THEORETICAL EXTRAGALACTIC BACKGROUND LIGHT

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THEORETICAL EXTRAGALACTIC BACKGROUND LIGHT

EBL is the totality light emitted by galaxies over the history of the universe (IR-UV)

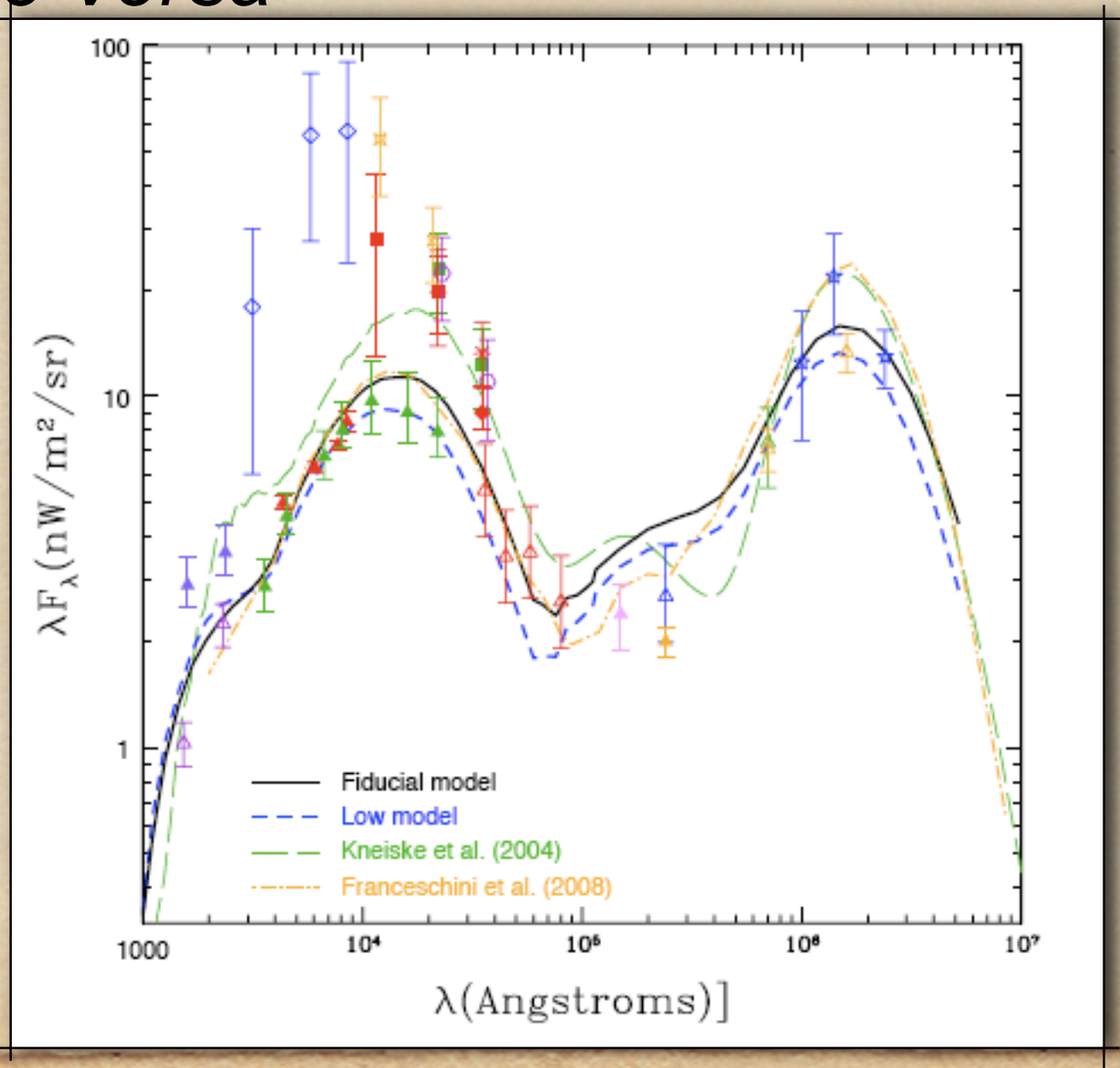
Link between cosmology and high energy astrophysics:

constrains on models of galaxies evolution;

constrains on blazar emission mechanism

COSMOLOGY

from observations we have costrains on galaxies formation or vice-versa



HIGH ENERGY ASTROPHYSICS

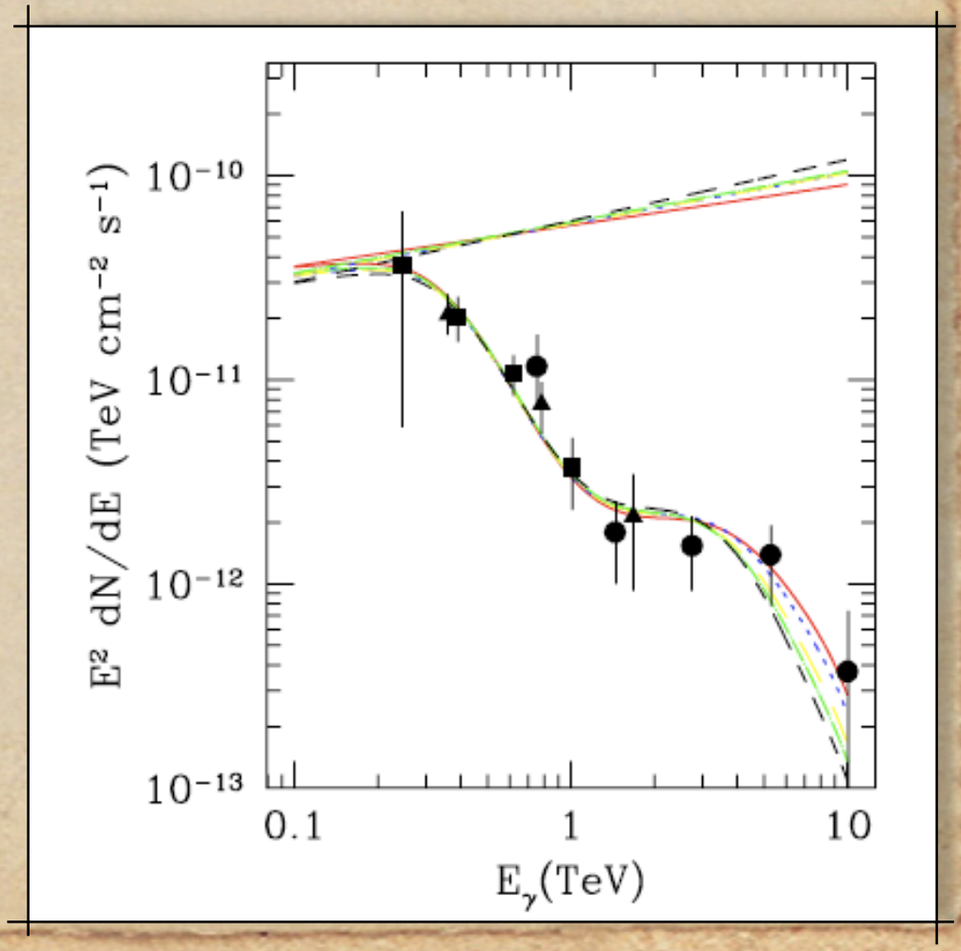
Gamma rays attenuation by pair production

$$\sqrt{2E_1E_2(1-\cos\theta)} \geqslant 2m_ec^2$$

$$E_{th} = \frac{2m_e^2c^4}{E_\gamma(1-\cos\theta)}$$

$$\tau(E) = \int_0^{z_{em}} \mathrm{d}z \frac{\mathrm{d}l}{\mathrm{d}z} \int_{-1}^{1} \mathrm{d}x \frac{(1-x)}{2} \int_{\epsilon_{\mathrm{th}}}^{\infty} \mathrm{d}\epsilon n(\epsilon)\sigma(\epsilon, E, x)$$

$$\left(\frac{\mathrm{d}N}{\mathrm{d}E}\right)_{\text{absorbed}} = \mathrm{e}^{-\tau(E)} \left(\frac{\mathrm{d}N}{\mathrm{d}E}\right)_{\text{unabsorbed}}$$



HOW TO BUILD THEORETICAL EBL

1) comoving emissivity;

2) mean specific background intensity

HOW TO BUILD THEORETICAL EBL

1) comoving emissivity:

$$\mathcal{E}_\nu(t) = \int_{t_\mathrm{m}}^{t} L_\nu(t-t')\dot{\tilde{\rho}}_*(t')\mathrm{d}t'$$

$$\mathcal{E}_\nu(z) = \int_{z}^{z_\mathrm{m}} L_\nu(t(z)-t(z'))\dot{\rho}_*(z')\left|\frac{\mathrm{d}t'}{\mathrm{d}z'}\right|\mathrm{d}z'$$

(erg s^{-1} Hz^{-1} Mpc^{-3})

$$\left|\frac{\mathrm{d}t}{\mathrm{d}z}\right| = \frac{1}{H_0(1+z)E(z)}$$

luminosity

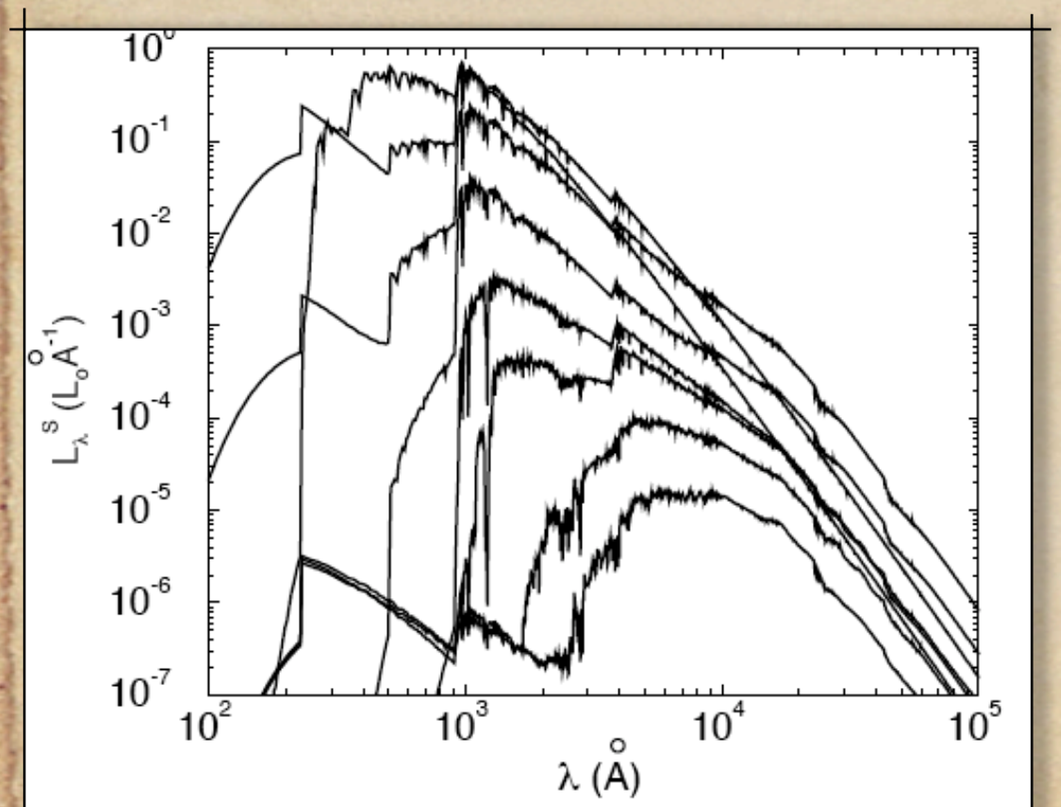
starformation rate

COMOVING EMISSIVITY

Luminosity

Salpiter IMF

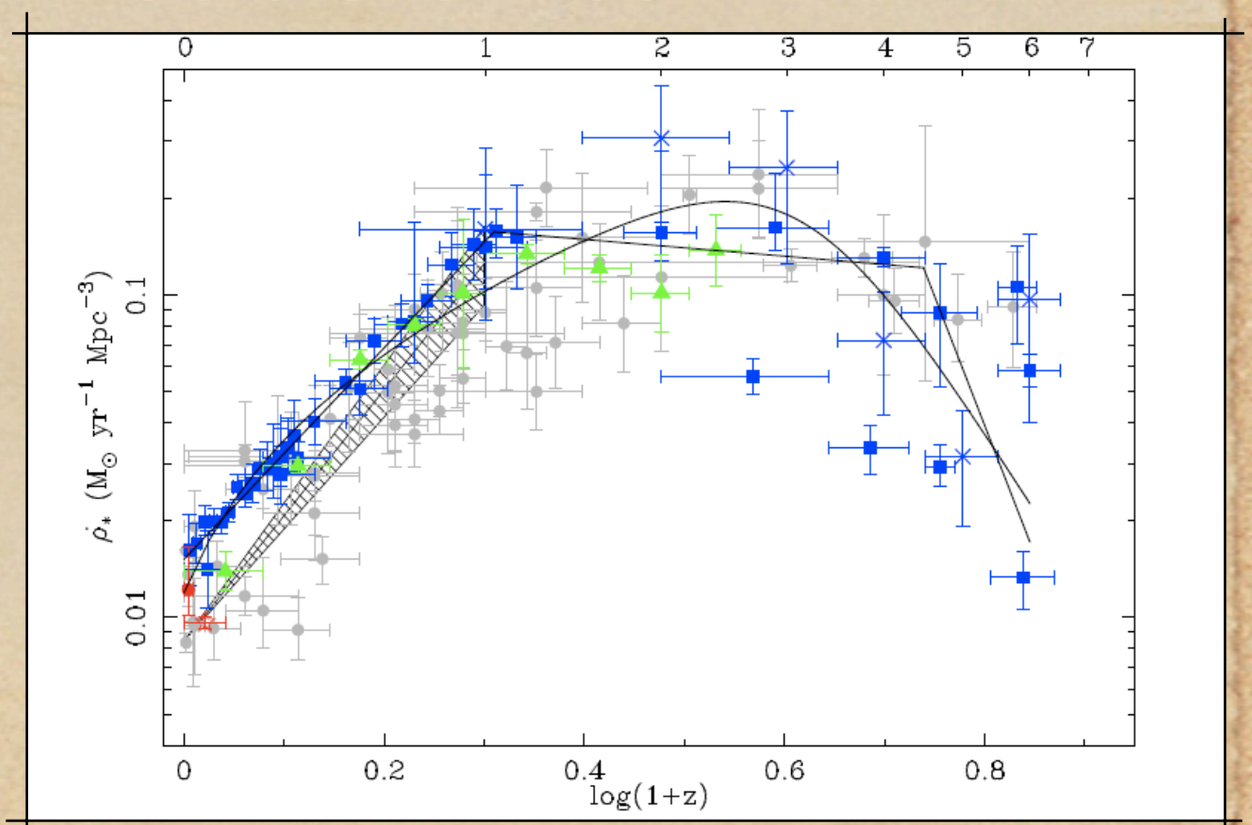
$1\ M_\odot < M < 100\ M_\odot$



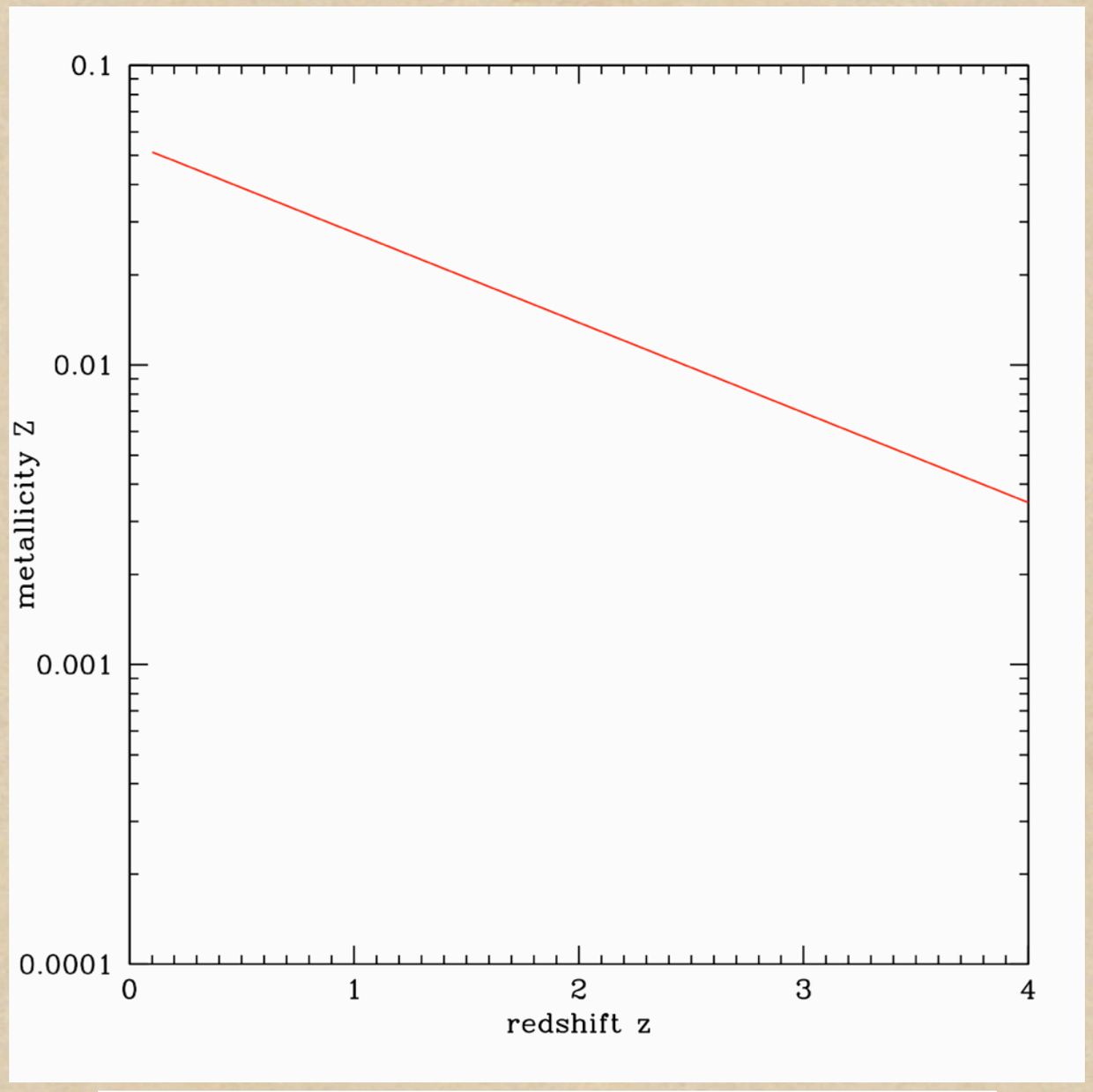
Star formation rate:

Hopkins et al 2007

Cole et al 2007



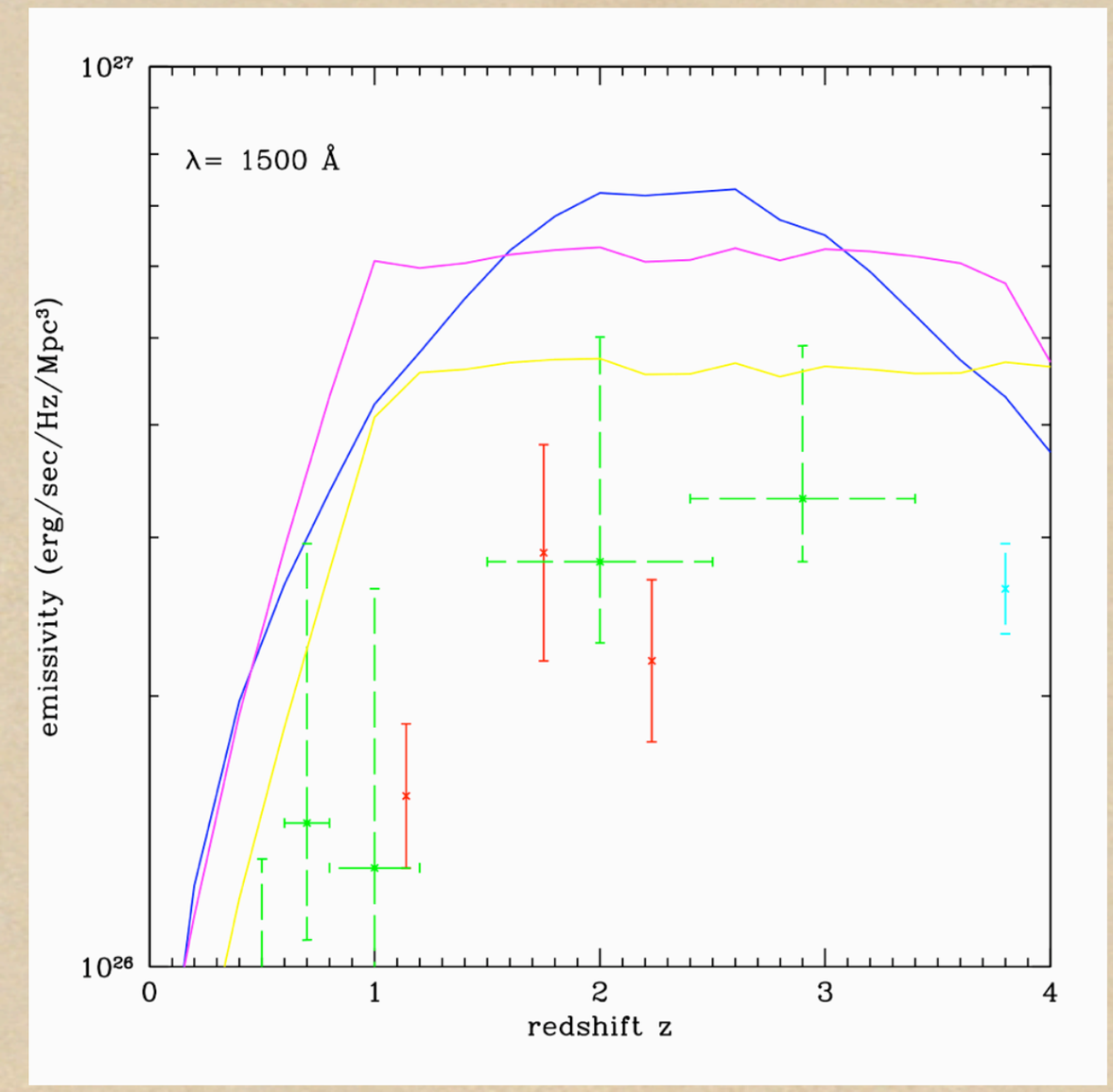
METALLICITY vs REDSHIFT



$$[\log(Z/Z_{\odot}) = -0.30z - 0.44].$$

Prochaska et al 2004

PRELIMINARY RESULT



THINGS TO DO:

2) mean specific background intensity

$$J(\nu_0, z_0) = \frac{(1+z_0)^3}{4\pi} \int_{z_0}^{\infty} \epsilon_\nu(z) \mathrm{e}^{-\tau_{eff}(\nu_0, z_0, z)} \frac{dl}{dz} dz$$

$$\nu = \nu_0(1+z)/(1+z_0)$$