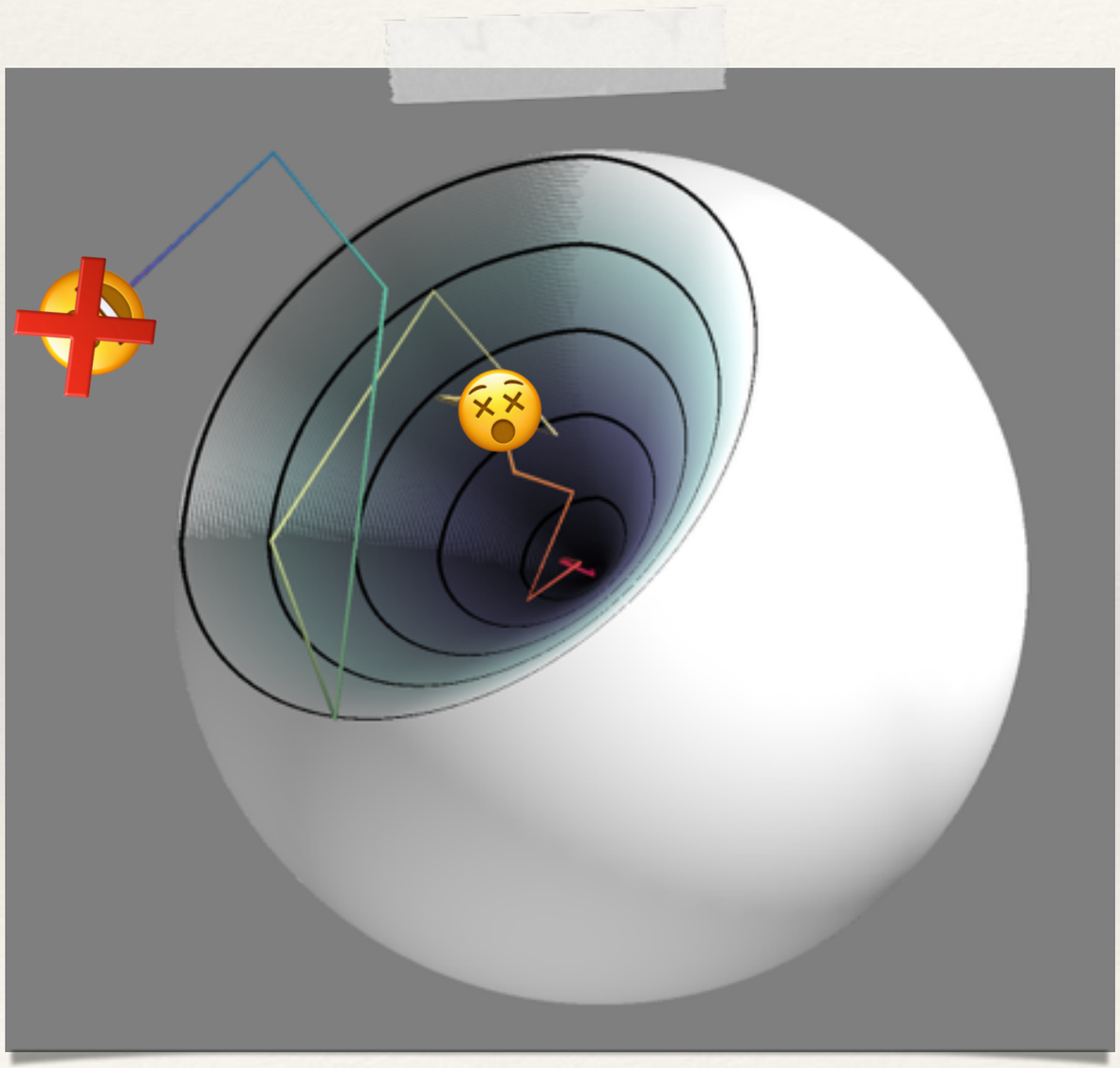


$$f_{esc} = \frac{1}{cosh(\sqrt{c_{11} NH_{18}^{c_{12}} V^{c_{21}} NH_{18}^{c_{22}} \tau_a^{c_3} V^{c_4}})}$$

$$\sigma_{f_{esc}} = z_{1-\alpha/2} \sqrt{\frac{f_{esc}(1 - f_{esc})}{N}}$$

Lyα Radiative Transfer

Expanding homogenous sphere



Expanding homogenous thin shell