# Correlated Anisotropies in the Cosmic Infrared Background: A New Insight into Structure Evolution and a Challenge for Components Separation Techniques

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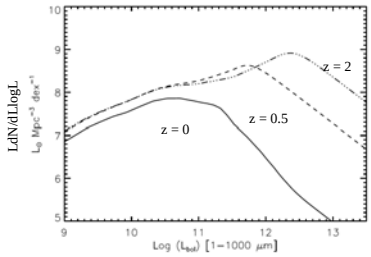
## Infrared Galaxies

- Contribute to 6% of the energy budget of the local universe
- BUT at z = 1 they account for 70% of the star formation
- High dust content and star formation rates.
- Their spectra are shifted toward the far-infrared (99% of their energy) because of the reemmission of stellar light by dust
- Grow more luminous with increasing redshift than optical ones (see figure on the right).

=> these galaxies have an important role in galaxies evolution




Energy emission of galaxies at different redshifts. The more the redshift increases, the more energy is released and the more the energy output is dominated by luminous objects.
From Lagache et al (2004).

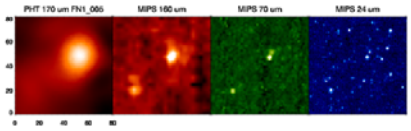



Illustration of the confusion: Same region of the sky observed at different wavelenghths. From right to left: the angular resolution degrades.
From Lagache et al (2005) .

## BUT far-infrared observations are limited by confusion

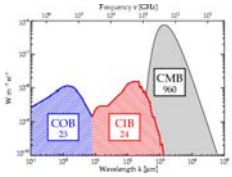
- Loss of high frequency spatial scales due to poor angular resolution
- We can't derive the angular correlation function

=> Use of the anisotropies of the Cosmic infrared background (CIB)

## Correlated anisotropies

- Measure the linear clustering bias at large angular scale
- Measure the nonlinear clustering within a dark matter halo at small angular scales

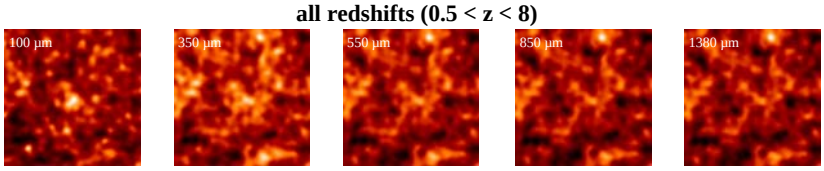
=> they probe dark matter halo mass scale and the physics governing the formation of infrared galaxies within a halo




Extragalactic backgrounds: Optic (COB), Infrared, (CIB), Microwave (CMB)
From Dole et al (2006).

**Need of maps of CIB anisotropies per redshits slices to constrain the clustering evolution => Components separation methods**

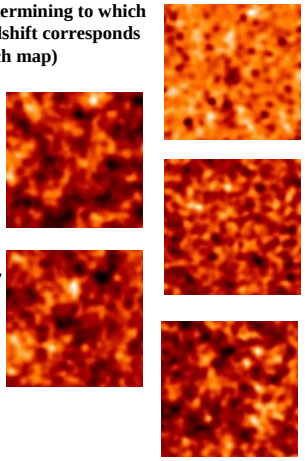
**Maps at different wavelengths (IRIS[1] and Planck): contribution of IR galaxies at all redshifts (0.5 < z < 8)**




Simulations of Planck maps of the Cosmic Infrared Background from Fernandez-Conde et al. (2008)

A beginning of answer with a components separation code => SMICA[2]

**Maps of the CIB per slices of redshifts computed by SMICA (one of the issue is determining to which redshift corresponds each map)**



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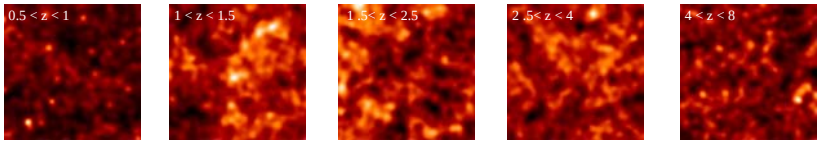
Another component separation method needs to be found

**Maps per redshifts slices**




After getting these maps we can compute their power spectra and derive the clustering properties of IR galaxies.

[1] Delabrouille J., Cardoso J.F., Patanchon G. 2002
[2] Mivilles-Deschênes M.A, Lagache G. 2005