

# Project 2:

## Deriving dust mass and temperature in distant star-forming galaxies with DustEM




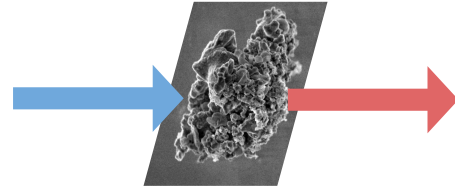
Supervisors: Nathalie YSARD, Karine DEMYK,  
Jean-Philippe BERNARD & Longji BING

Participants: Ana Carolina Posses, Antonio Pensabene,  
Marjorie Decleir, Fernanda Roman de Oliveira &  
Evangelos Paspaliaris



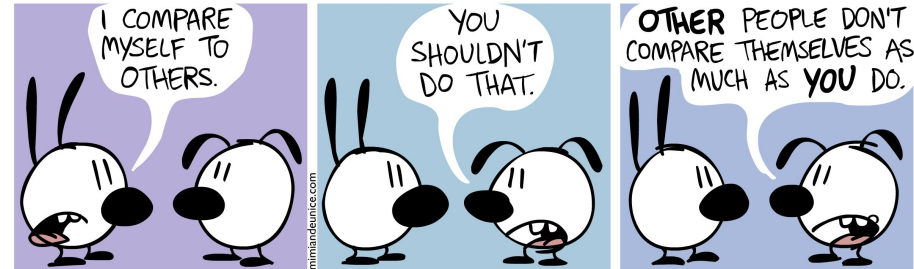
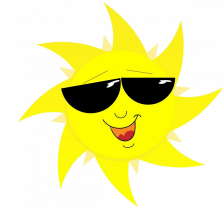
# DustEm

- Numerical tool to compute **interstellar dust grain**
  - Extinction
  - Emission
  - Polarisation
- Fortran 95 
- Developed by
  - Institut d'Astrophysique Spatiale (IAS)
  - Institut de Recherche en Astrophysique et Planétologie (IRAP)
- Designed to easily change and mix **dust properties**
- Originally for dust grain model of Compiègne et al. (2011)
- Now also other dust grain models
- Public: <https://www.ias.u-psud.fr/DUSTEM/>

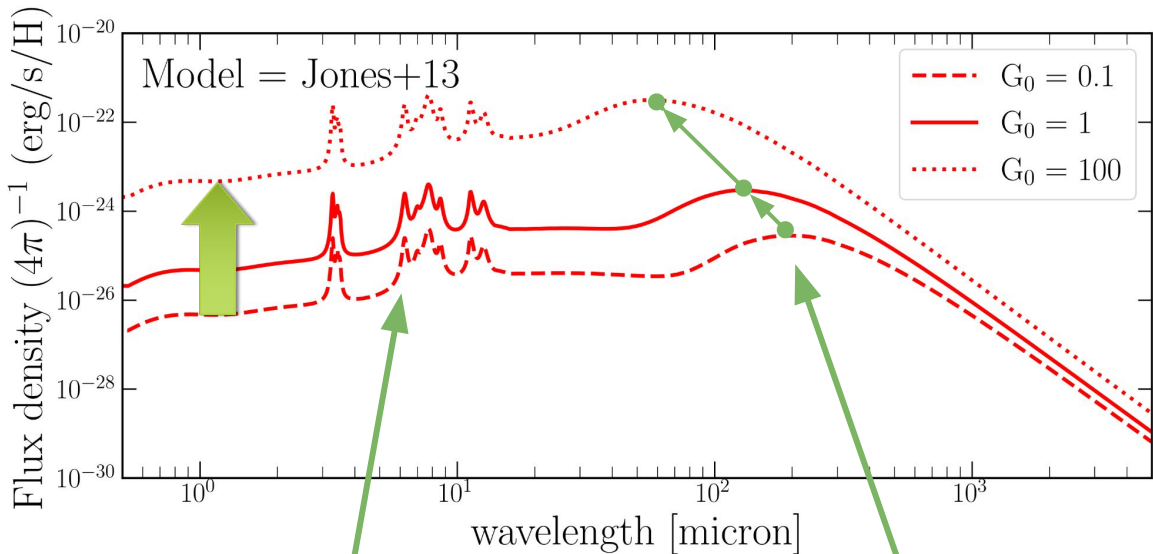
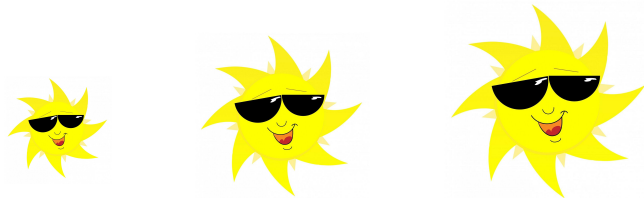


# Goals

- Test influence of parameters on the dust SED and extinction curve:
  - Intensity of ISRF ( $G_0$ )
  - Color of ISRF (temperature)
  - Dust grain size distribution
  
- Compare different dust grain models
  - Compiègne et al. 2011
  - THEMIS (Jones et al. 2013, Koehler et al. 2014, Ysard et al. 2015)
  - Draine & Li 2007



# Results I



Increase ISRF intensity:  
→ dust grains absorb more energy

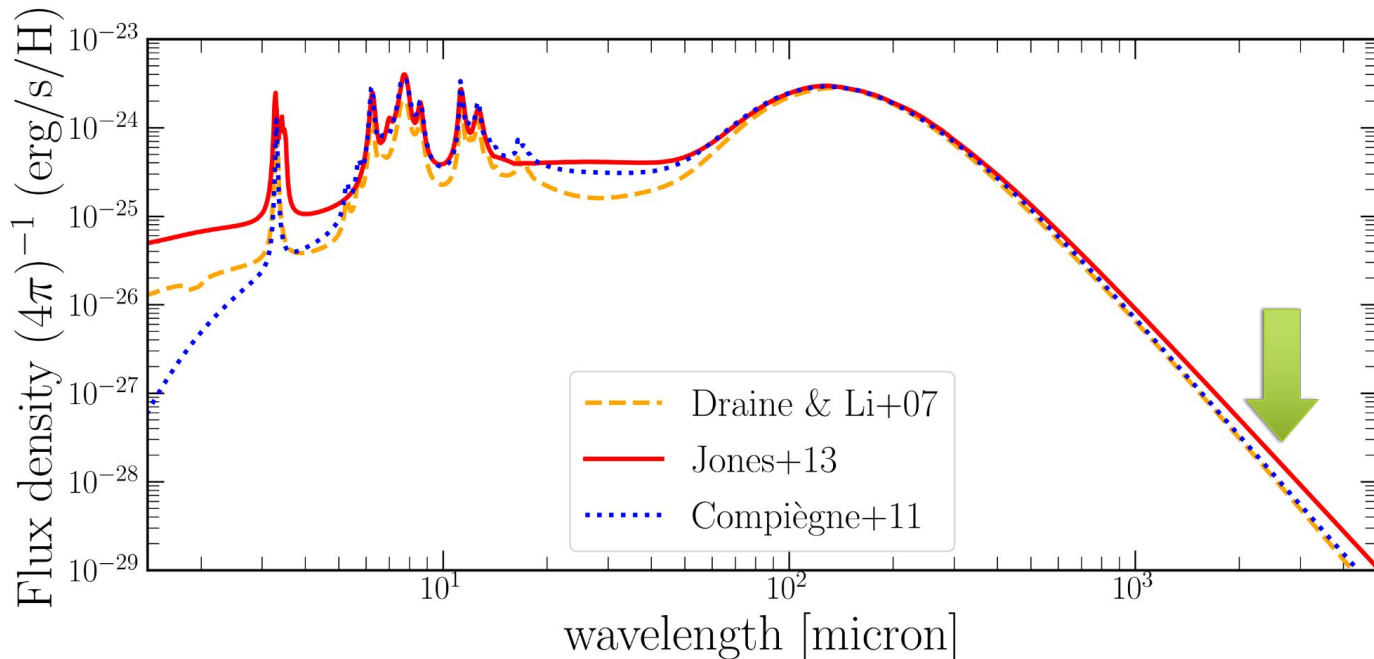


Dust grains emit more energy

Smaller grains  
(~0.4nm, molecules):  
no wavelength shifts

Larger grains  
(~100nm, bulk material):  
emission peak shifts to shorter  
wavelengths

# Results II



Different slopes at long wavelengths



Different dust emissivities



Influences derived dust mass

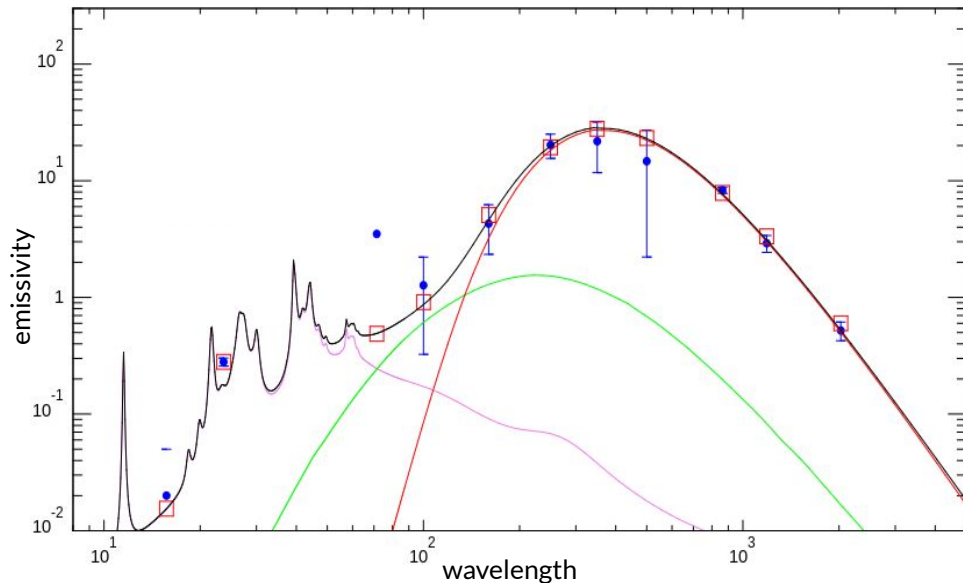
# DustEM Wrapper

- An IDL (Interactive Data Language) or GDL (Gnu Data Language) interface for running DustEM
  - Allows for efficient iterative runs of Dustem
  - Fits data SEDs using a chi2 minimization

Can be used both with photometry and spectroscopy

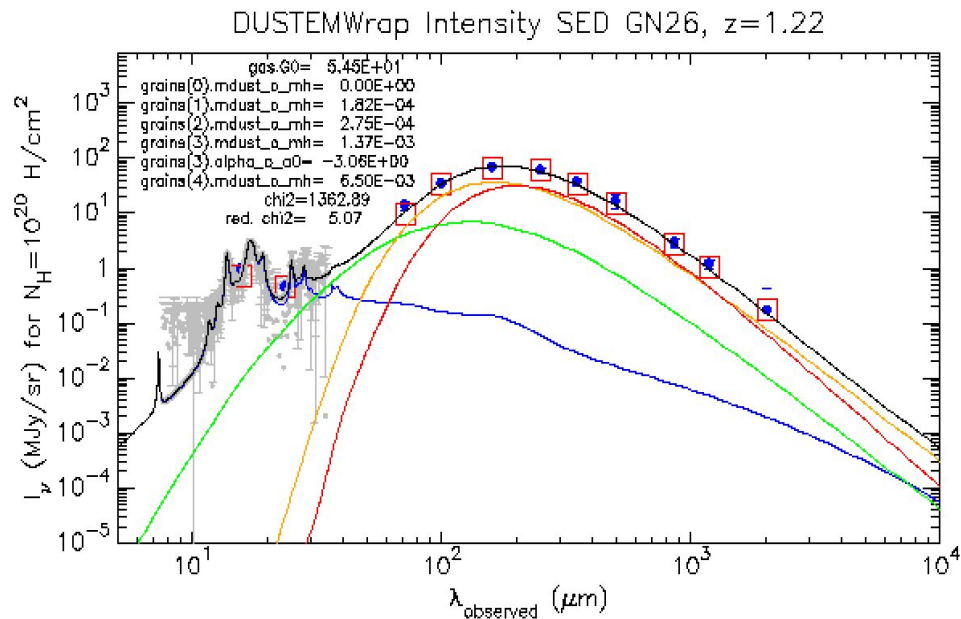
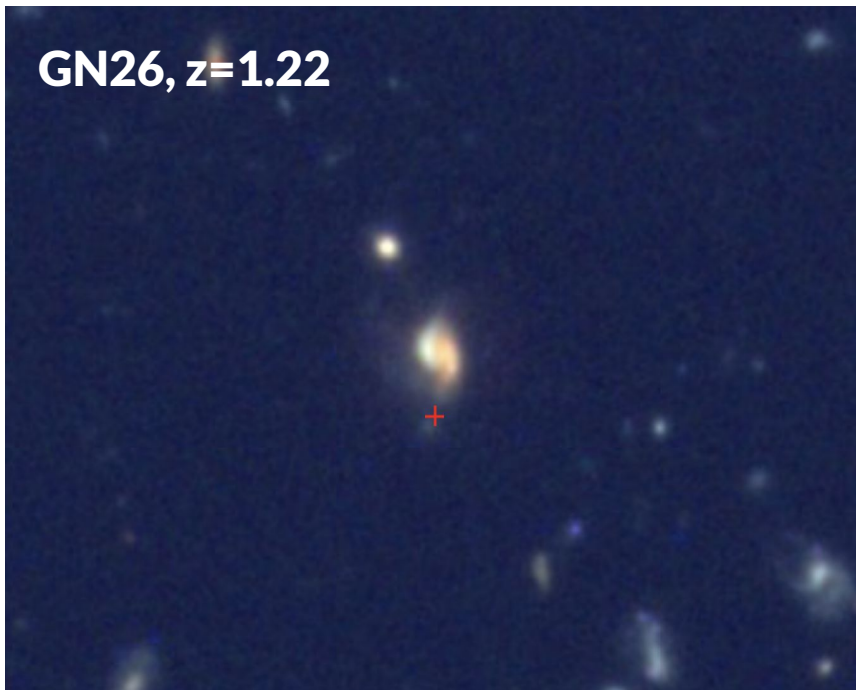
Radiation field is not appropriate for a whole galaxy

Shift of the spectra frequency for high-z fit



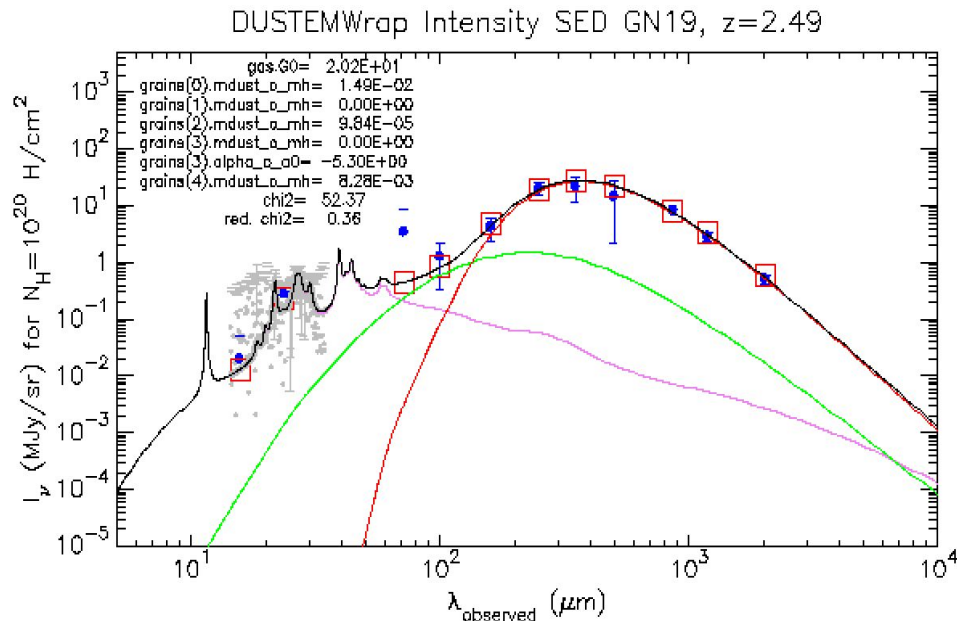
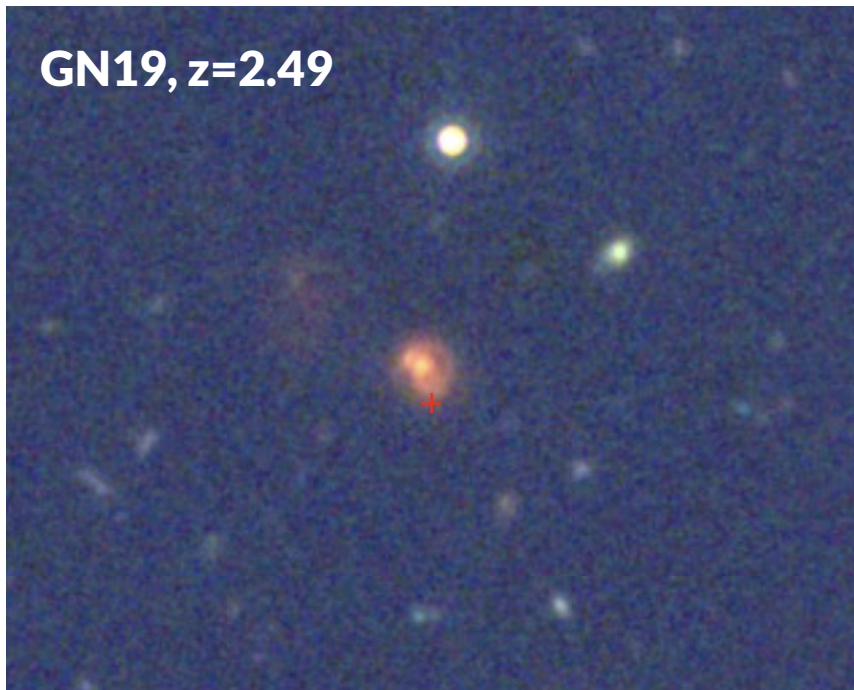
# Results - Fitting high-z galaxies

GN26,  $z=1.22$



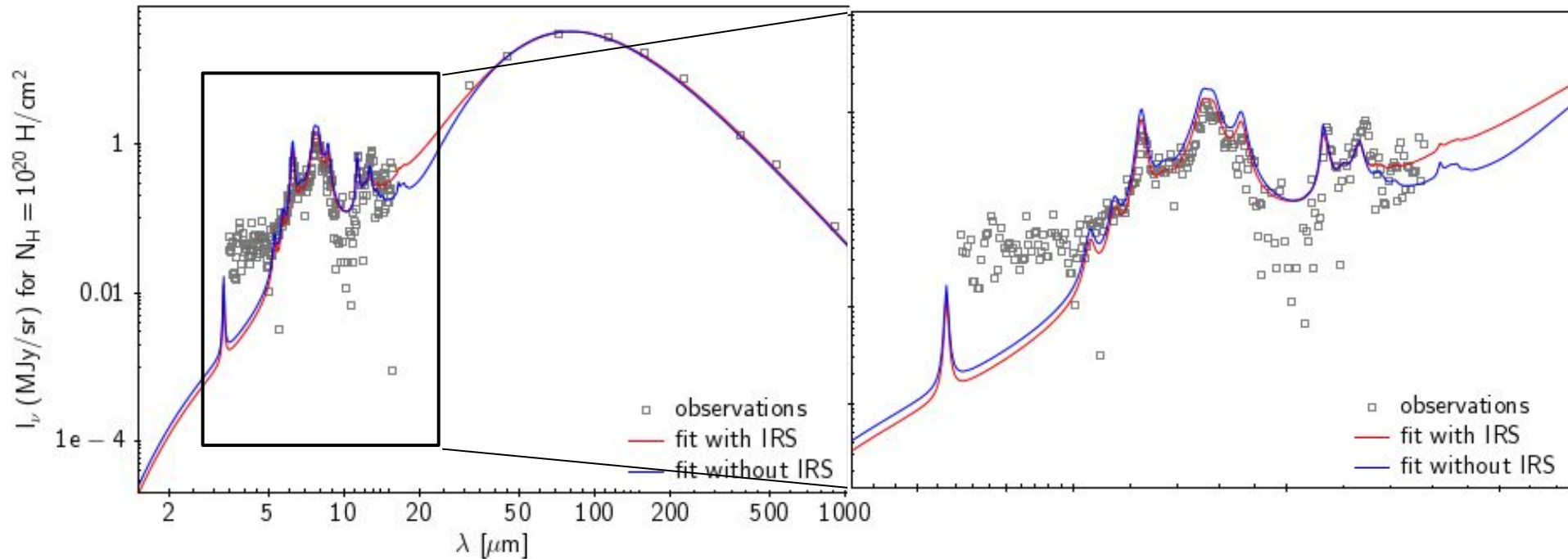
# Results - Fitting high-z galaxies

GN19,  $z=2.49$





# Results - Fit with and without spectra



# Summary

- Several parameters can influence the dust SED
- Different dust models can give different results
- Dustem can fit high-z galaxies with the IDL Wrapper
- Dustem fits the data well even without spectroscopy

**Thank you!**

# CM20 plaw-ed

