# Extragalactic Background Light inferred from Galaxy SED-type fractions

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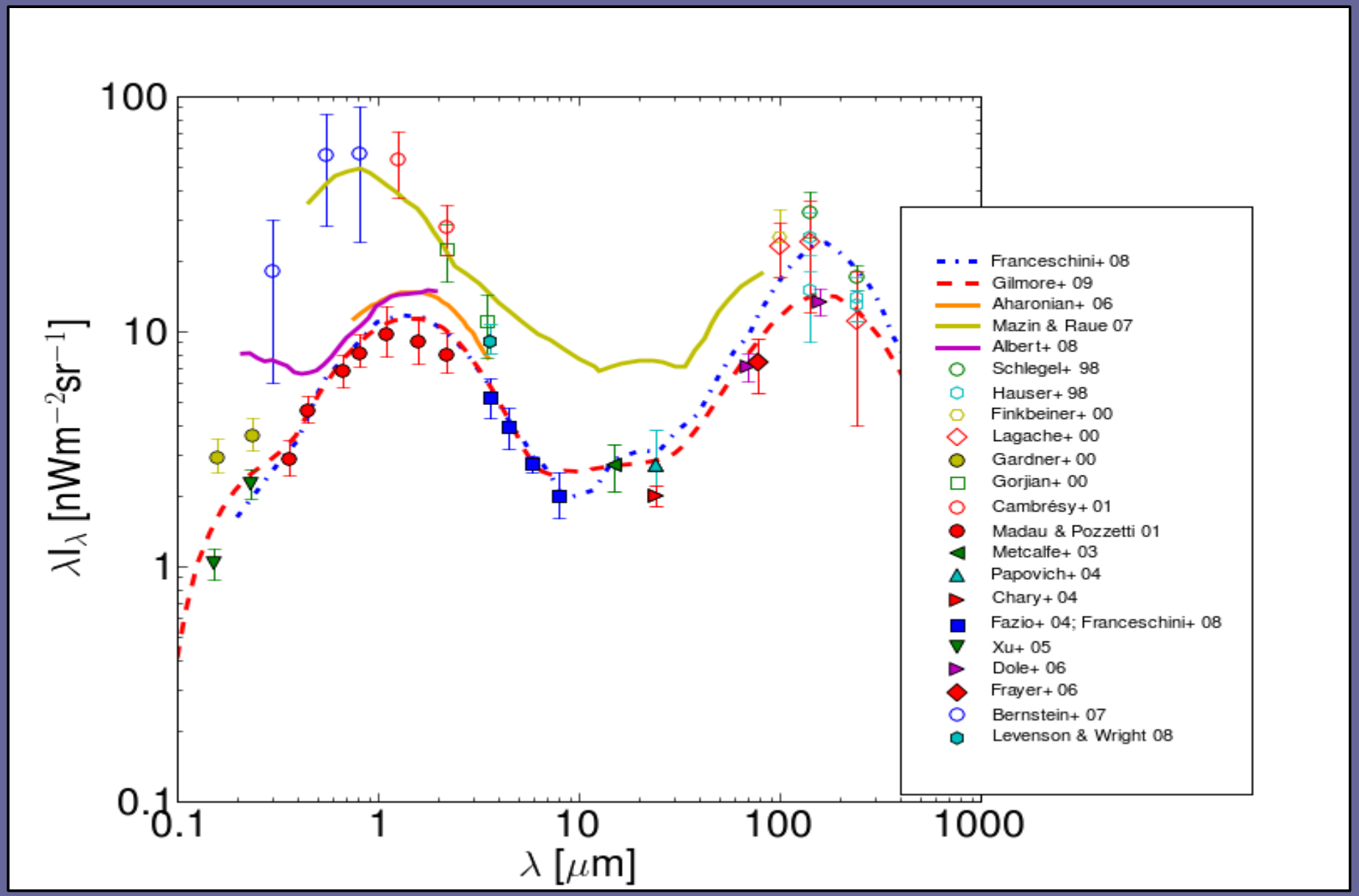
AEGIS Collaboration Meeting, Toledo 9-11 Dec 2009

# State of the art



# Methodology

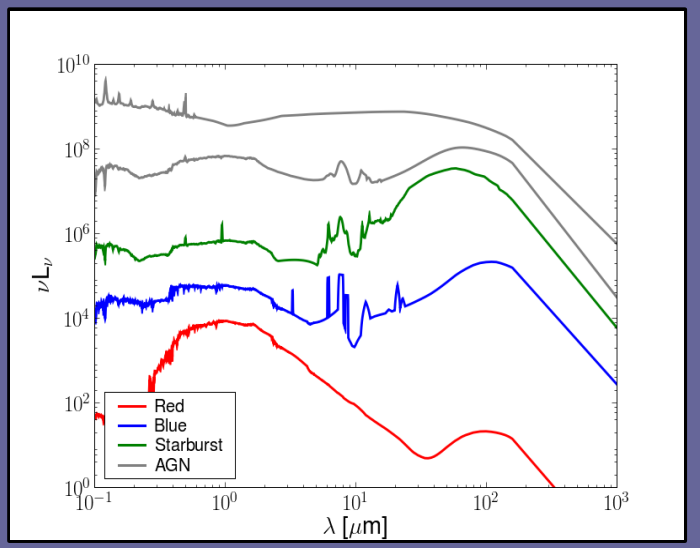
$$j_i(\lambda,z) = j_i^{faint} + j_i^{mid} + j_i^{bright} =$$

$$= \int_{M_1}^{M_2} \Phi(M_K,z) f_i T_i(M_K,\lambda) dM_K +$$

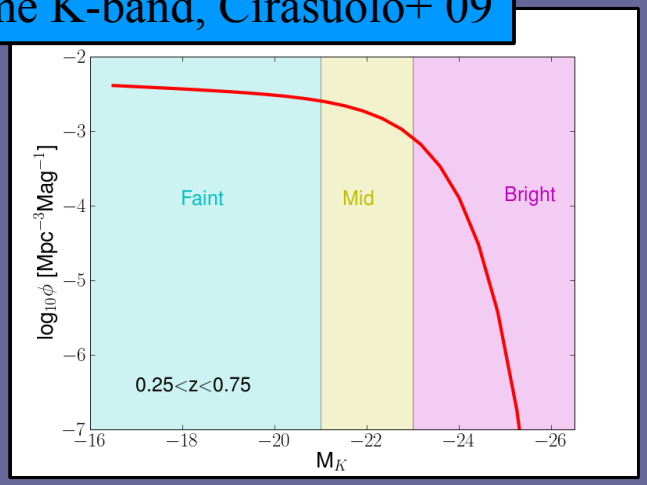
$$+ \int_{M_2}^{M_3} \Phi(M_K,z) m_i T_i(M_K,\lambda) dM_K +$$

$$+ \int_{M_3}^{M_4} \Phi(M_K,z) b_i T_i(M_K,\lambda) dM_K$$

Galaxy Spectral Energy Distributions (SEDs)
SWIRE template library, Polletta+ 07



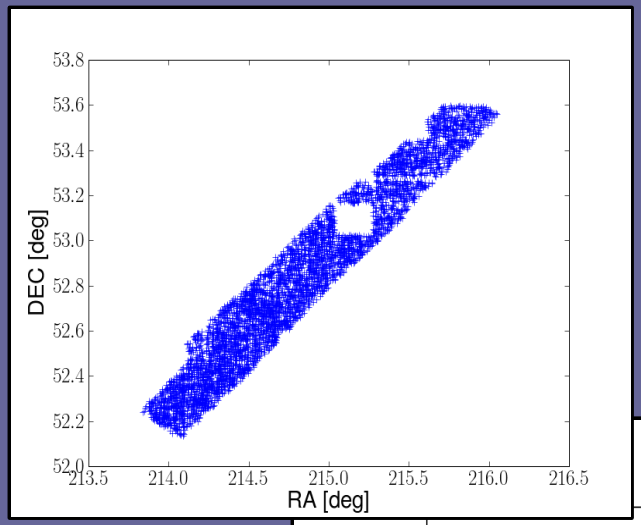

Luminosity function
rest-frame K-band, Cirasuolo+ 09

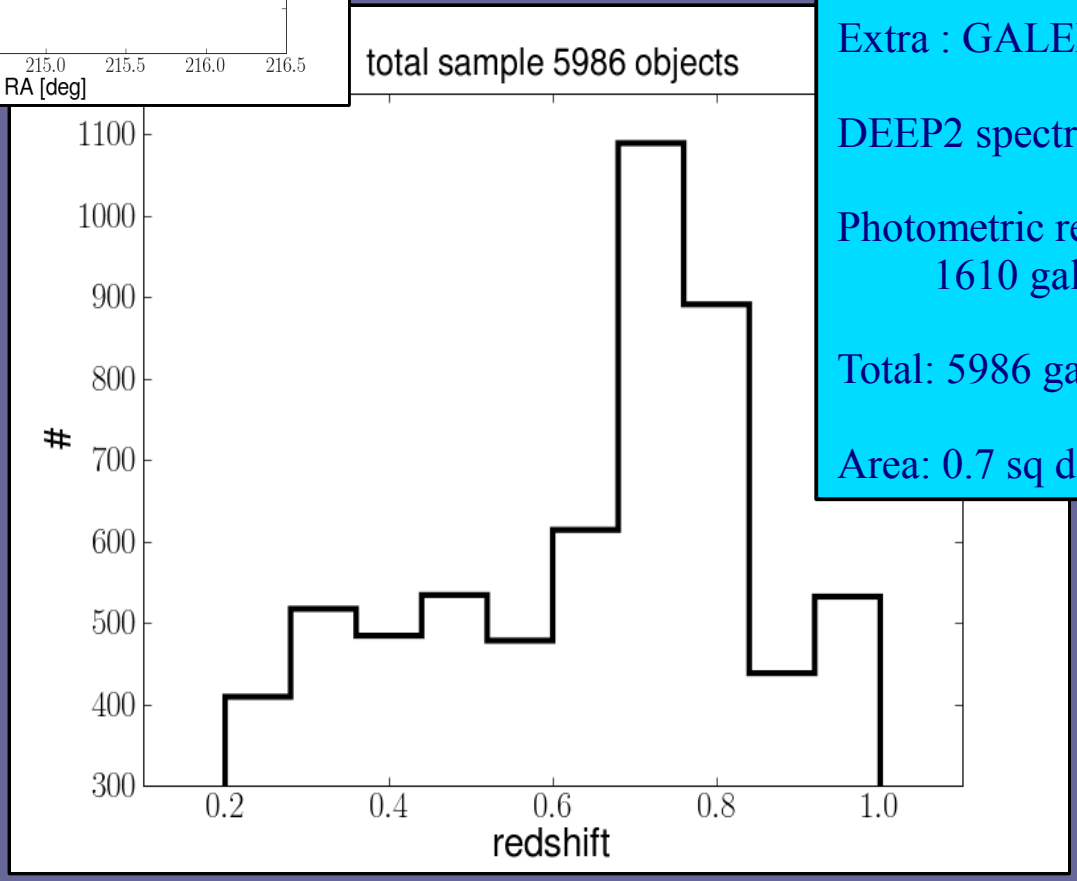



Galaxy SED-type fractions, this work

$$\lambda I_\lambda(z) = \frac{c}{4\pi} \int_z^{z_{max}} j_{total}\left[\lambda(1+z)/(1+z'), z'\right] \left|\frac{dt}{dz'}\right| dz'$$

# Our sample




AEGIS multi-wavelength sample

Detection:
B, R, I, Ks, IRAC 3.6

Observation:
IRAC 4.5, IRAC 5.8, IRAC 8, MIPS 24

Extra : GALEX

DEEP2 spectroscopic redshift: 4376 galaxies

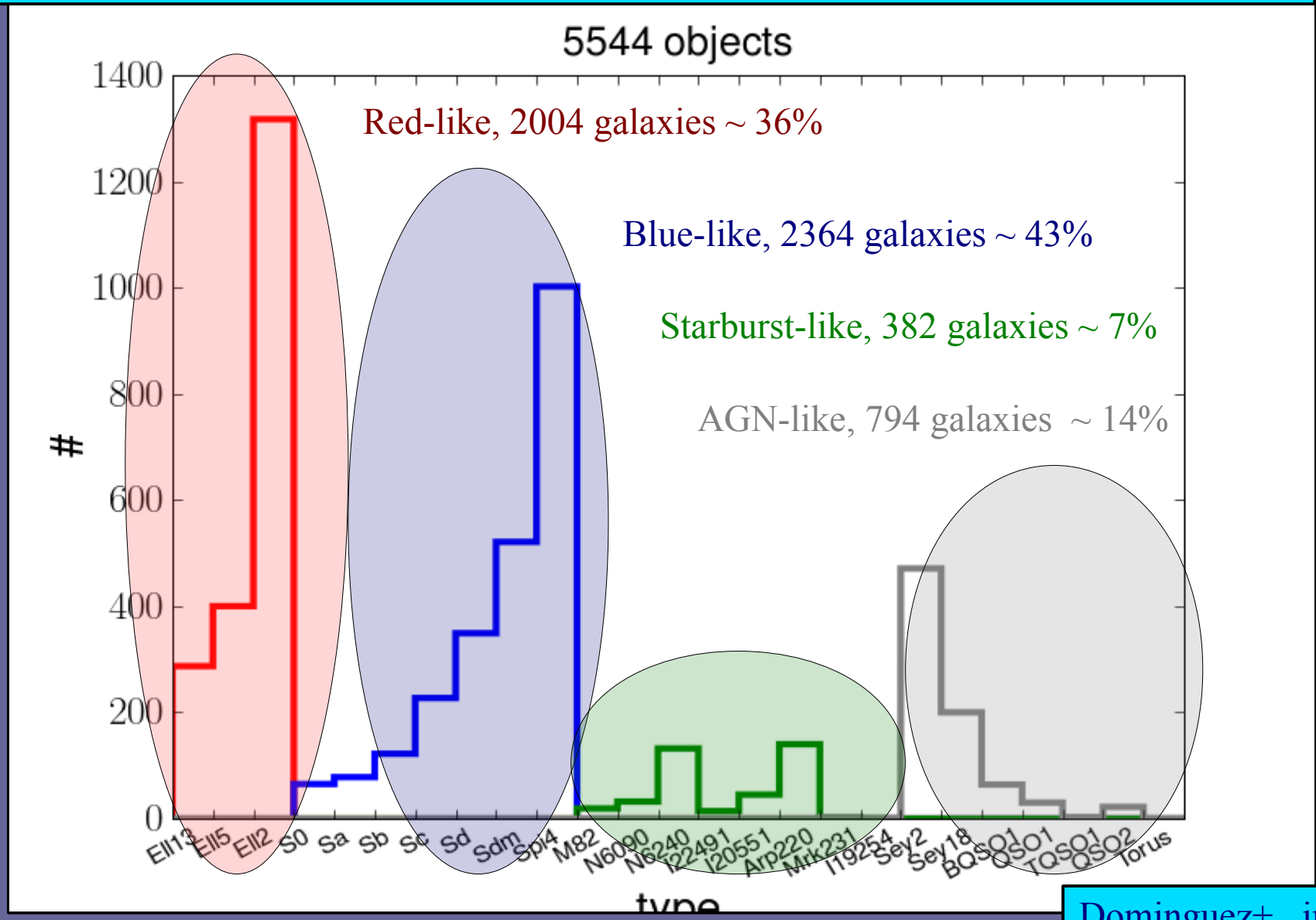
Photometric redshift with mean error less than 0.1:
1610 galaxies

Total: 5986 galaxies

Area: 0.7 sq deg

# Chi2 fit

Lephare code for fitting the SWIRE templates in B, R, I, Ks, IRAC3.6, 4.5, 5.8, 8 and MIPS24




Dominguez+ , in prep.

# Galaxy SED-type fractions

Local fractions, z<0.2:

Goto+ 03, morphologically classified from Sloan converted to spectral classification using results from Galaxy Zoo

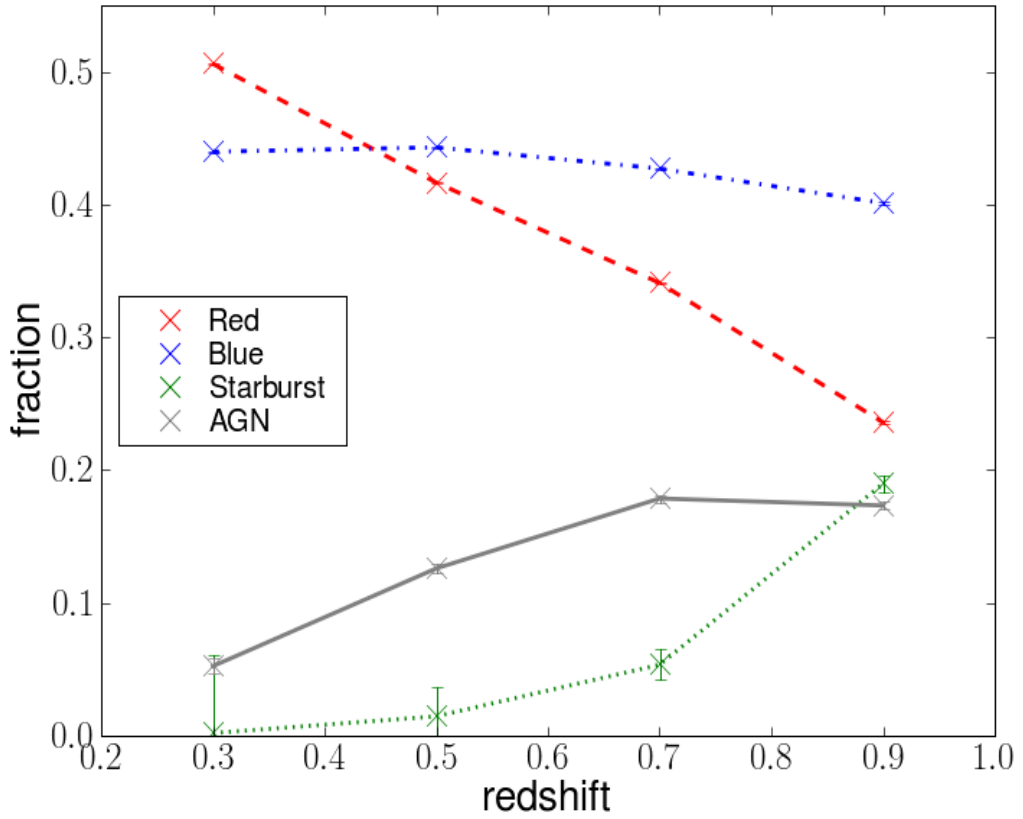
Skibba+ 09 ~6% blue ellipticals

Schawinski+ 09 ~25% red spirals

Results:

52% red-type galaxies
48% blue-type galaxies

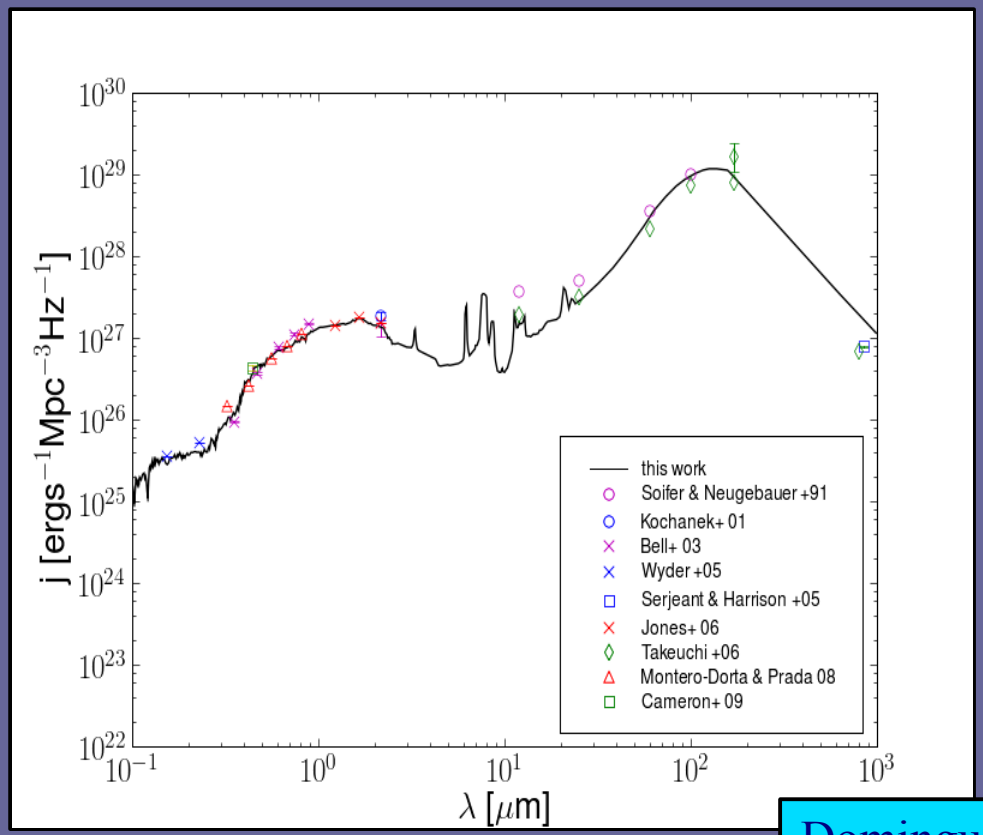
Dominguez+ , in prep.

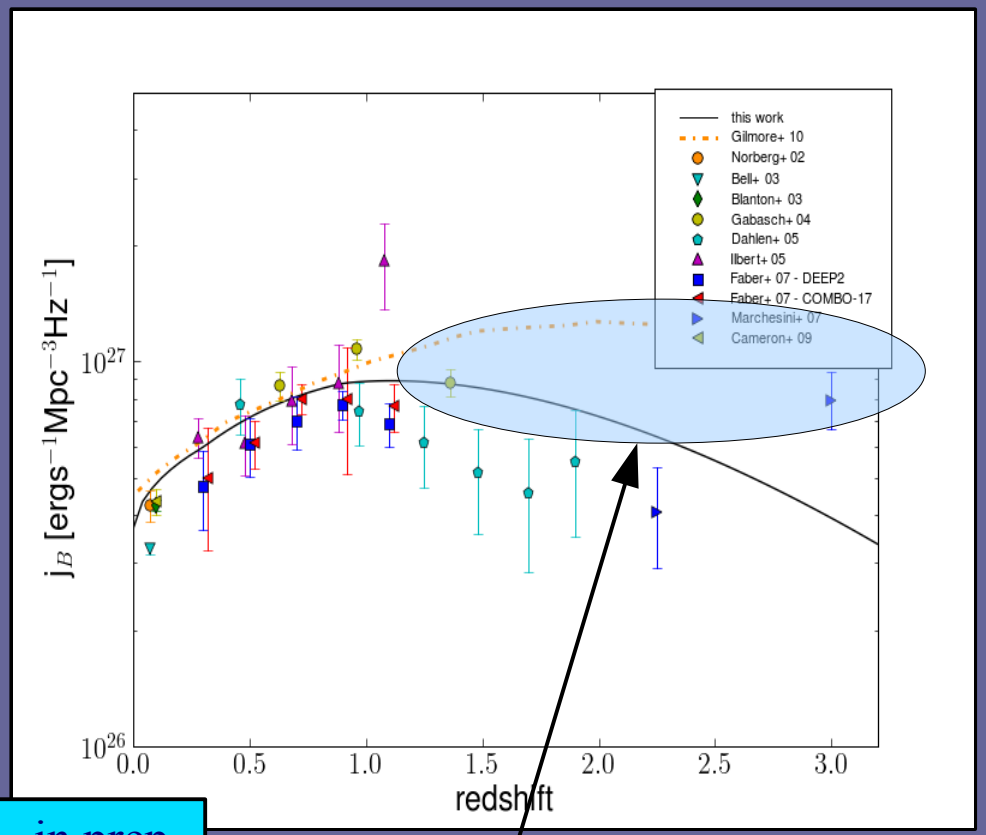



High-redshift universe, z>1:

One approach, keep constant the fractions of our last redshift bin

# Luminosity densities and SFR history

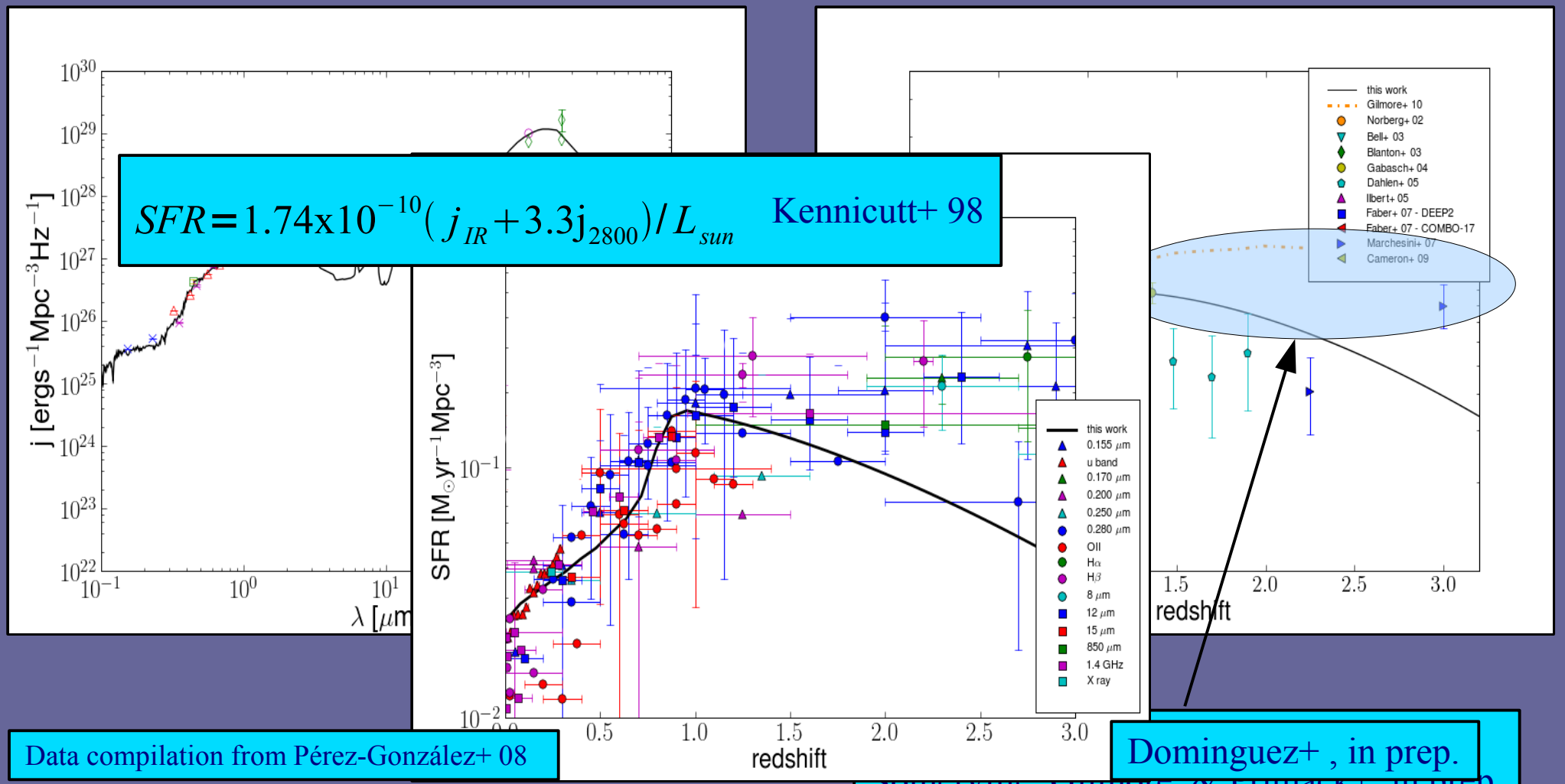



Dominguez+ , in prep.

Difference with SAMs at high redshifts
Somerville, Gilmore, & Primack+, in prep.

# Luminosity densities and SFR history

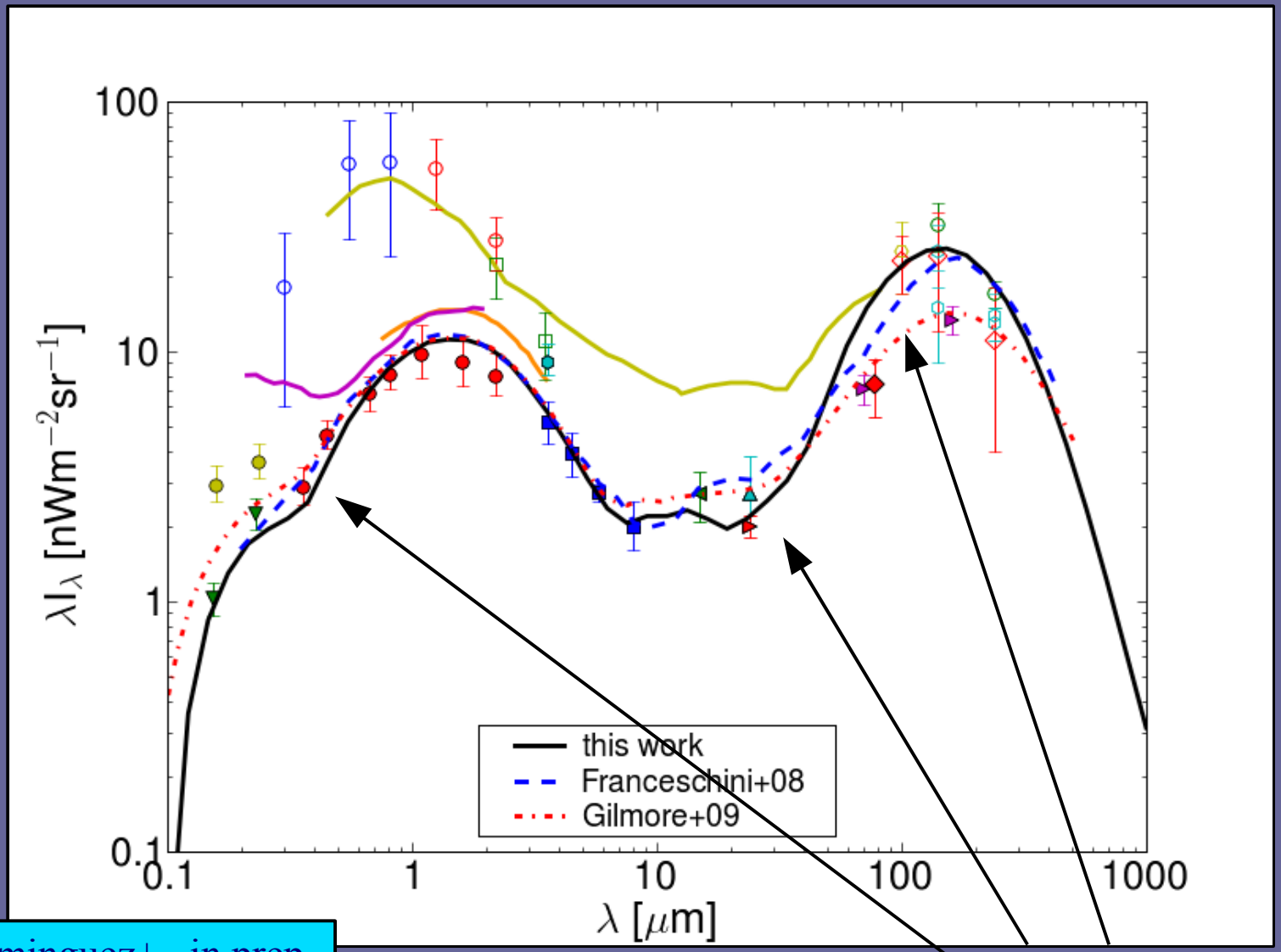



Data compilation from Pérez-González+ 08

Dominguez+ , in prep.

Somerville, Gilmore, & Primack+, in prep.

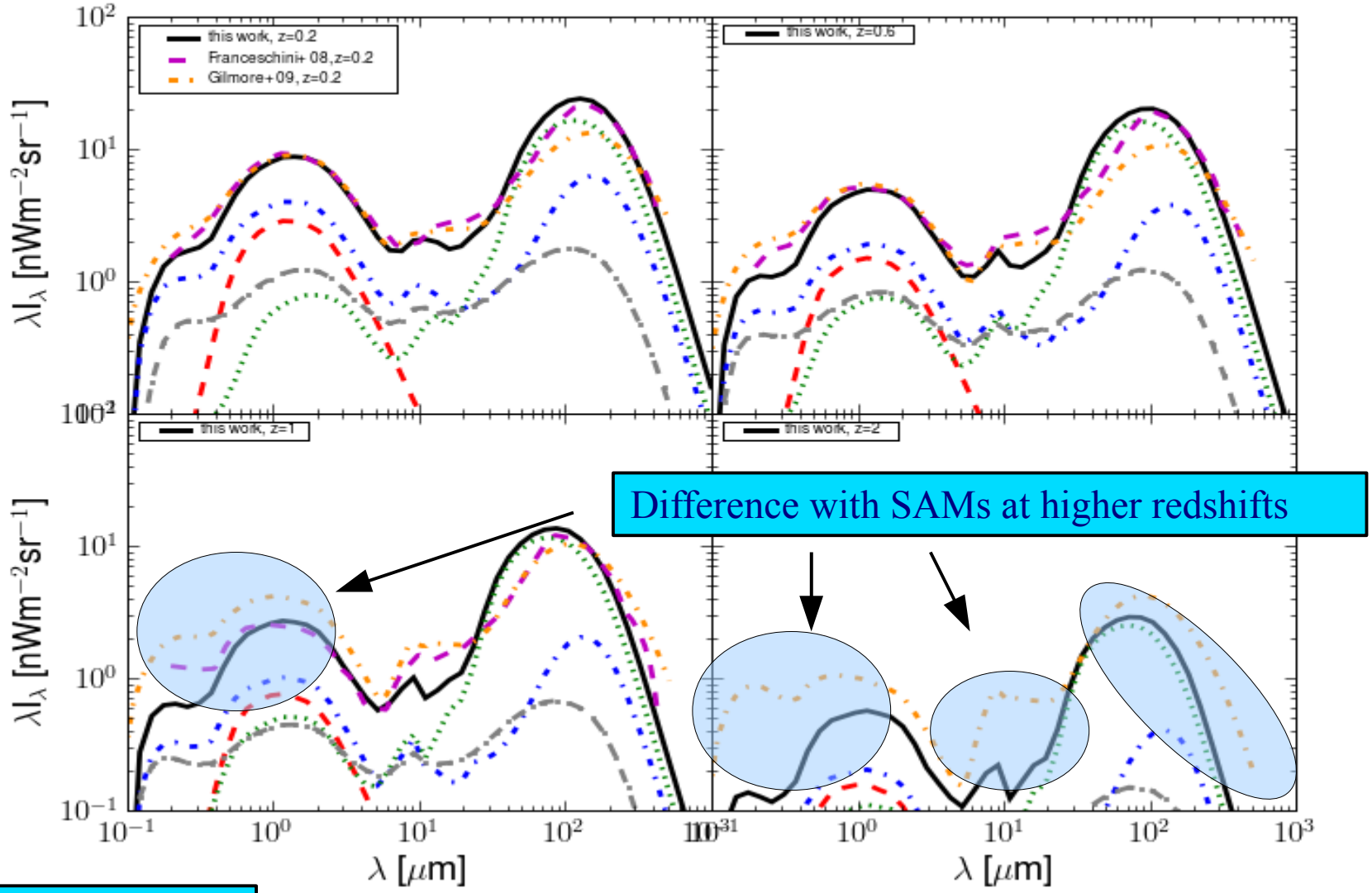
# Local Extragalactic Background Light




Dominguez+ , in prep.

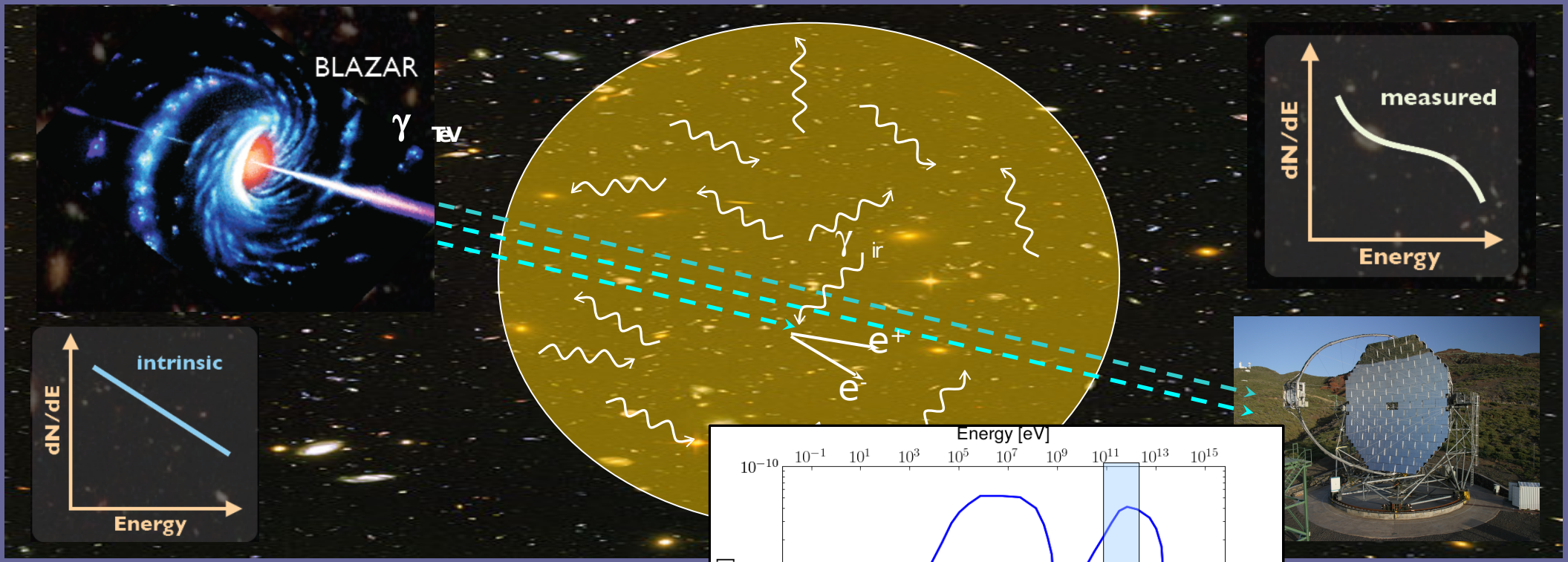
Difference with current models

# EBL history




Dominguez+ , in prep.

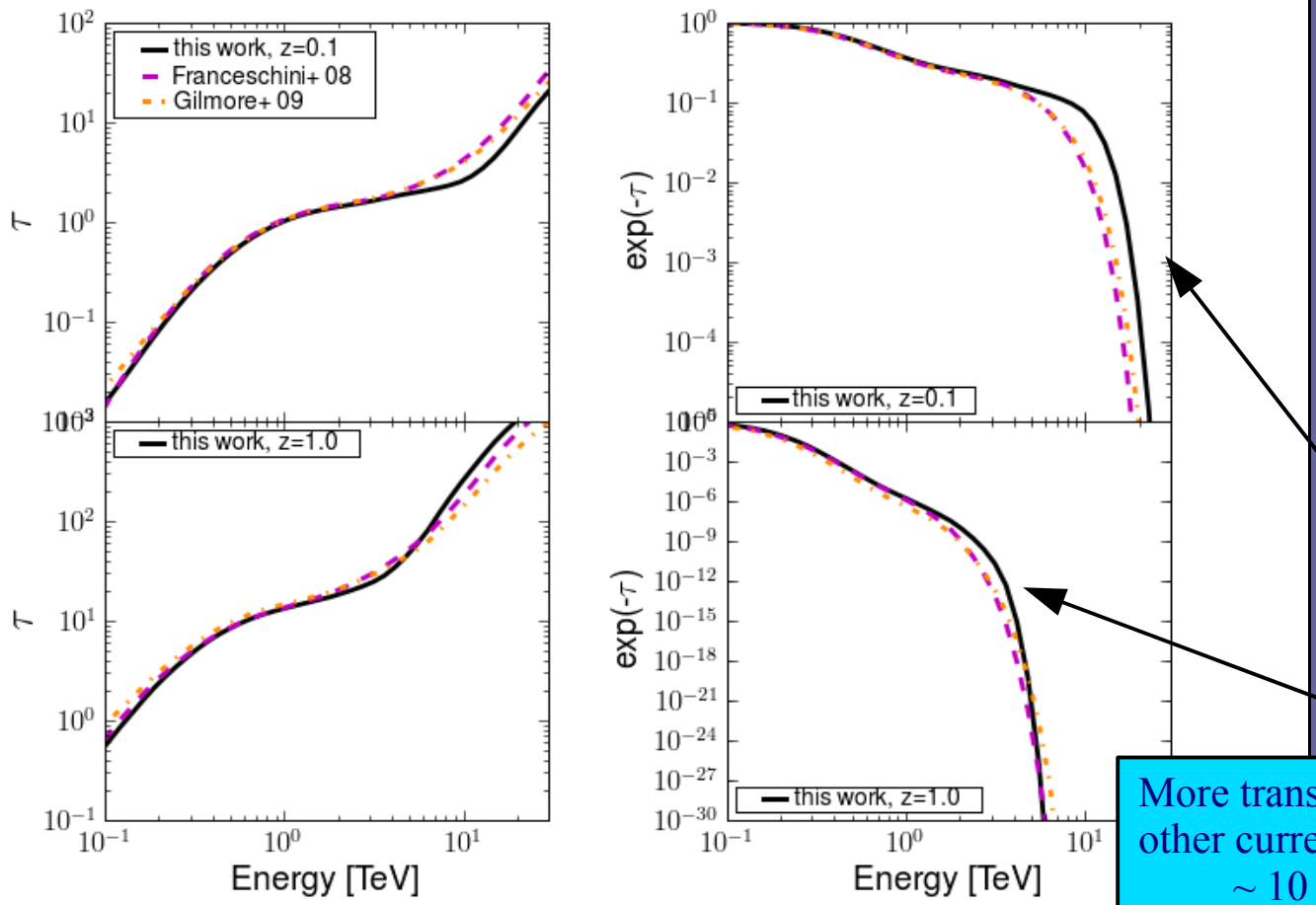
# Gamma-ray attenuation




$$\left.\frac{dN}{dE}\right|_{int} = \left.\frac{dN}{dE}\right|_{obs} \exp\left[\tau(E,z)\right]$$

$$\left.\frac{dN}{dE}\right|_{obs} = \left.\frac{dN}{dE}\right|_{int} \exp\left[-\tau(E,z)\right]$$

# Gamma-ray attenuation




$$\left.\frac{dN}{dE}\right|_{obs} = \left.\frac{dN}{dE}\right|_{int} \exp\left[-\tau(E,z)\right]$$

More transparent universe compared with other current models:

~ 10 TeV for low-redshift sources

~ 3 TeV for high-redshift sources

Excellent news for gamma-ray astronomy!!!

Dominguez+ , in prep.

# Conclusions

**1.-** Galaxy SED-type fractions from a multi-wavelength catalog of ~6000 galaxies between z=0.2-1 from AEGIS, allow a new calculation of the Extragalactic Background Light (EBL).

**2.-** Local EBL along lower limits from galaxy counts from UV up to mIR, but higher at fIR. In good agreement with limits from gamma-ray astronomy.

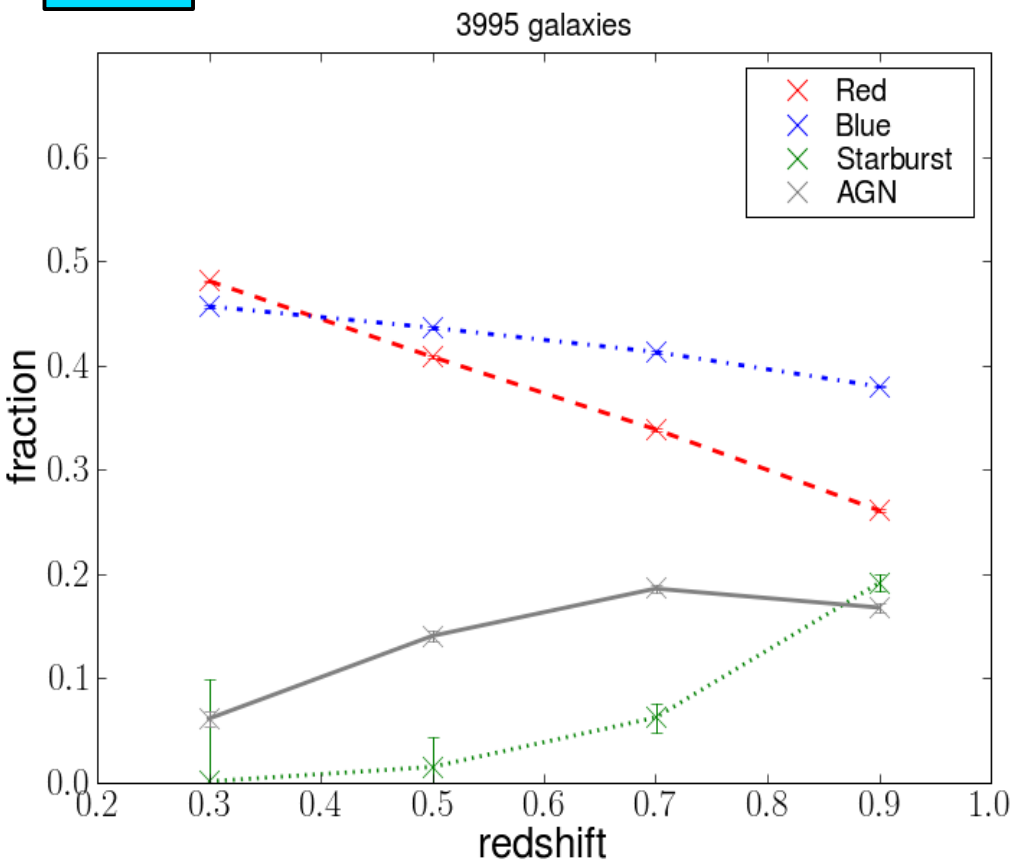
**3.-** Semi-analytic models predict more light at high redshifts than our observational model over all wavelengths.

**4.-** Universe more transparent for VHE gamma-ray photons than other current models:

- For low-redshift sources (z~0.1), around 10 TeV, almost one order of magnitude in flux.
- For high-redshift sources (z~1), around 3 TeV, almost two order of magnitude in flux.

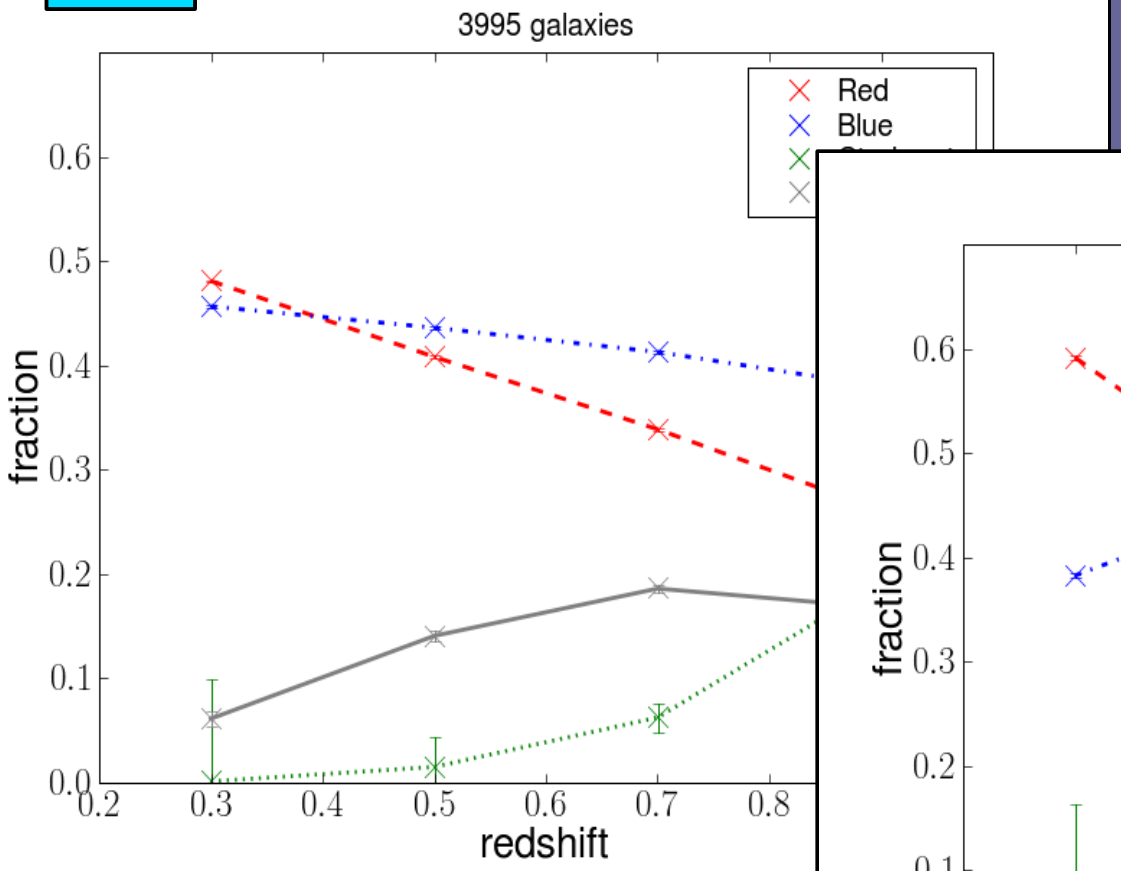
# Supplementary info

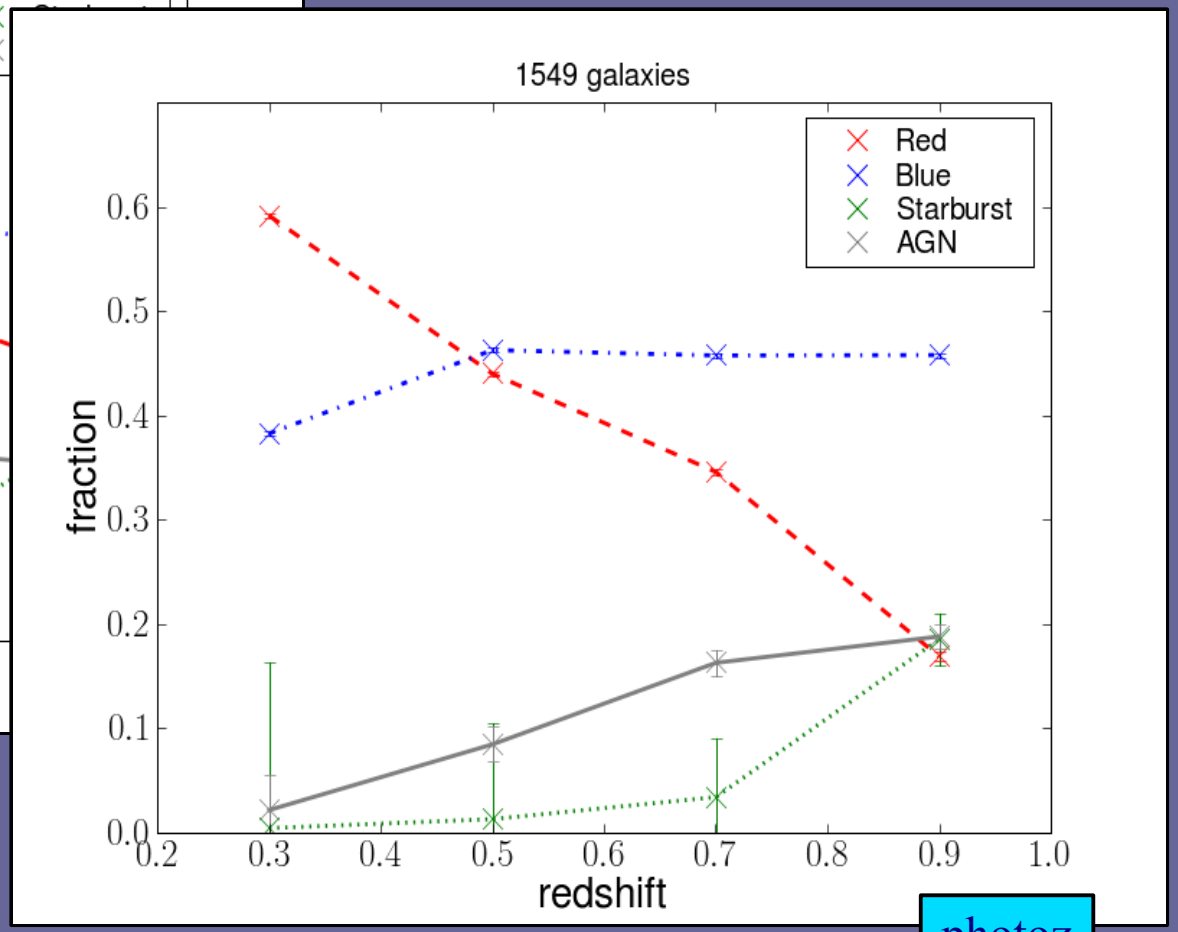
specz



# Supplementary info

specz




photoz

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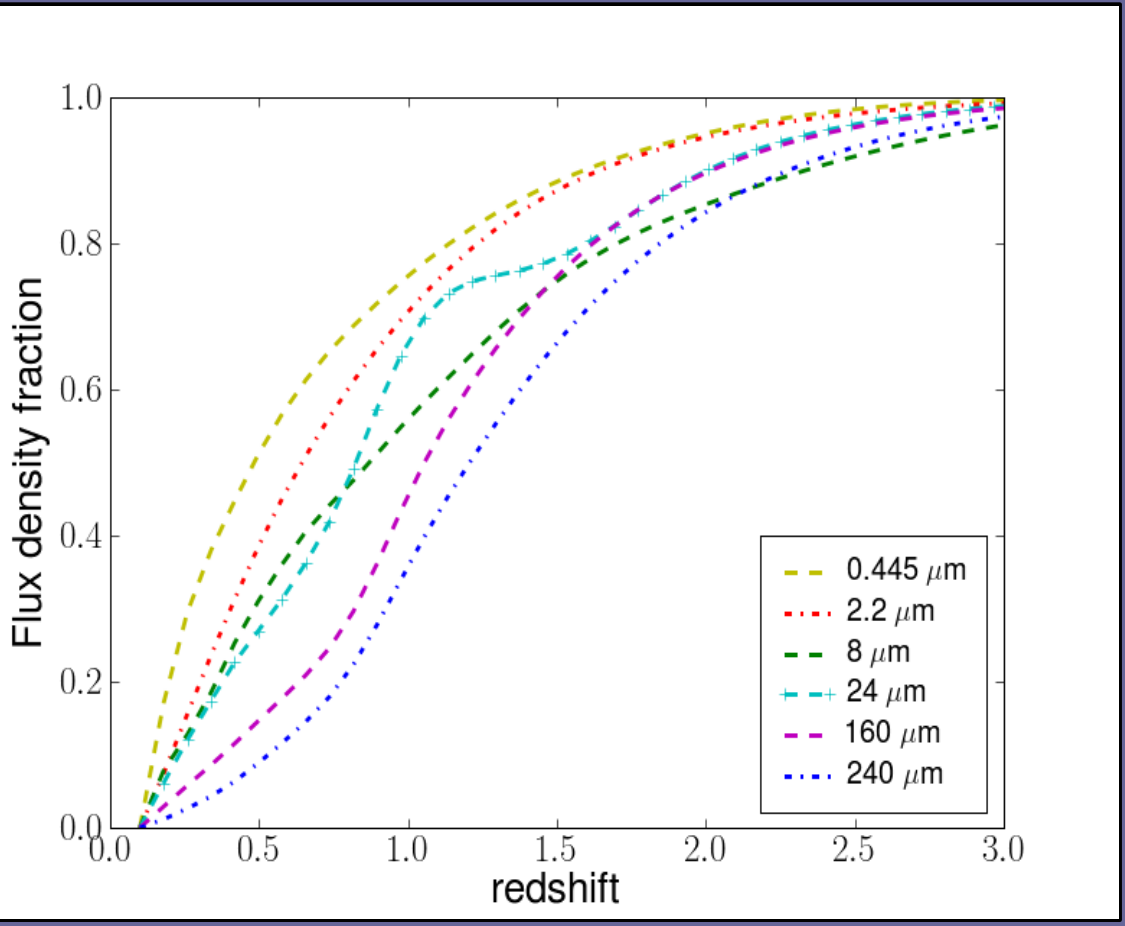

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