UNIVERSIDAD COMPLUTENSE MADRID

VII MEETING ON FUNDAMENTAL COSMOLOGY 9-11 SEPTEMBER 2019 MADRID, SPAIN

How much light is there in the Universe?

Empirical determination of the Extragalactic Background Light through panchromatic galaxy-SED selected from HST-CANDELS survey

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Final Master Thesis **2018/19**
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2. CANDELS survey and Rainbow Navigator
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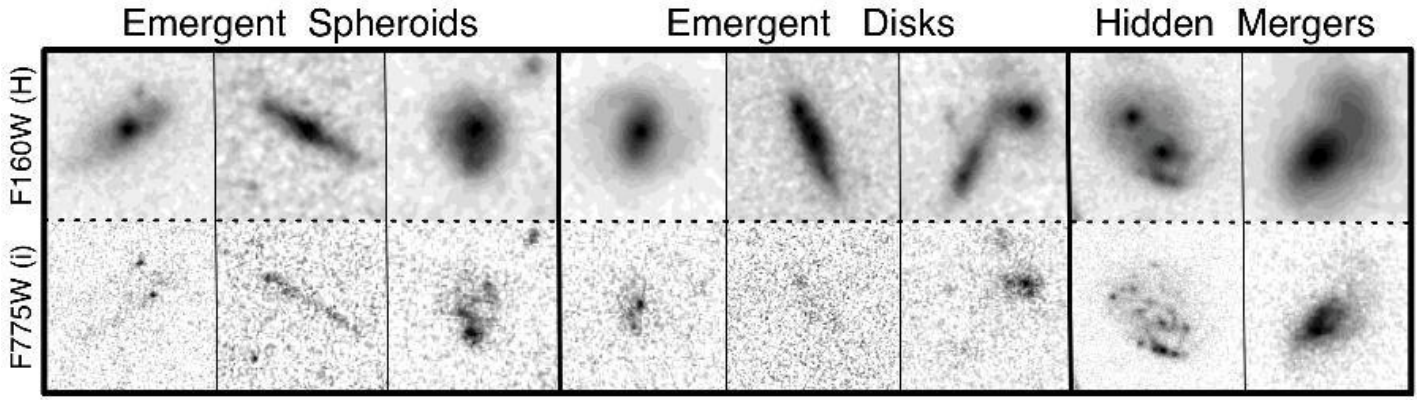
7. Cosmic Optical and Infrared Backgrounds (COB/CIB)



https://blog.galaxyzoo.org/2012/09/12/candels-intro/

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1. Extragalactic Background Light (EBL)

http://wwwiexp.desy.de/groups/astroparticle/crf/en/research/

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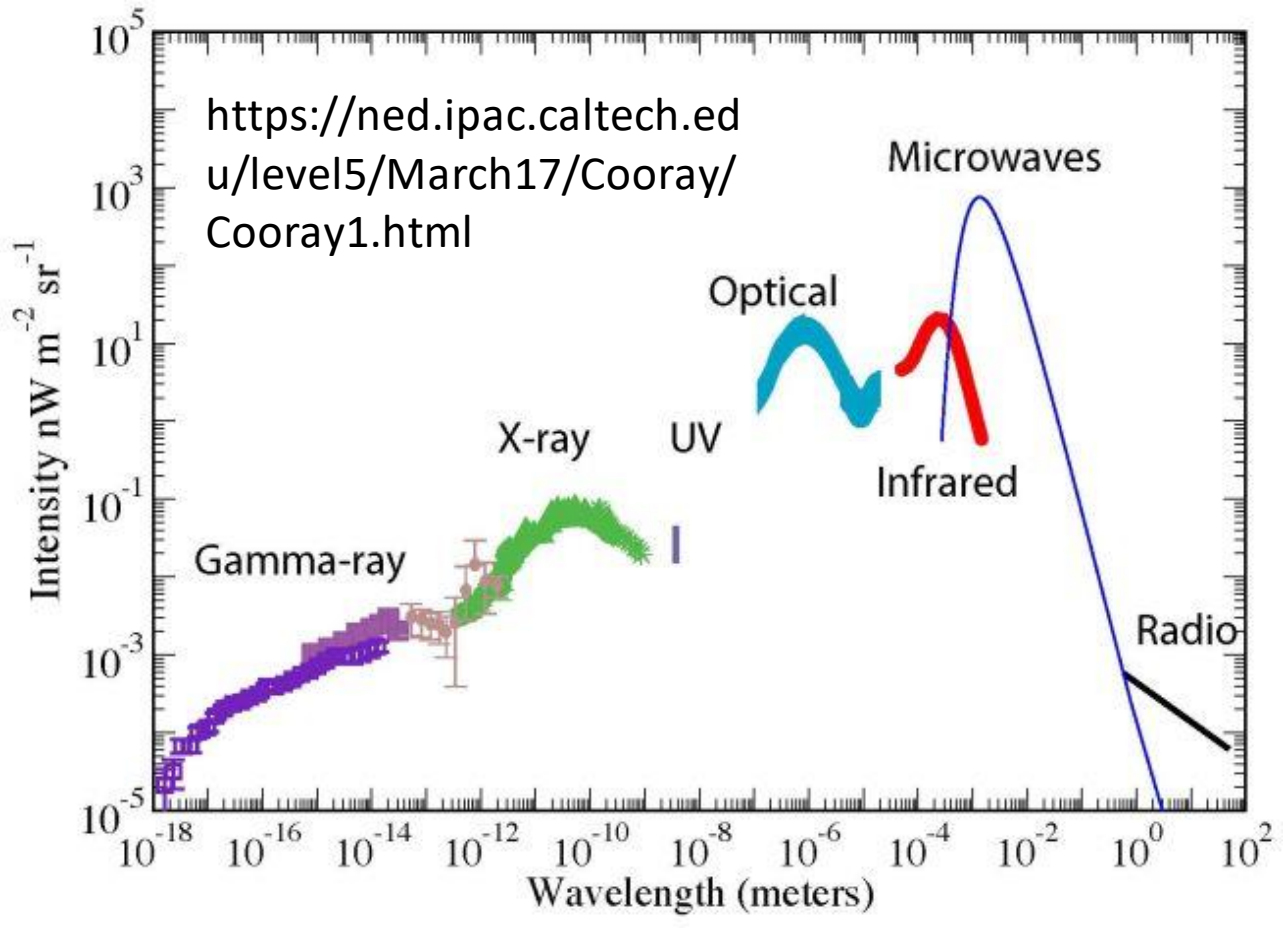

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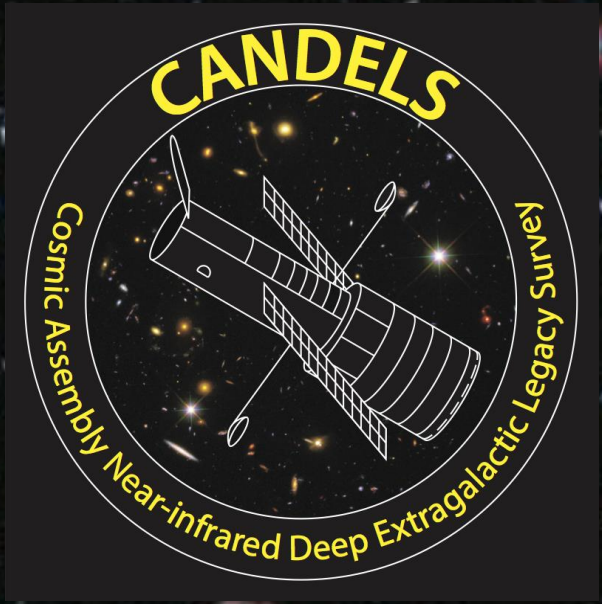

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2. CANDELS survey and Rainbow Navigator

CANDELS
Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey

Rainbow Navigator

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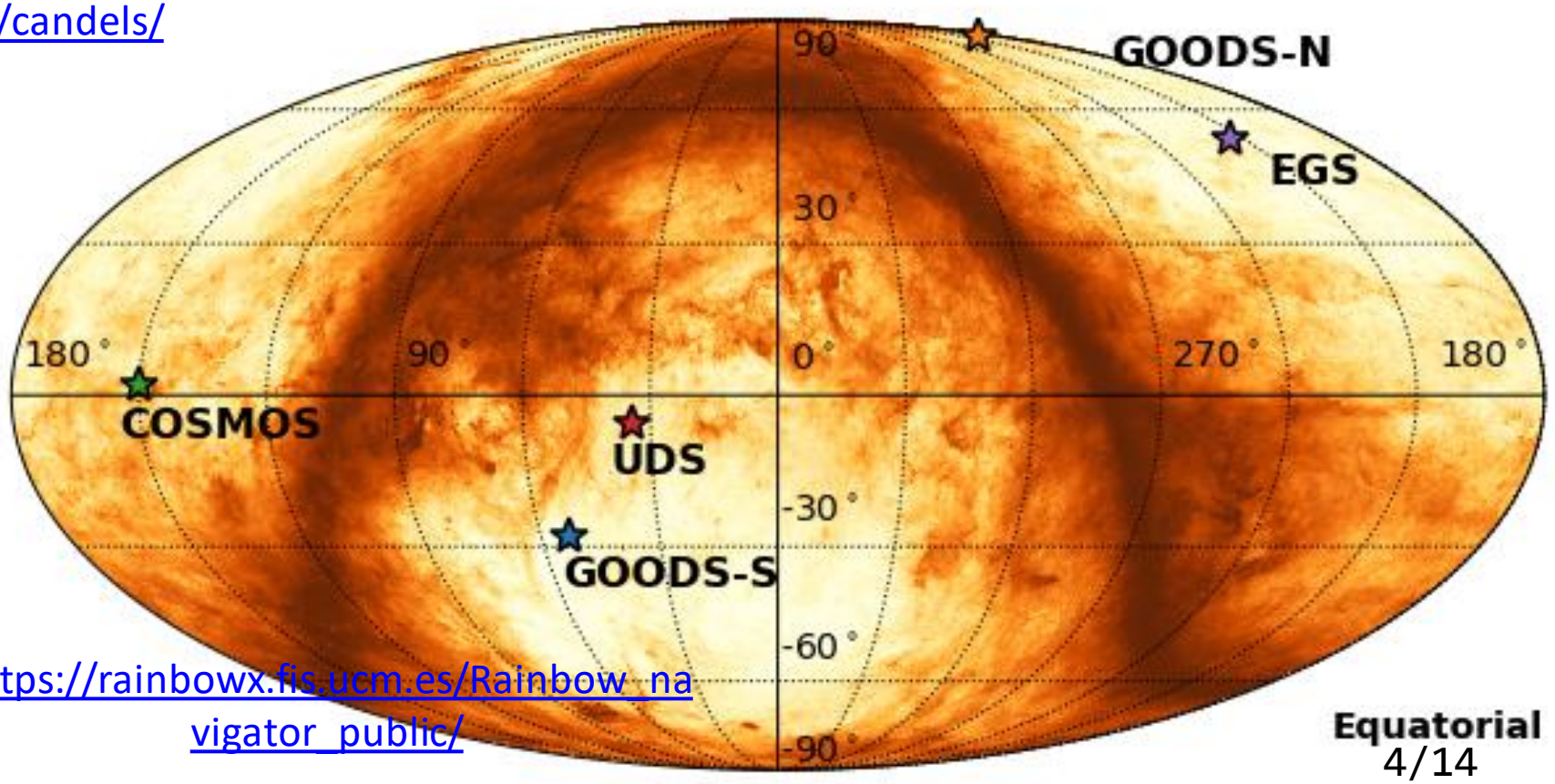
The 5-CANDELS Fields

http://arcoiris.ucolick.org/candels/



https://rainbowx.fis.ucm.es/Rainbow_navigator_public/

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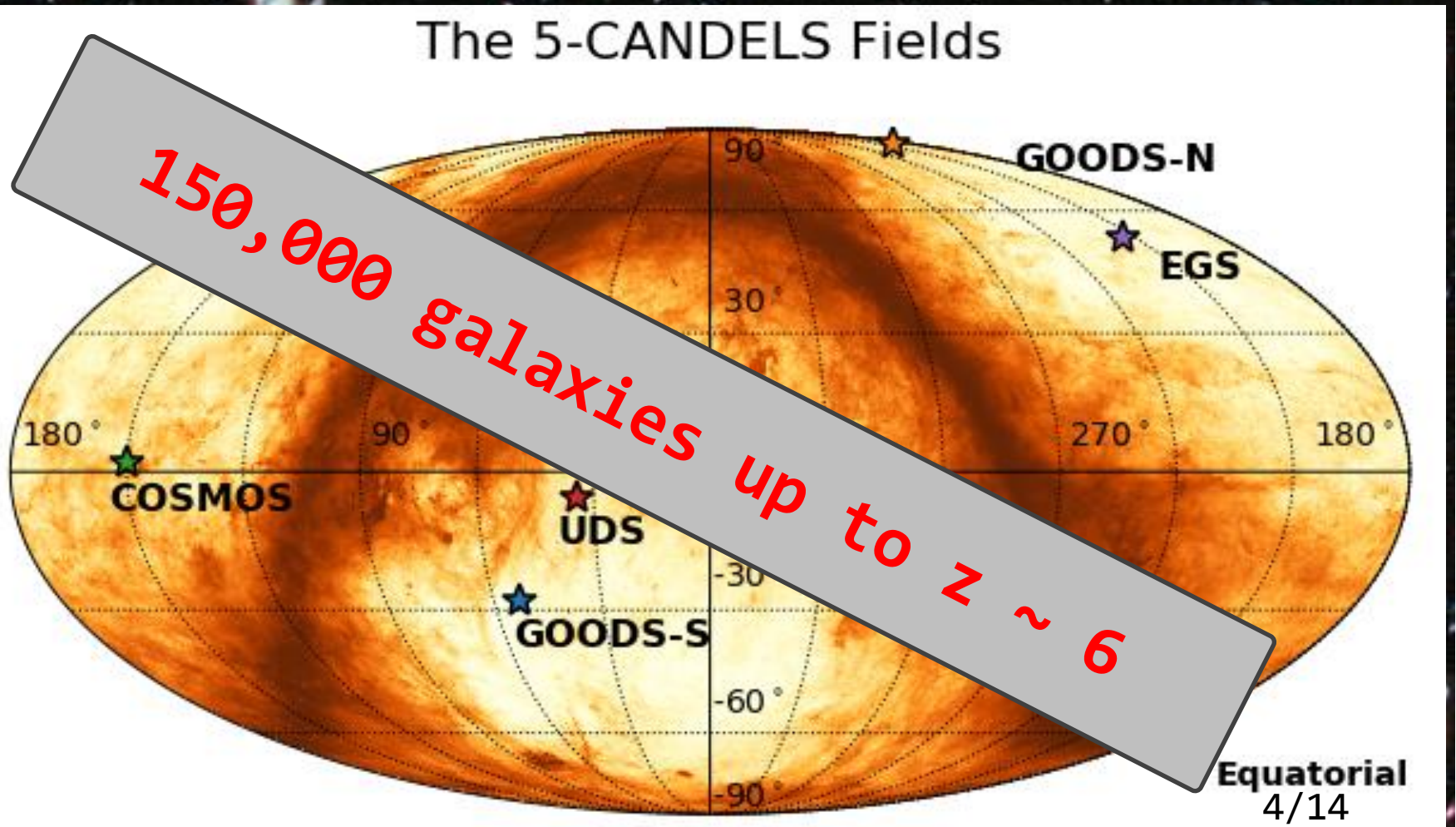

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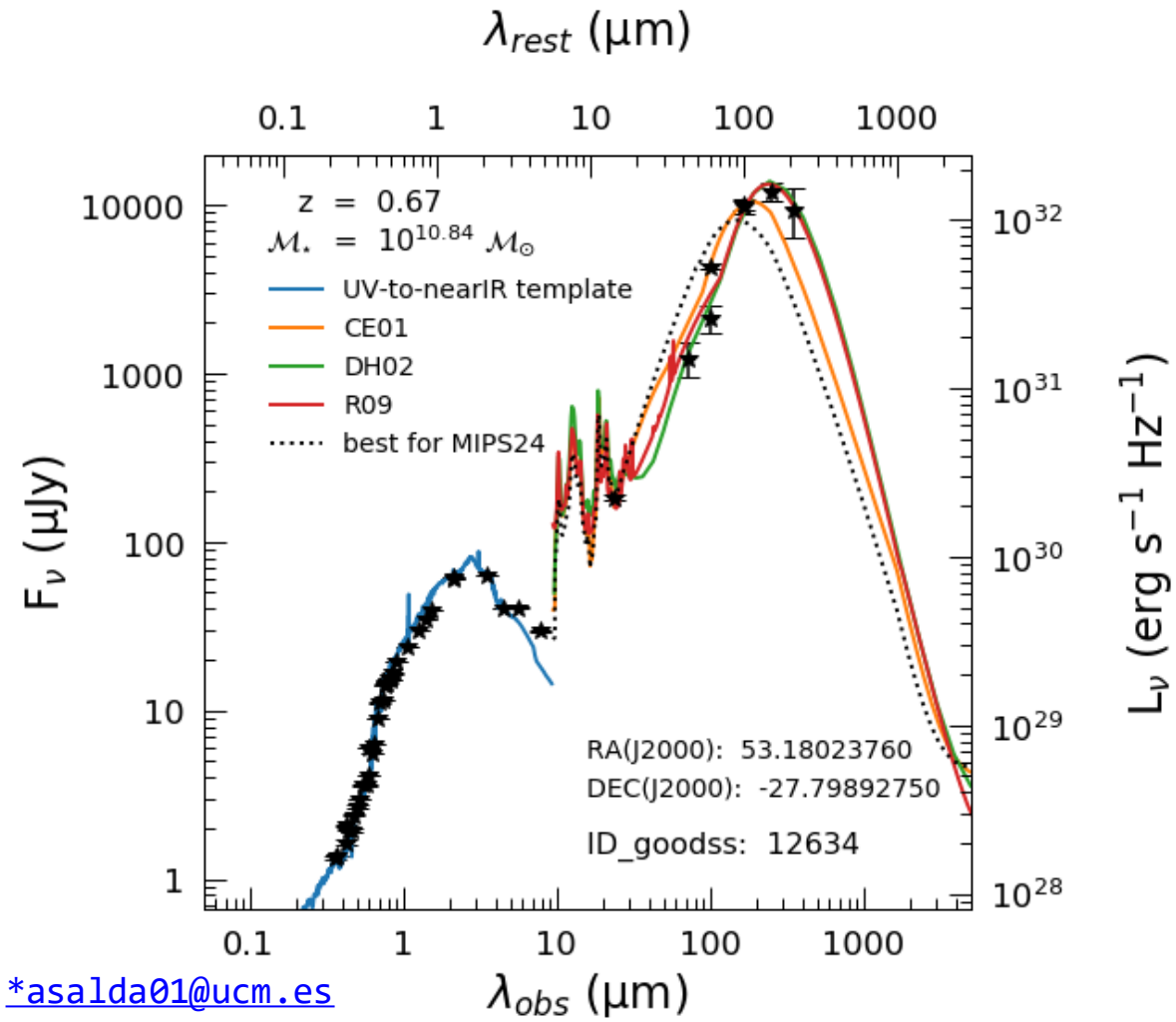
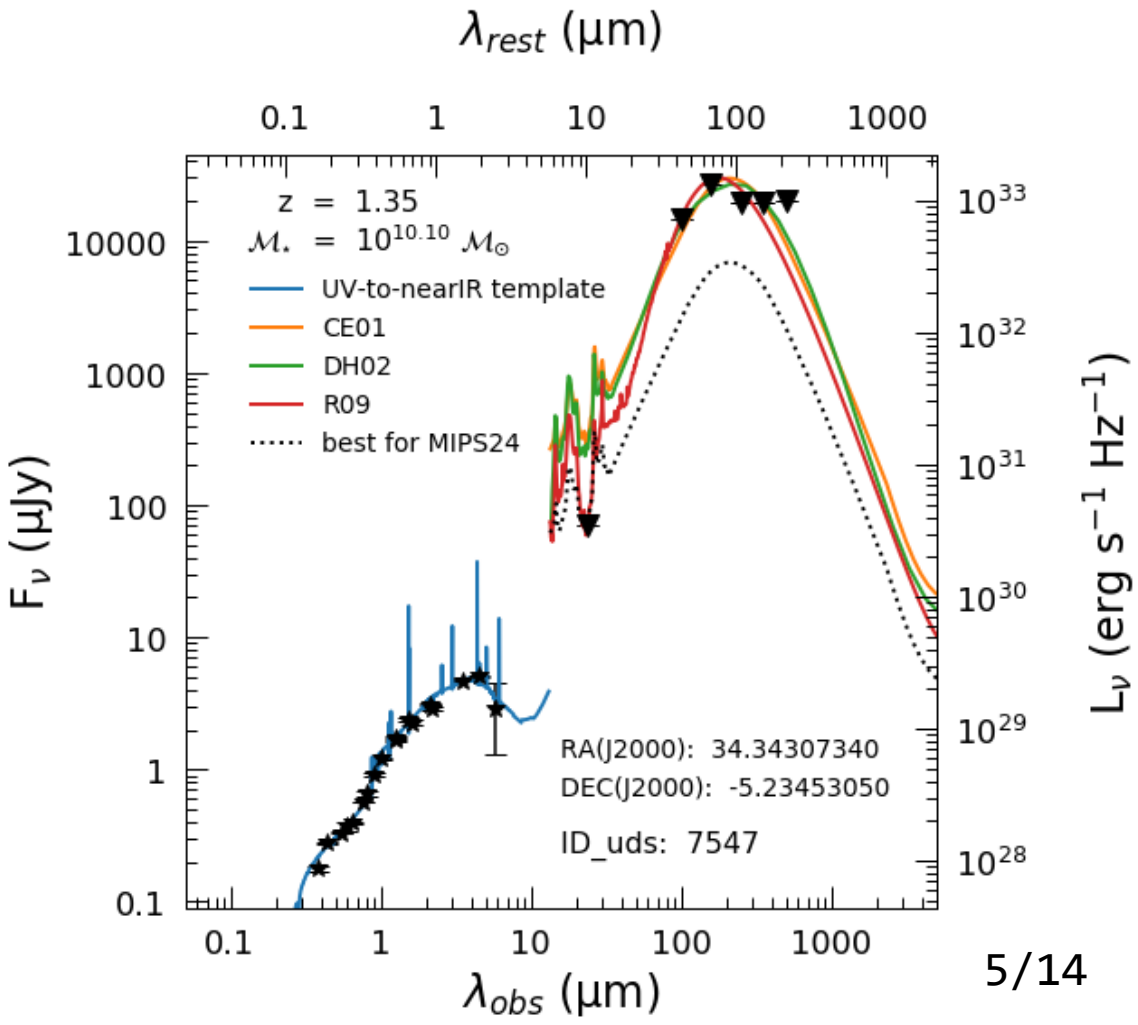
3. Galaxy-SEDs and L(TIR) estimation





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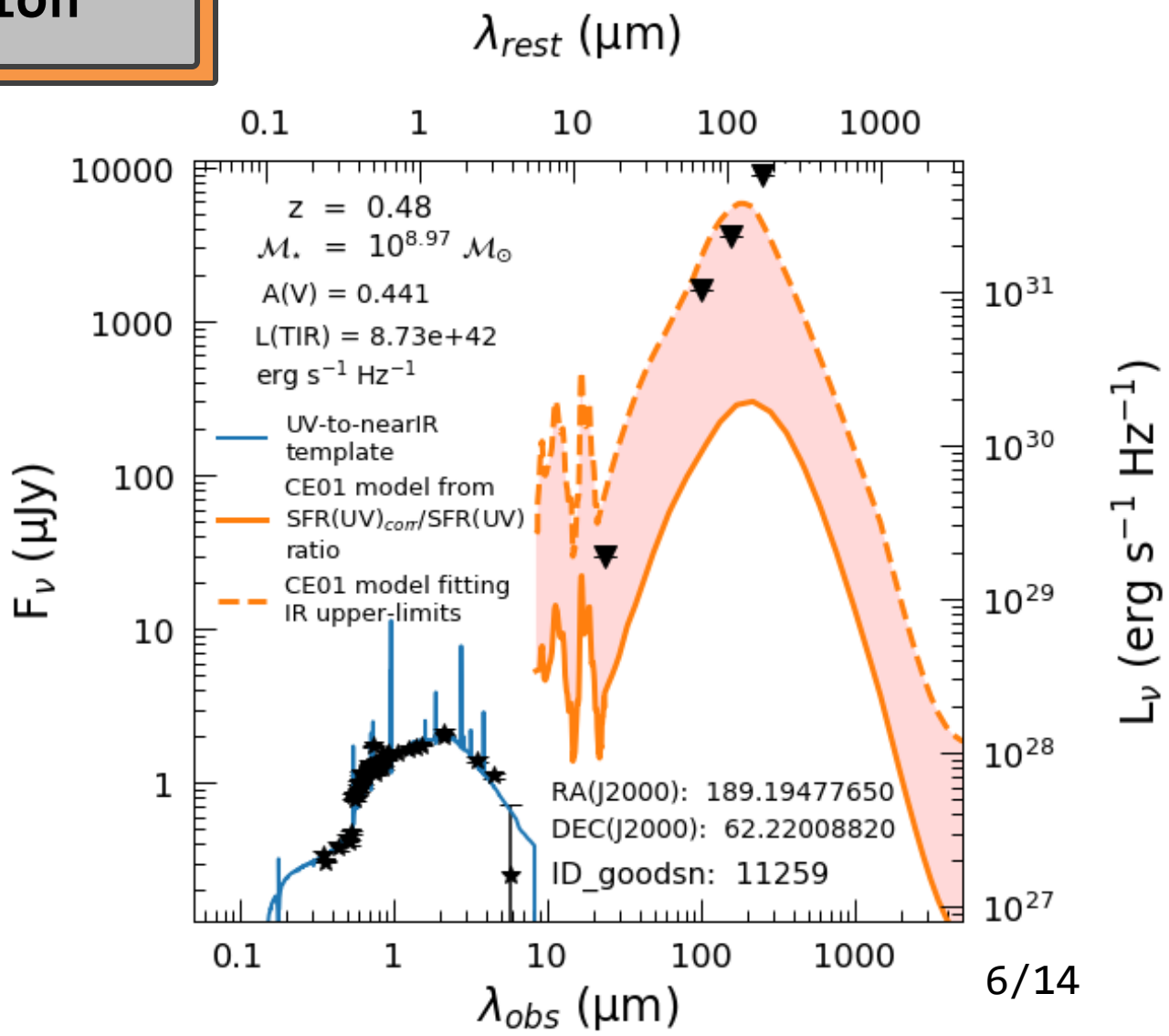
3. Galaxy-SEDs and L(TIR) estimation

$$\Delta\mathrm{SFR}(2800) = \mathrm{SFR}(2800)_{\mathrm{corr}} - \mathrm{SFR}(2800)_{\mathrm{obs}}$$

$$\mathrm{L(TIR)}_{\mathrm{own}}(\mathrm{erg/s}) = 3.36 \times 10^{43} \Delta\mathrm{SFR}(2800)$$



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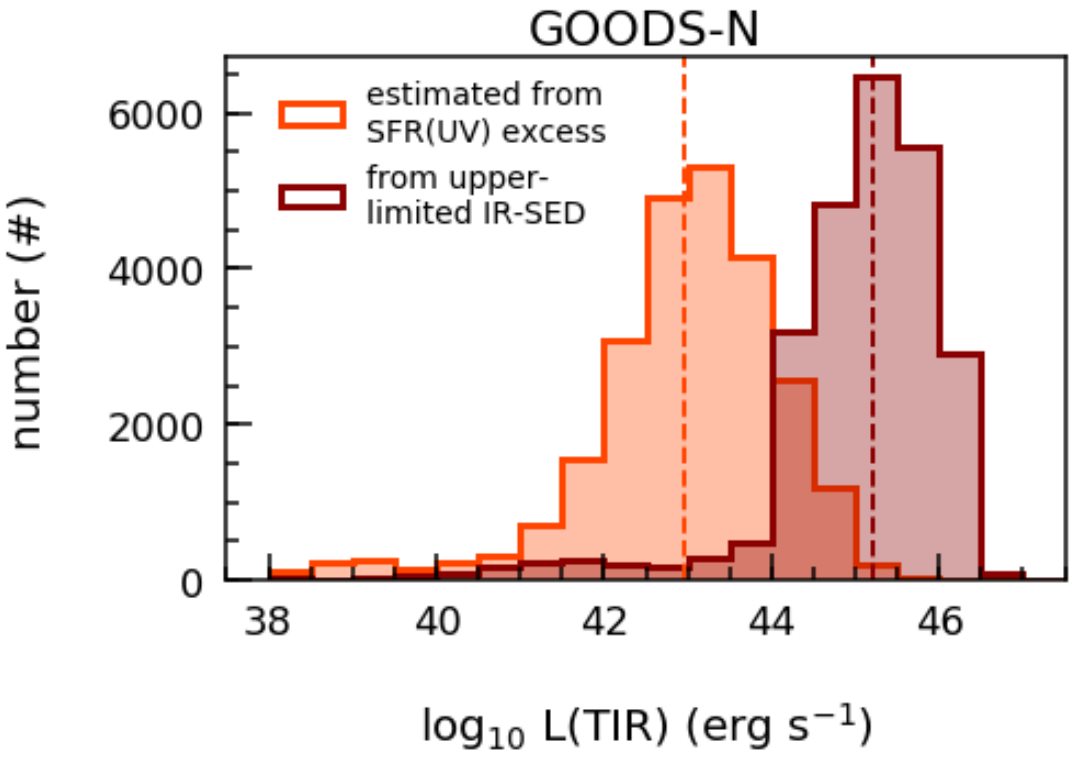

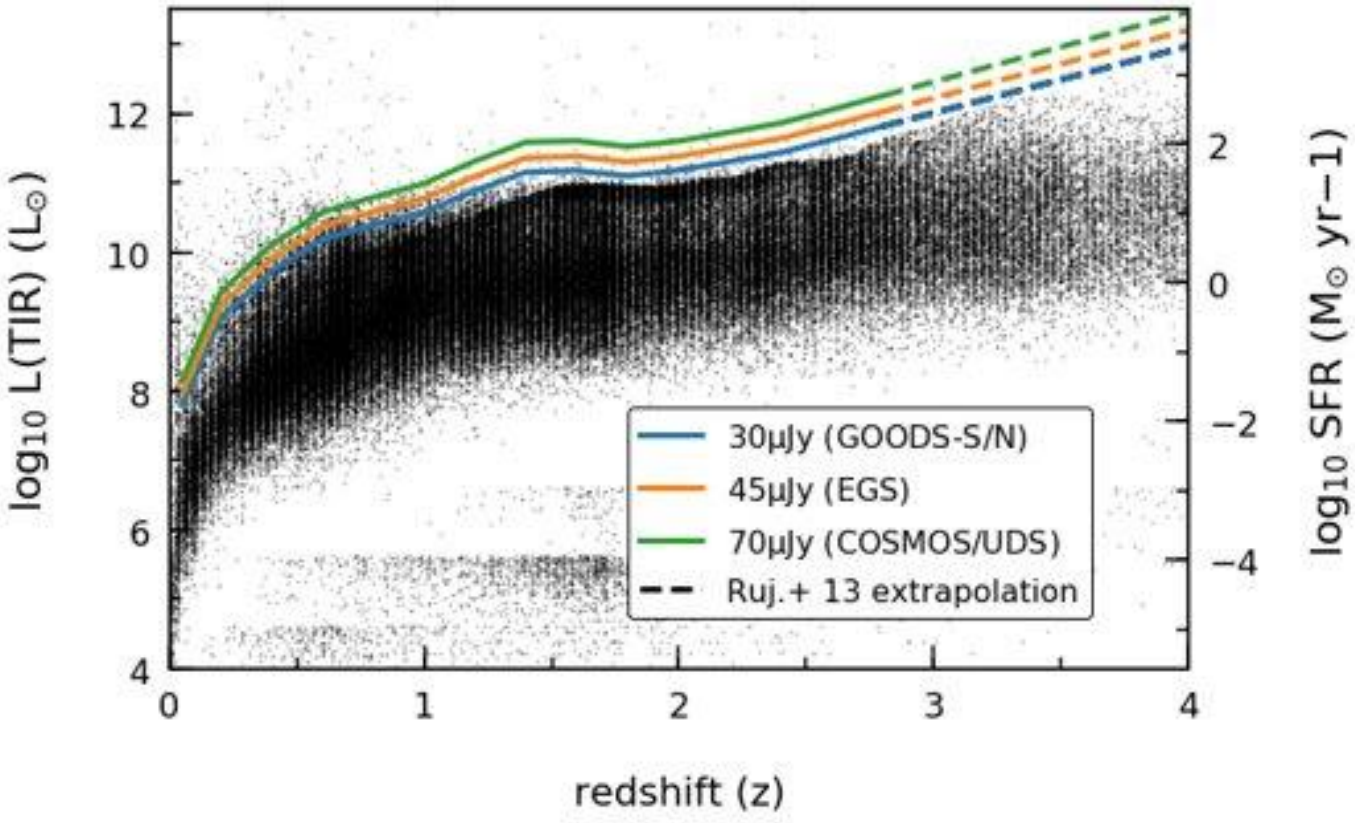

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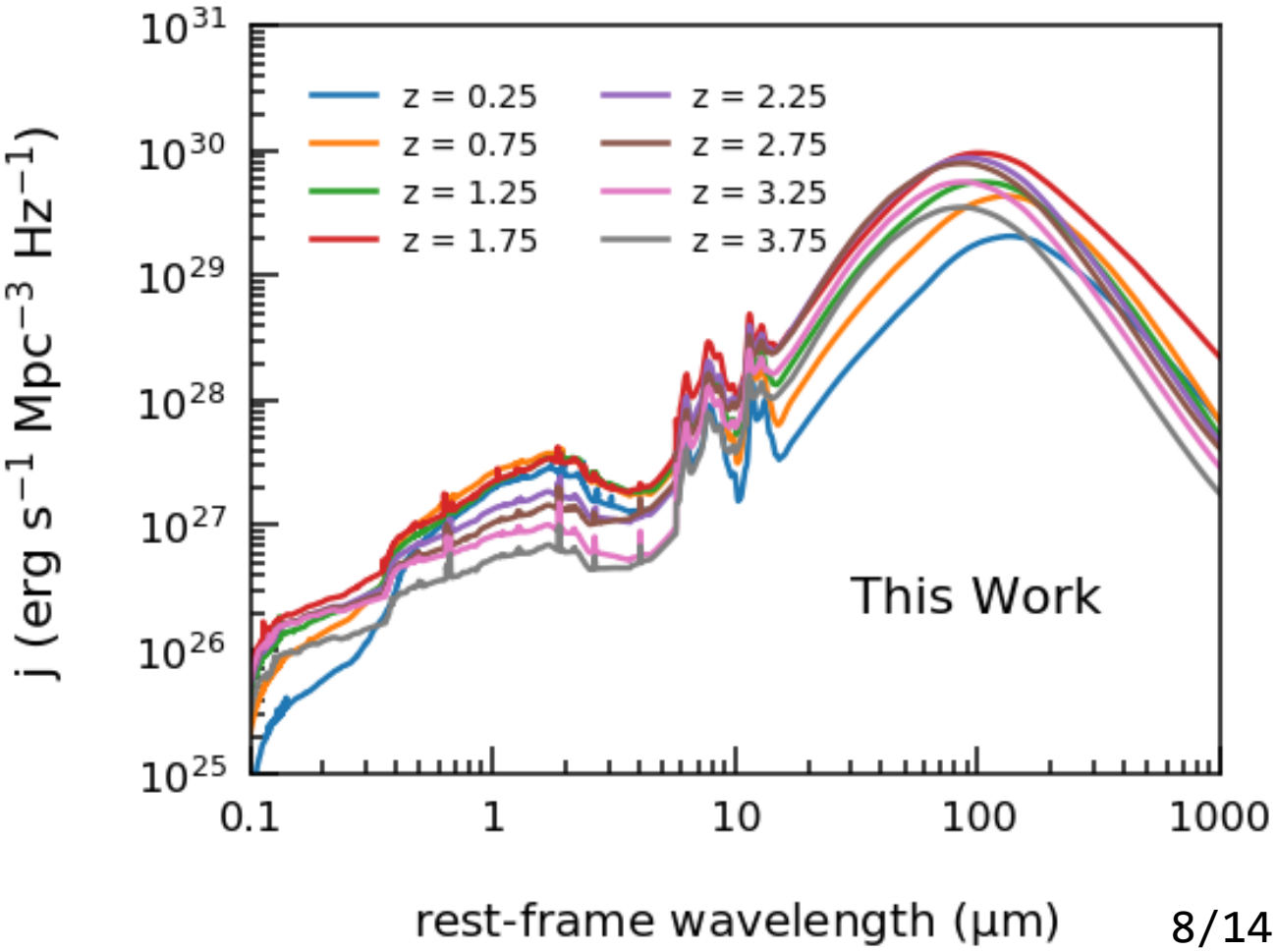
4. Evolving luminosity density

'Universe's optical-to-farIR energetic output'

$$j(\lambda, z_i) = \frac{\left(\sum_{j=1}^{n} \mathrm{SED}(\lambda)_j\right)}{\mathrm{V_c}(z_i) \cdot \mathrm{A}_\Omega}$$

comoving survey volume



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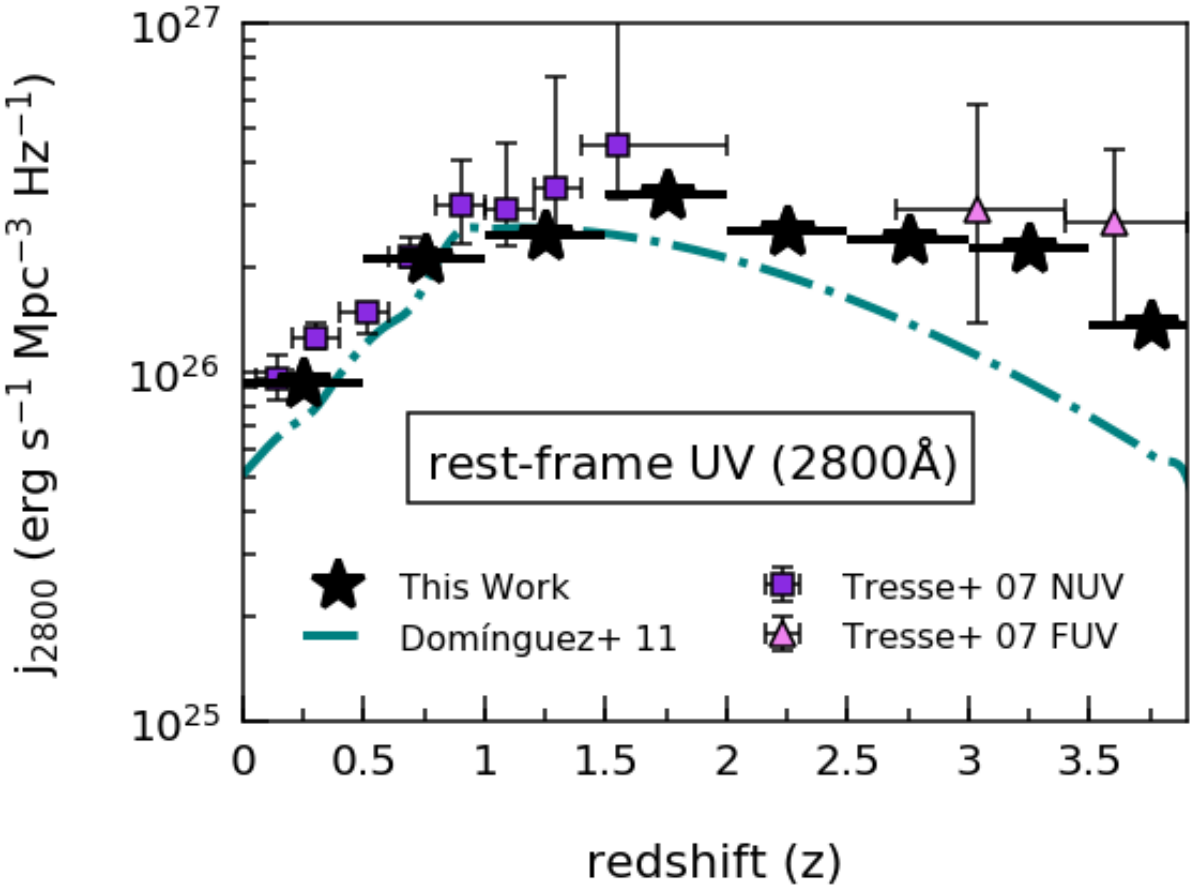

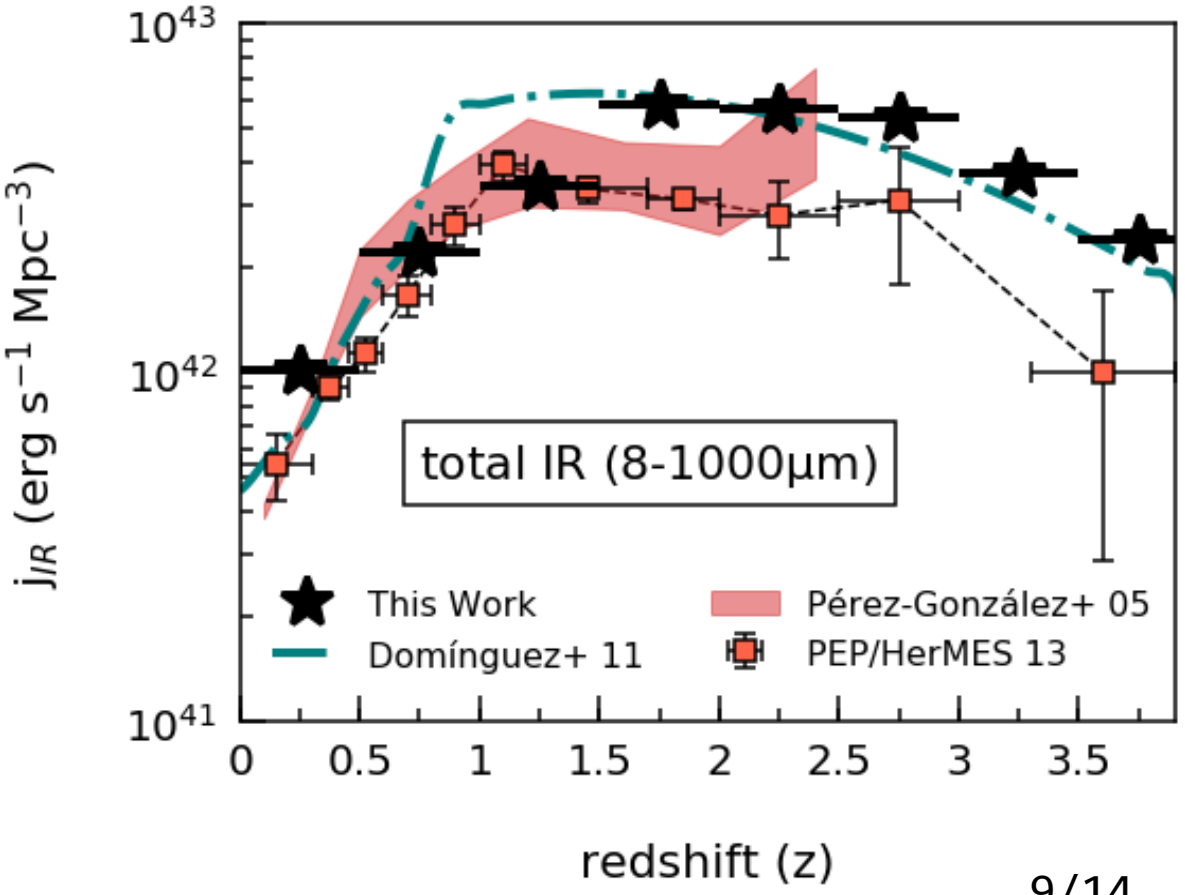

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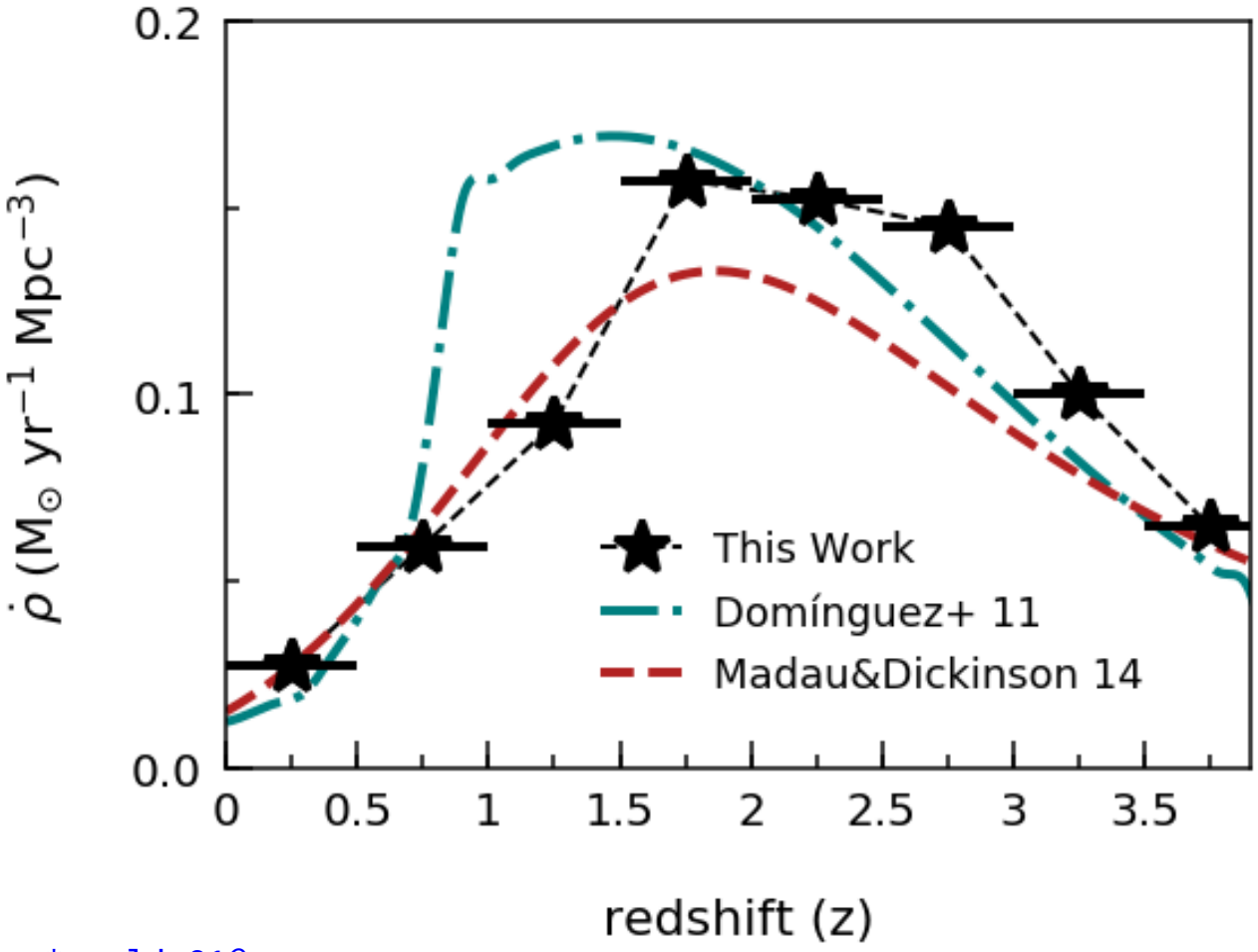
5. Cosmic Star Formation History (CSFH)



$$\dot{\rho} = 1.08 \cdot 10^{-10}(3.3 \cdot j_{2800} + j_{\rm IR})/{\rm L}_\odot$$

$$\rm M_\odot\ yr^{-1}\ Mpc^{-3}$$

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6. Evolving EBL-SED

$$\lambda I_\lambda(\lambda, z_i) = \frac{c^2}{4\pi\lambda} \int_{z_i}^{z_{max}} j\left(\lambda(1+z_i)/(1+z'), z'\right) \left|\frac{dt}{dz'}\right| dz'$$

redshifted luminosity density integration

$$\left|\frac{dt}{dz'}\right| = \frac{1}{H_0(1+z')\sqrt{\Omega_\Lambda + \Omega_M(1+z')^3}}$$

cosmologial term

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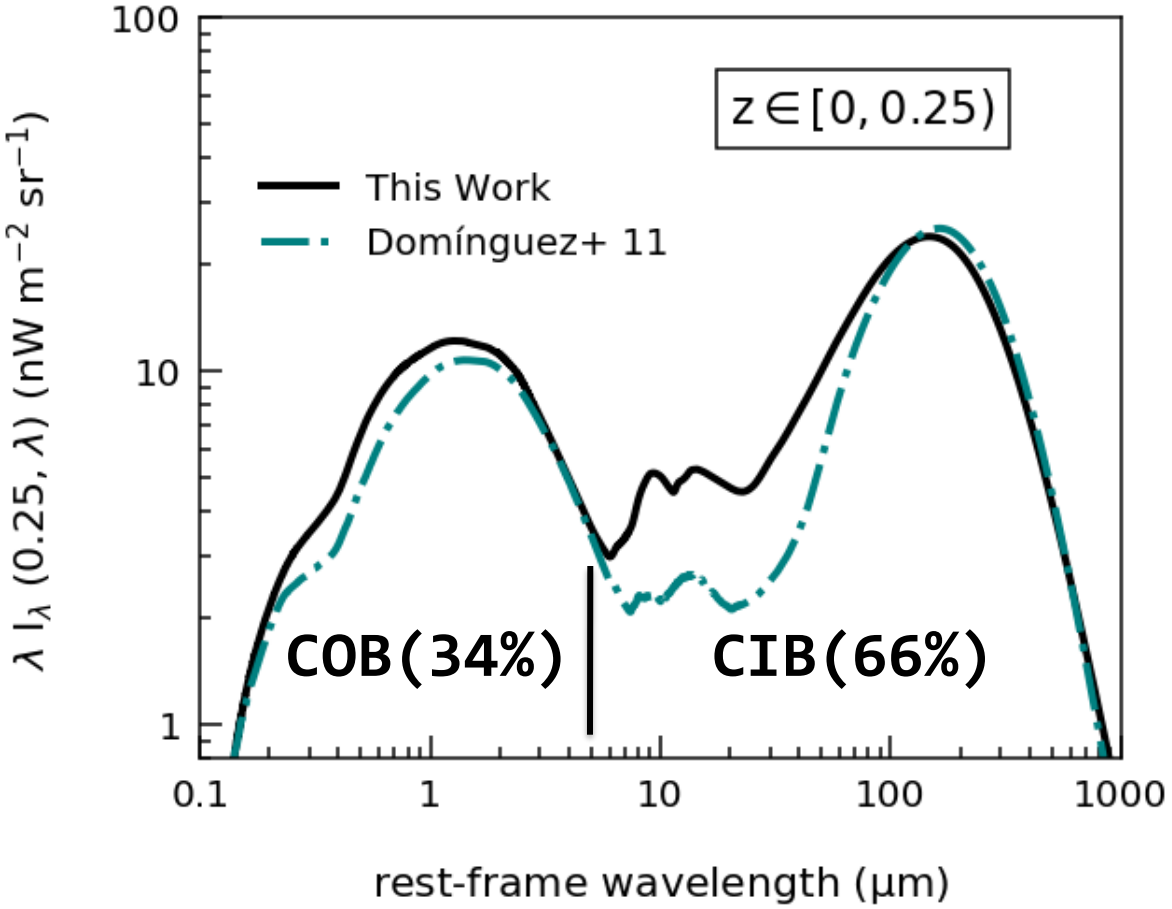
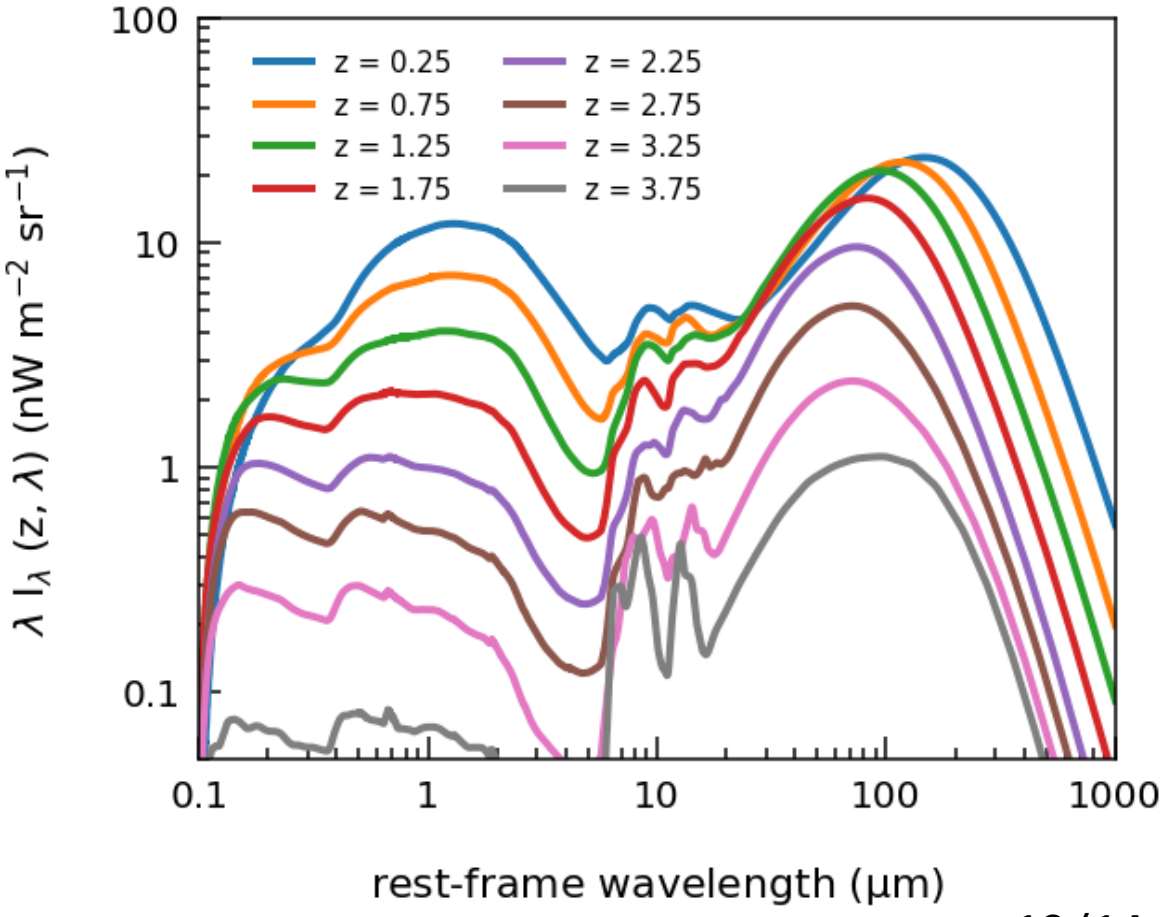
6. Evolving EBL-SED



...in a comoving reference frame...



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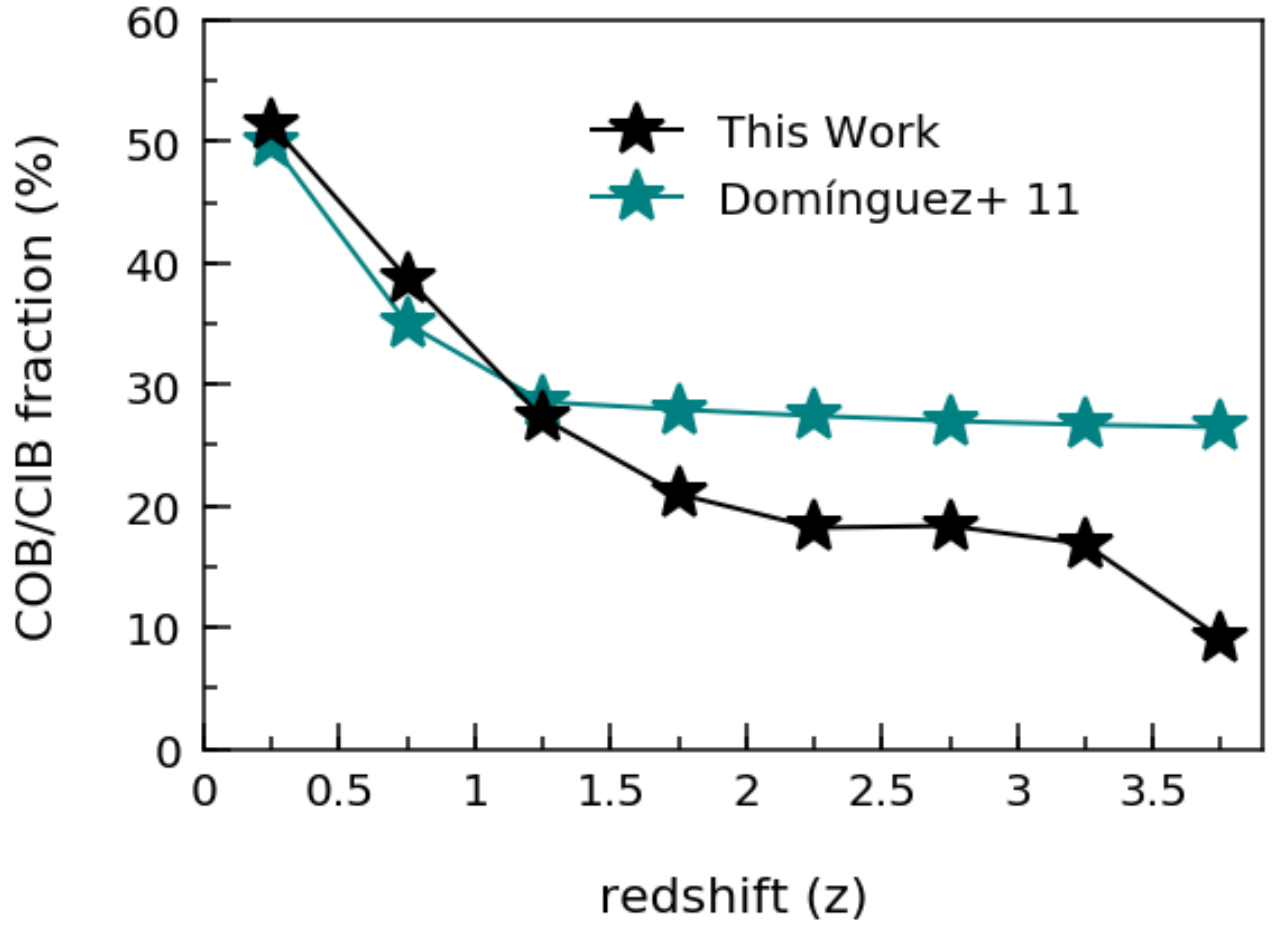
7. Cosmic Optical and IR Backgrounds (COB/CIB)



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References

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- Barro et al. (2019), ApJ Supplement Series, 243(2): 22

Thank you for your attention

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