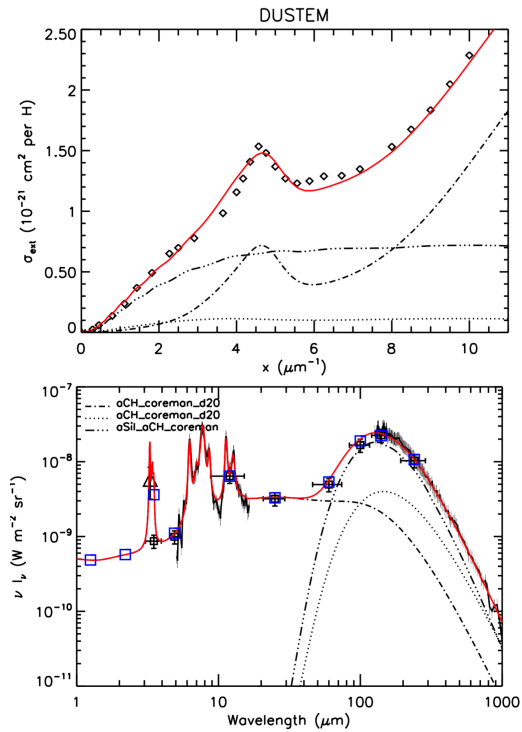
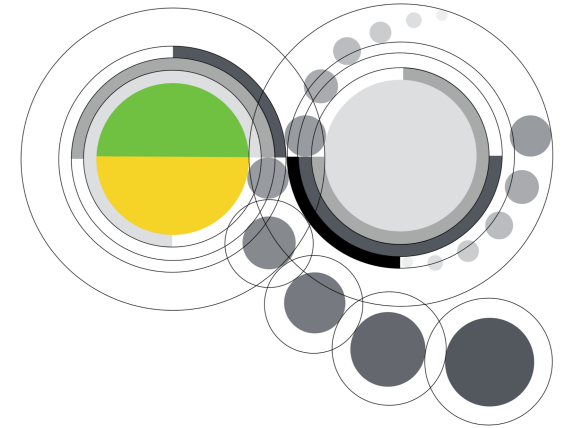


# Dust Modelling

DustEM & THEMIS



Ant Jones, Nathalie Ysard, Melanie Köhler,  
Marco Bocchio, Laurent Verstraete, ...

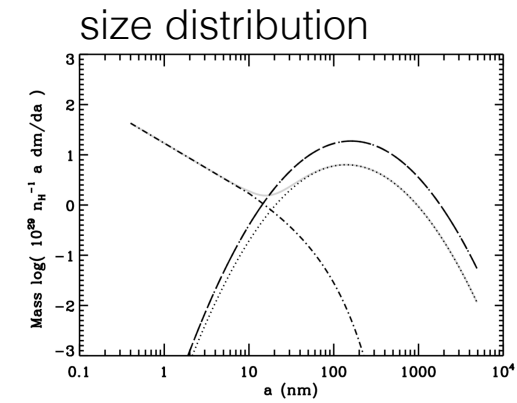
# DustEM

What does it do?

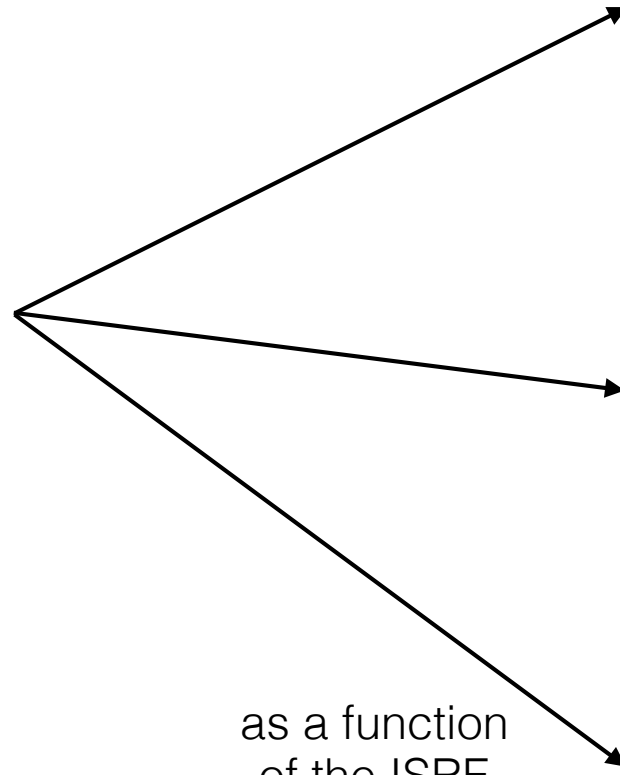
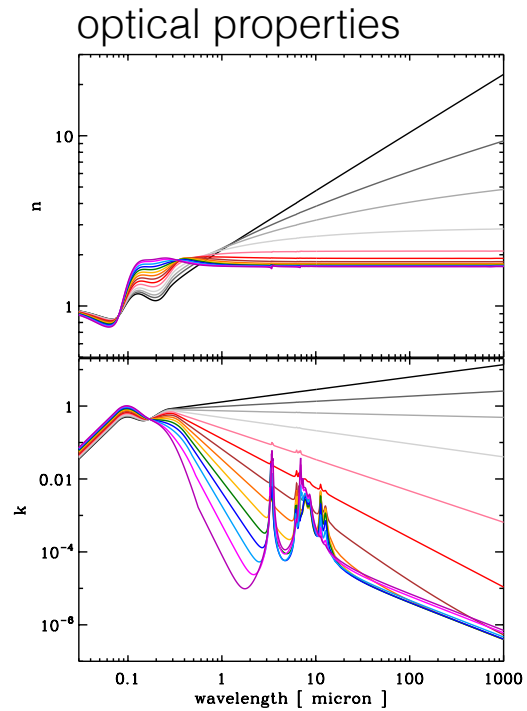
- extinction ( FUV-FIR )
- emission ( IR-cm ) - photon and electron heating  
& nano-particle destruction
- polarisation ( FUV-cm )
- charge distribution -  $Z(a)$
- photo-electron heating
- anomalous microwave emission ( “spinning dust” )

# DustEM

How does it do it?

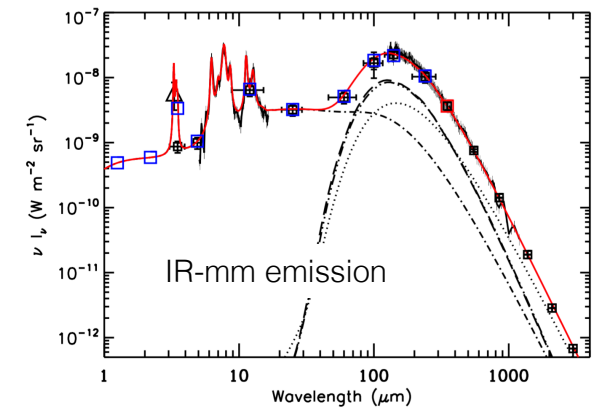
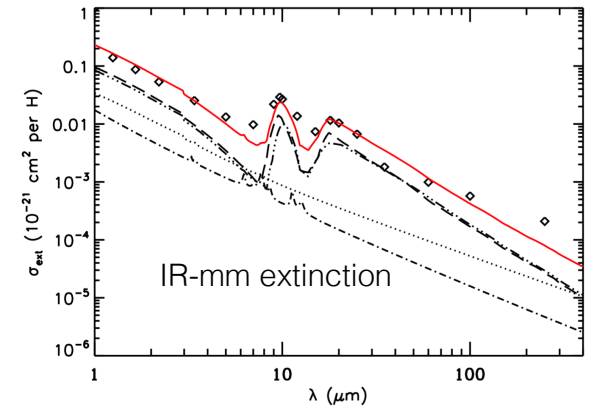
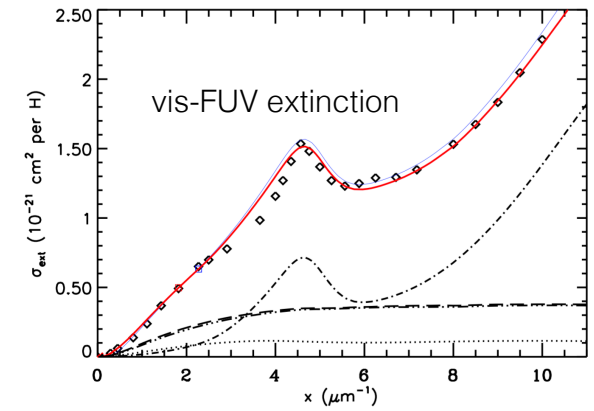


+



as a function  
of the ISRF  
 $G_0$

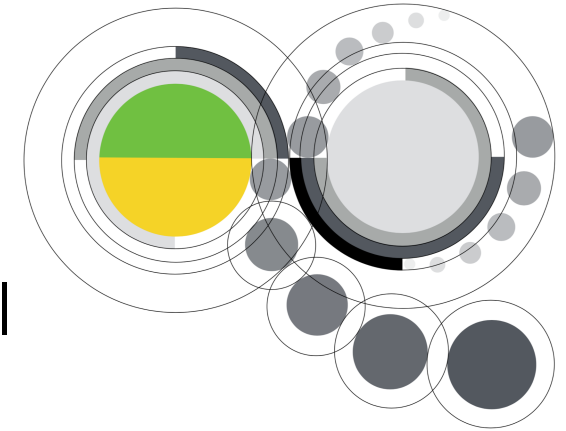
DustEm outputs



# THEMIS

( The Heterogeneous dust Evolution Model for Interstellar Solids )

What is it?

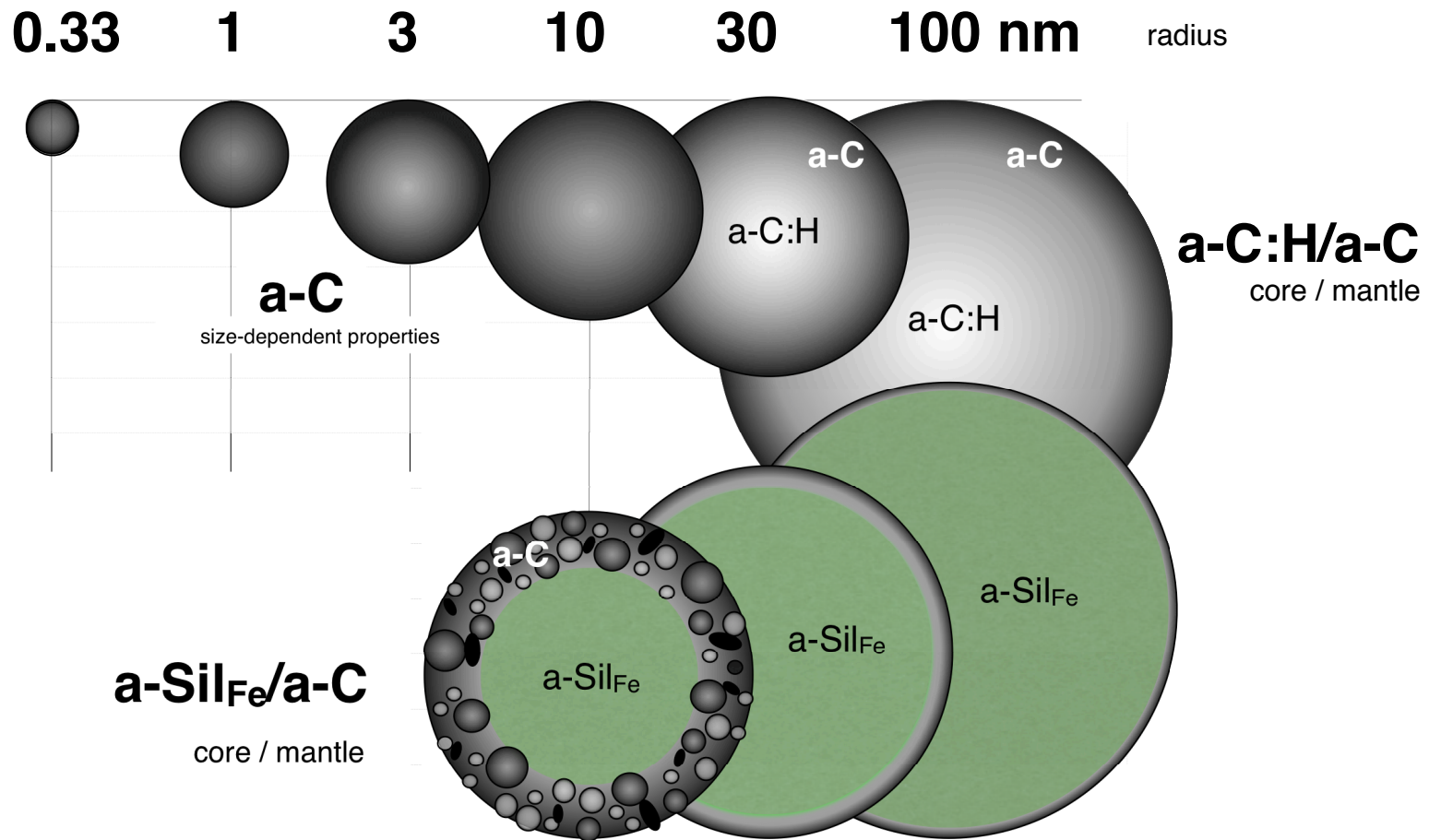


- a new core/mantle (CM) dust model
- mixed solid phases - a-C:H/a-C & a-Si<sub>Fe,FeS</sub>/a-C
- dust evolution - from diffuse to dense ISM
  - a-C:H  $\longleftrightarrow$  a-C, mantle accretion & dust coagulation

# THEMIS

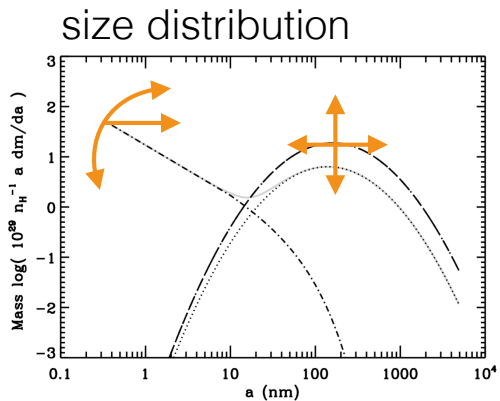
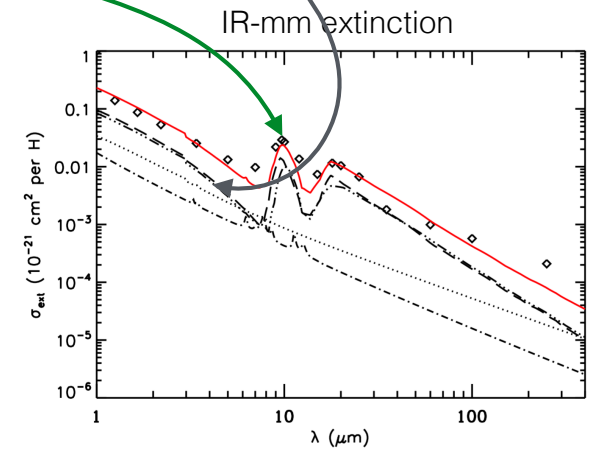
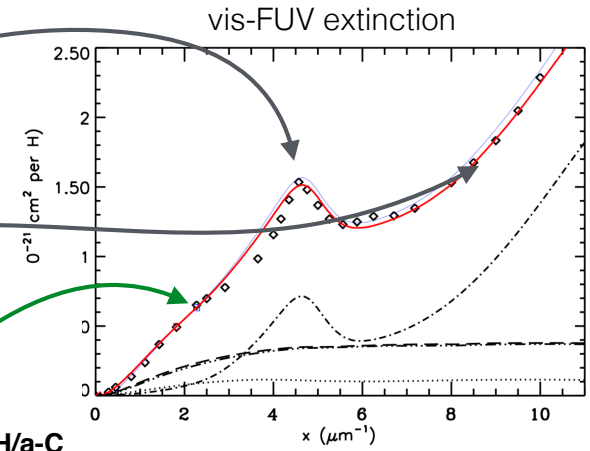
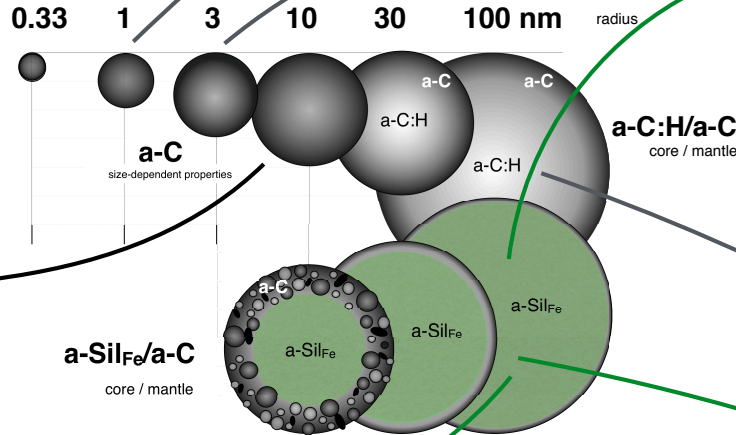
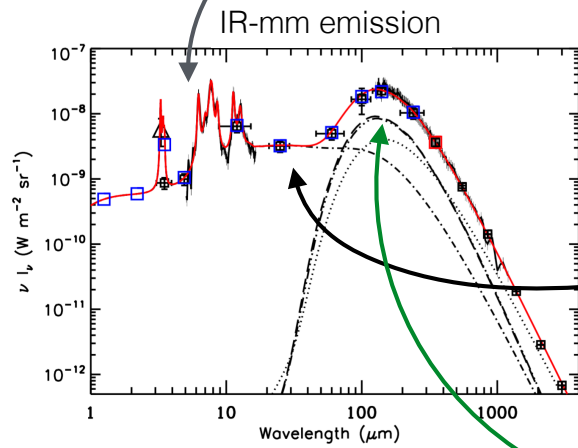
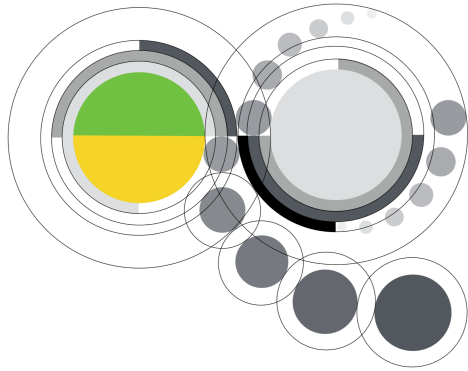
( The Heterogeneous dust Evolution Model for Interstellar Solids )

What does it look like?

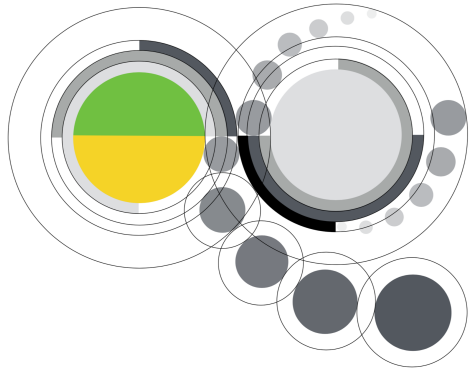


# THEMIS

## What does what?

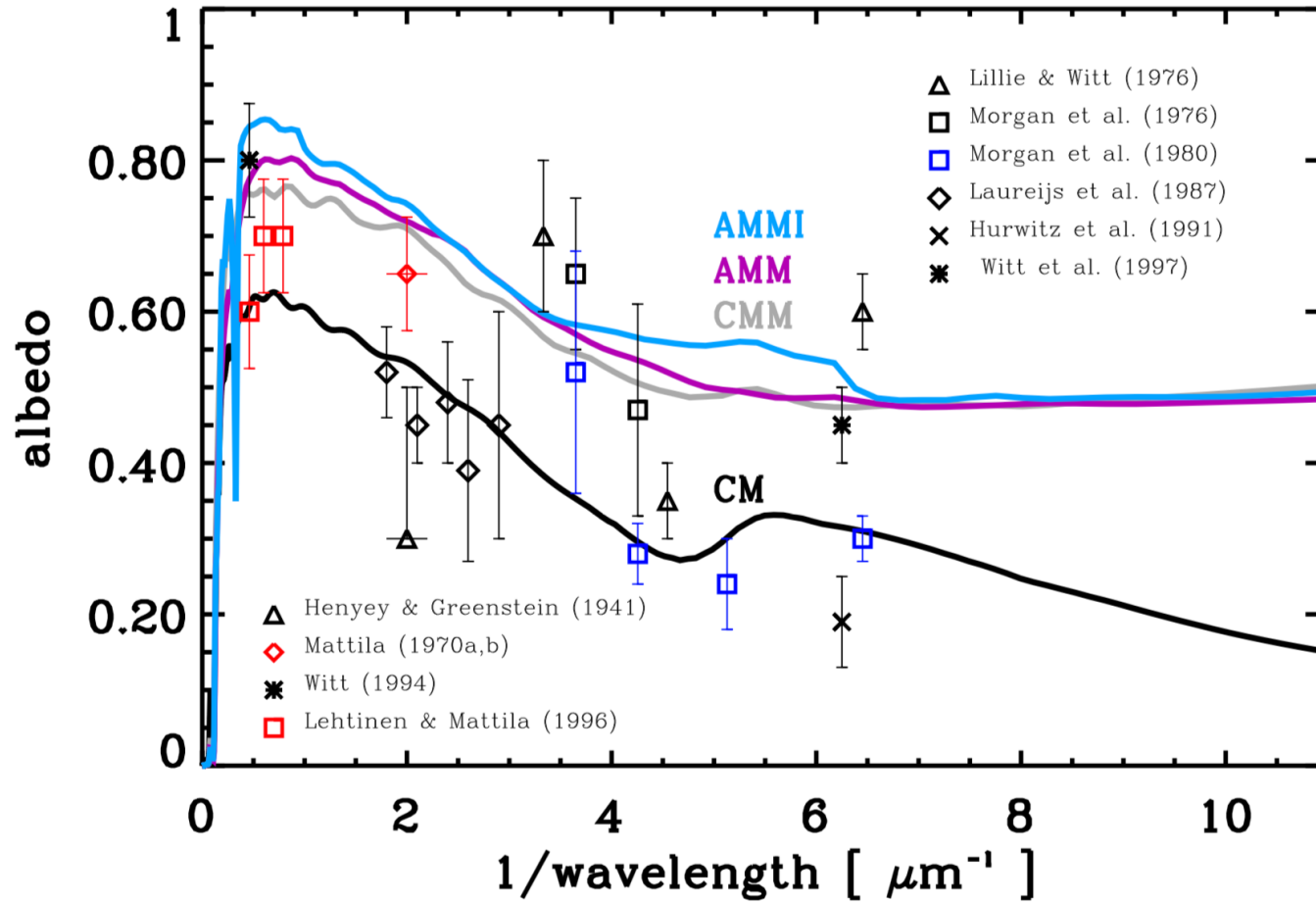


Jones et al. (2013)



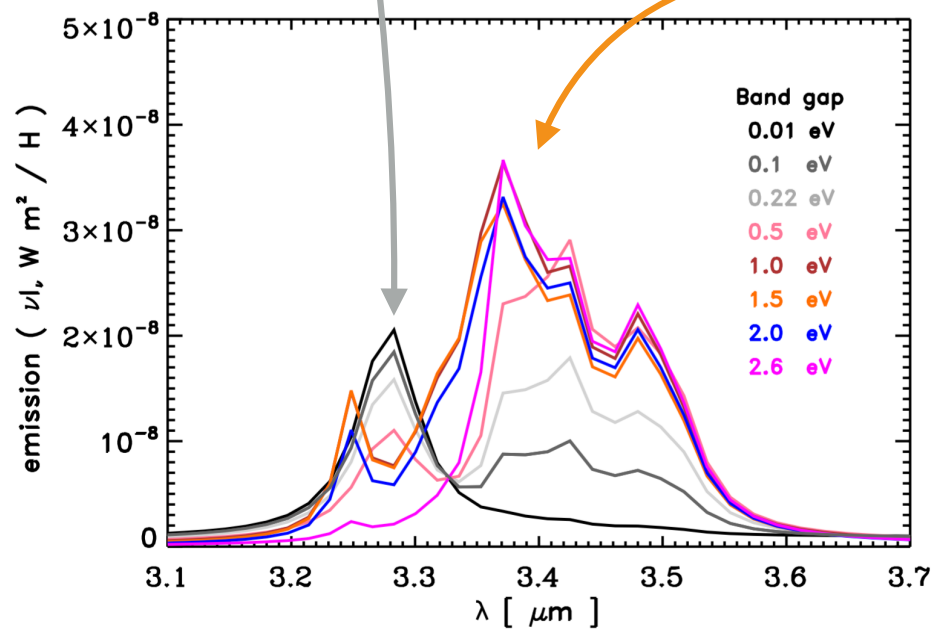
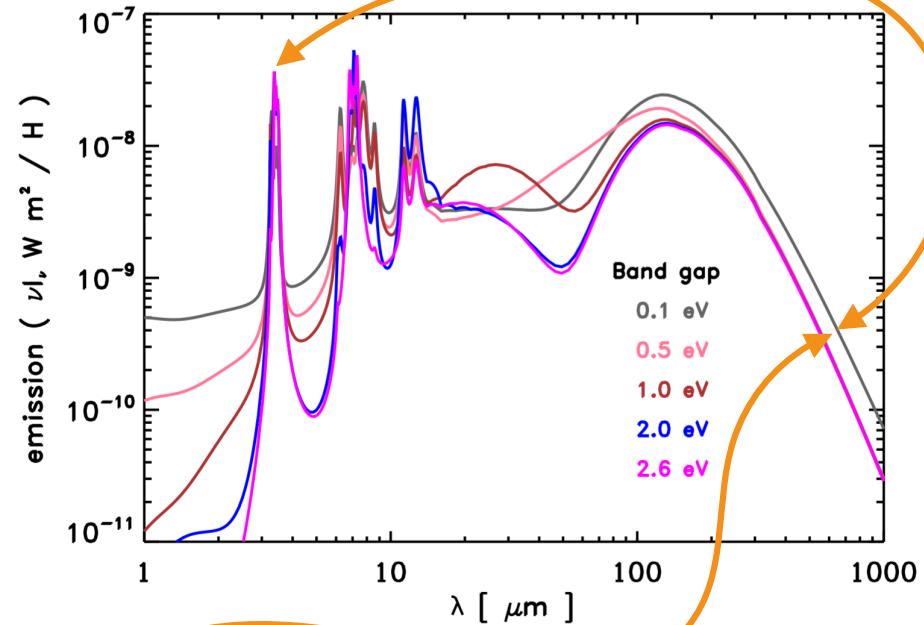
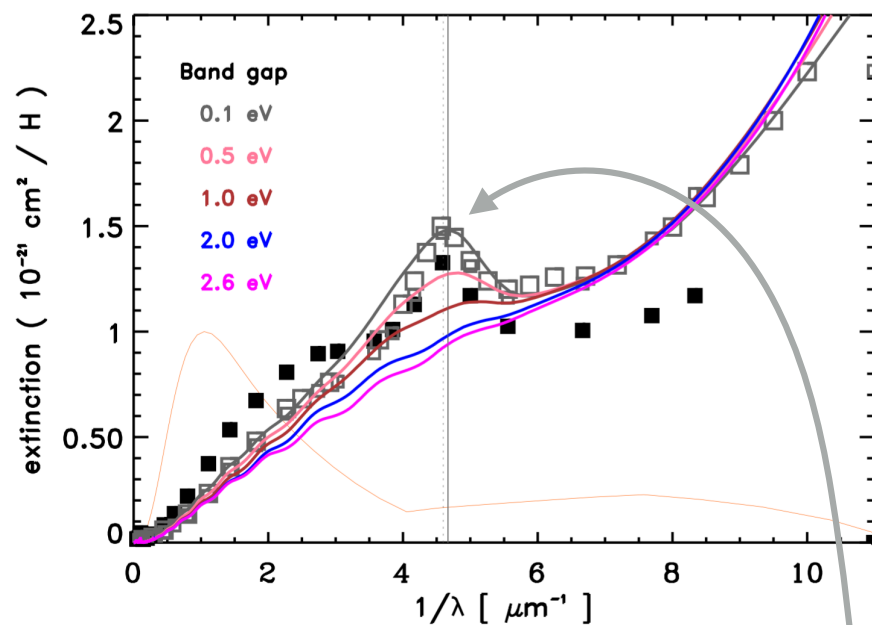
# DustEM & THEMIS

## dust albedo

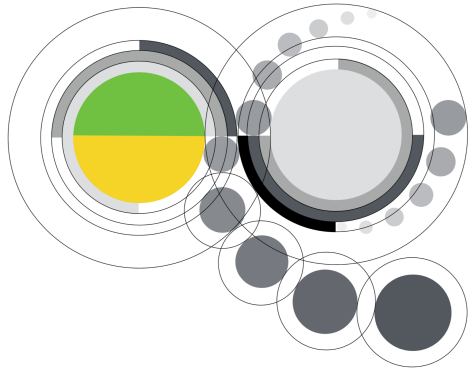


# THEMIS

## evolution of the dust composition



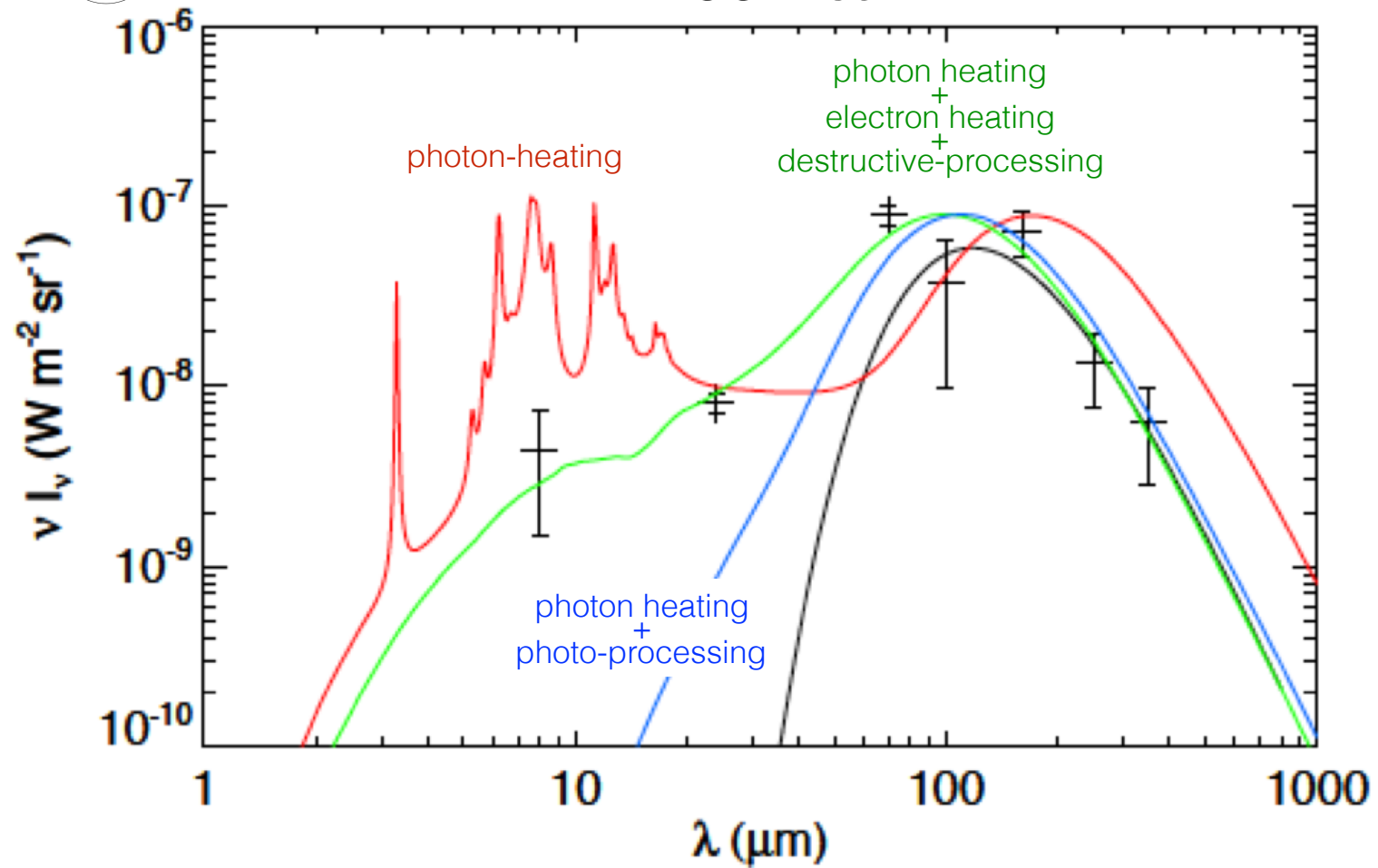


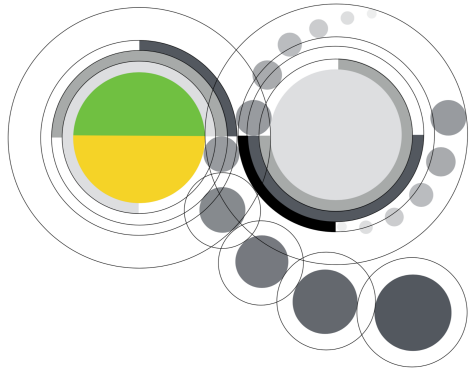


# DustEM & THEMIS

## electron collision heating

NGC 4438

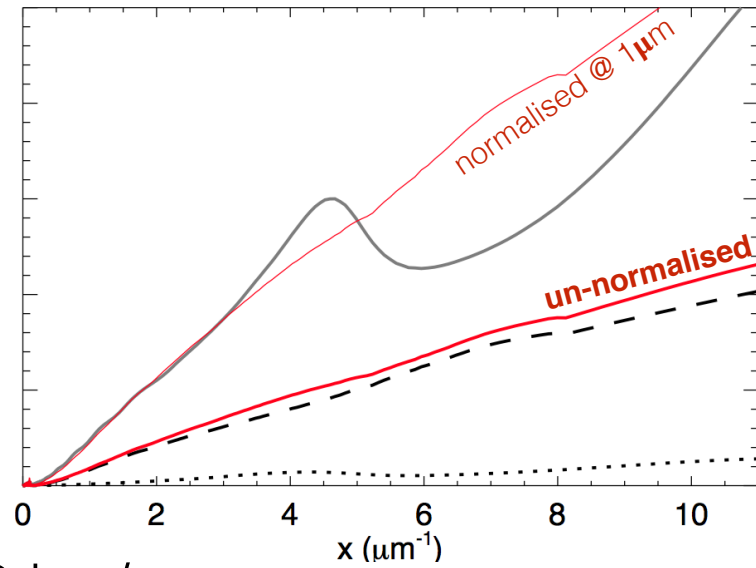
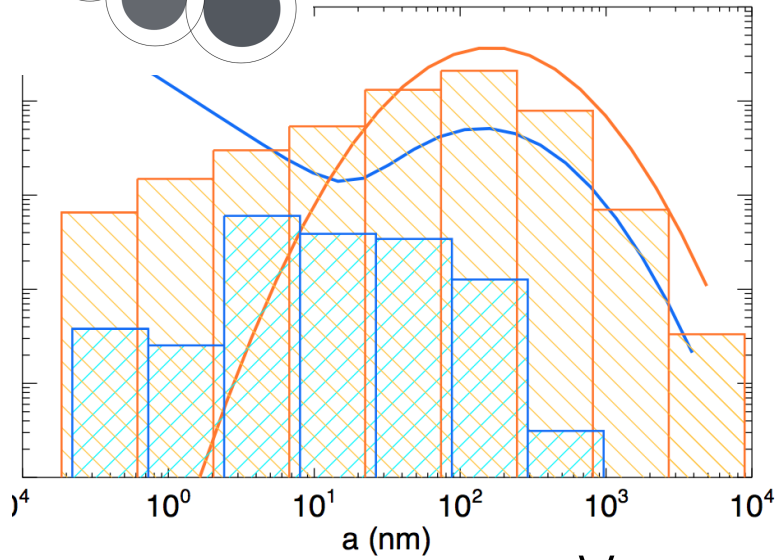




# DustEM & THEMIS

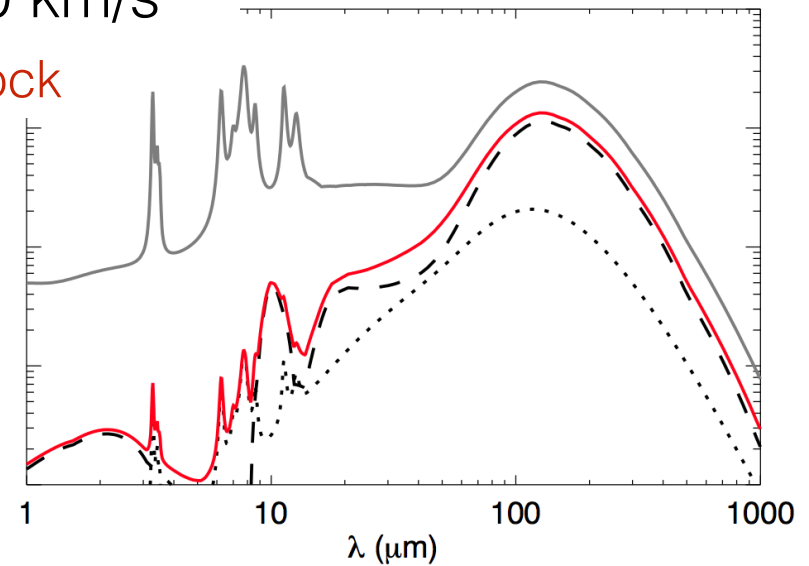
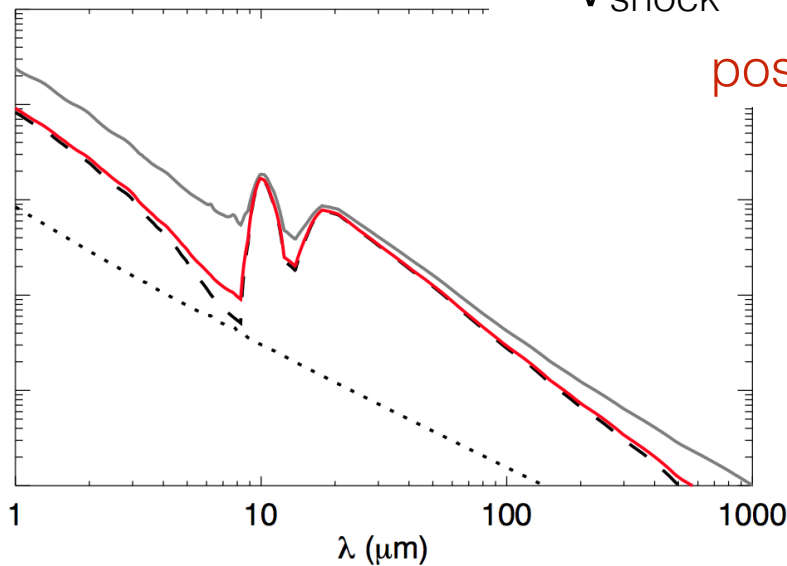
## GRASHEX and SN shocks (50-200 km/s)

pre-shock



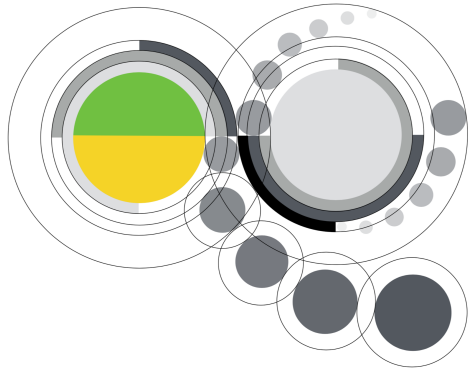
$V_{\text{shock}} = 100 \text{ km/s}$

post-shock



# DustEM & THEMIS

## Summary



THEMIS

DustEM

dust evolution  
dense clouds  
PDRs, HII regions, shocks

mantle accretion  
coagulation  
photo-processing  
hot e<sup>-</sup> processing  
SN shock-processing

